

RAT Online: Design, Delivery and Evaluation of Constructivist Computer Supported Martial Arts Learning Environments

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Declaration

This research has been carried out as partial fulfilment of the requirement for the award of a degree of *PhD* in the Faculty of Human Sciences at the University of KwaZulu-Natal. I declare that this thesis is my own work that I have achieved through consulting various sources acknowledged here.



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Abstract

This thesis describes the evaluation of several computer supported martial arts learning environments. These learning environments were designed, developed and implemented for practitioners of Rough and Tumble (RAT), a South African martial art, originally as a result of an increasing number of RAT practitioners relocating to other countries and yet wishing to continue their learning and practise of RAT. This project revolves mainly around the effectiveness evaluation of whether RAT martial arts knowledge, skills and attitudes can be learned in computer supported learning environments. The research is situated within design research and has pragmatic goals to provide a computer supported learning environment for the learning of RAT. Furthermore the design research was conducted to derive design principles for future design and development efforts. A brief account of the literature is provided, covering three main learning paradigms, with a focus on behaviourism and constructivism, followed by a description of issues in the computer supported learning field, an explanation of various definitions of martial arts and how the term is delimited in this study, and an overview of various evaluation paradigms. This account revealed inadequacies of the theories and terminology described pertaining to this study, resulting in the combined use of various underlying theoretical approaches to guide this research. These approaches include the eclectic-mixed methods-pragmatic paradigm as the overarching framework, a social constructivist learning approach, cognitive flexibility theory, Bloom's Taxonomy, the RAT approach to martial arts learning and teaching, and a mixed methods research design. Two main components were developed as solutions, which included the development of a computer martial arts resource, the RAT CD-ROM, and four online courses, the RAT Online courses. Data were collected using a number of research instruments, such as questionnaires, interviews, observations, records, expert reviews and learner artefacts in an attempt to understand the data from multiple viewpoints and develop a more reliable depiction of evaluation events. The data were analysed using mainly qualitative coding in software, expert rating diagrams, basic frequency statistics, and martial arts assessments of physical performances. These analyses revealed that although there is significant work involved in mixed methods research and there are issues such as participants not meeting task deadlines, technology failures, software usability issues, and small participant numbers, the research approach has contributed to the pragmatic goal of providing computer supported learning environments to RAT

practitioners, who otherwise would not have been able to participate in RAT. In addition a number of design principles for the creation of RAT computer supported learning environments were derived from this research, including the use of social constructivism, cognitive flexibility theory, Bloom's Taxonomy, multiple contextual training, and using computers as learning and knowledge construction tools. These underlying theoretical principles translate to more practical procedural principles, such as amongst others, to design computer supported learning environments incorporating tools to enable knowledge construction and collaboration, provide learning designs that are complex and authentic, encourage multiple representations of learner knowledge, take on a mentor role as online course facilitator, and to build problem solving activities into the learning design.

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Abbreviations

BIG – beyond the information given

CAI – computer assisted instruction

CBT – computer based training

CFT – cognitive flexibility theory

IBT – Internet based training

LMS – Learning management system

MCT – multiple contextual training

MMA – mixed martial arts

NHB – no holds barred fighting

RAT – Rough and Tumble

WBI – web based instruction

WBT – web based training

WIG – without the information given

ZPD – Zone of Proximal Development

Chapter 1: Introduction

This project is an evaluation of the Rough and Tumble (RAT) Online project, which is a project initiated to investigate and implement computer supported martial arts learning environments. The project is an evaluation of several computer supported martial arts learning environments comprised of two main components. The evaluation takes into account the design, development, and implementation of each component.

The evaluation is focused around the South African martial art, RAT, which I founded and developed from the late 1980's continuing into the early 1990's. In the mid-1990's the late Wayne Roscherr (my Jujitsu teacher) and I expanded the RAT syllabus into a comprehensive and life-long training programme for RAT practitioners. This syllabus undergoes continuous development and improvement and has resulted in several iterations of the syllabus.

Wayne Roscherr and I had both attained advanced martial arts ranks (above black belt level) in several martial arts disciplines and thus drew on our eclectic martial arts knowledge base to develop RAT and incorporate concepts and principles derived from different martial arts, as well as developing new concepts, principles and techniques contributing to the development of a practical self-defence and martial arts approach.

This chapter introduces the RAT approach to martial arts and the RAT learning approach. The chapter also introduces the main components of the study, the research questions, the background to the study, and an overview of the structure of this thesis.

First, a background to RAT as a martial art is described.

1.1 Background: RAT as a martial art

The following quotation taken from the literature on formal logic shows how beliefs can easily be misconstrued as facts or as bona fide research.

The campaigning politician “argues” that he should receive our votes because “everybody” is voting that way. We are told that such and such a breakfast food, or cigarette, or motor car is “best” because it is America’s largest seller. A certain belief “must be true” because “everyone knows it”. But popular acceptance of policy does not prove it to be wise; widespread use of certain products does not prove them to be satisfactory; general assent to a claim does not prove it to be true. To argue in this way is to commit the *ad populum* fallacy.

(Copi, 1961, p. 61)

Nowadays the advent, or rather revival, of No Holds Barred (NHB), ‘anything goes’, mixed martial arts (MMA), or ‘no-rules’ (all terms can be used interchangeably) fighting attracts full-capacity audiences and the introduction of technology allows us all to witness the showmanship of modern day gladiators through such channels as satellite and pay per view television and websites such as YouTube. This martial arts sport, originally enforcing few rules, was introduced in 1993 by Rorian Gracie, a Brazilian Jiu-Jitsu practitioner (Ferguson, 2011). According to Acevedo and Cheung (2010) MMA is now one of the fastest growing sports. Martial arts instructors, students and martial arts masters use such entertainment platforms to engage in rhetoric typical of the *argumentum ad populum* quoted above. The winner must be the best! The winner’s martial arts system must be the best! Are these statements really true? Is there such a thing as a best fighting system? Is the winner really the best fighter in the world? Should we really make such sweeping claims, when if proven false, novice martial arts students sustain serious injuries in real-life confrontations as a result of the promises made by such claims?

The underlying philosophy of RAT is pragmatic and practitioners recognise that there are certainly martial arts that might be better suited to certain situations, but importantly that there may be no such thing as a ‘best’ martial art. Since the early 1990’s, RAT has evolved from an original military application to provide learning for a civilian population and many of its learners have been successful in various kinds of competitions, ‘no-rules’/MMA and otherwise. However, these successes do not provide a basis to claim that RAT is the best martial art. Physical conflict involves such a complex array of factors contributing to defeat of one combatant over another. Fighters may lose because they possess inappropriate skill-sets for a specific type of competition, such as a ‘no-rules’ type competition. For example, a competitor with poor grappling (wrestling) skills might have difficulty when many ‘no-rules’ bouts end up with both competitors having to grapple on

the ground for dominance. Furthermore, each competition contains a set of rules. Even if competition organisers claim that it is a ‘no-rules’ event, there are usually always rules to ensure the safety of the participants. Rules lend themselves to being used in ways where some contestants can benefit more than others. For example, if the competition does not allow grappling on the ground, the person who favours punching and kicking (striking techniques), may be at an advantage over the grappler simply because the grappler would have to rely on an unfamiliar skill and knowledge-set.

Physical conflicts in authentic real-life situations may involve different skill-sets and knowledge, where a dependency on one skill-set, such as grappling or striking may be problematic. A defender may be attacked by two opponents for example. In this situation, the defender who favours grappling might attempt to win by wrestling one of the opponents on the ground. This would leave the defender open to attack by the second attacker. This is not to undermine the importance of grappling as an essential component of any well-rounded self-defence system. The point is that an appropriate strategy is required which is context dependent. Grapplers have made a significant impact in the NHB/MMA world, especially in light of combatants who favour striking techniques as a favoured combat strategy. So for different contexts different skills and knowledge may be required. This means that one martial art may be better suited to one kind of context while another martial art may be better suited to a different kind of situation. It is the work of the RAT practitioner to develop the attitude to gain as much experience, knowledge and skills as possible to deal with multiple kinds of contexts. Adding to the complexity of self-defence and martial arts situations, it is not only that one requires knowledge and skills for multiple strategies, but other factors have an impact on the outcome of an attack. For example, a fighter may just be feeling ill and even succumb to a less skilful opponent. In my view, because there are so many factors involved it is irresponsible of martial artists to perpetuate attitudes that convey to learners that there is only one way, method or philosophy to deal with all physical conflicts.

The MMA matches have done a great deal to change the mindset of many martial artists, because competitors from many different martial arts disciplines can participate. From my own experience and interaction with other martial artists over the years, there was a belief in the martial arts community that martial arts that use predominantly punching and kicking techniques (striking) are better suited to combat. The Brazilians contributed

significantly to changing this old mindset when they beat striking martial artists in the early Ultimate Fighting Championship (UFC) matches with their *Gracie Jiu-Jitsu* (Wikipedia, 2011), a predominantly ground grappling art. In my martial arts experience the striking martial arts such as *Karate*, *Kung Fu*, *Taekwondo*, and *Kickboxing* had dominated the martial arts spectator sport scene for many years. The UFC is a now widely viewed competition held in the United States of America (USA) where participants from different martial arts disciplines and countries can enter (UFC, 2011). Nowadays the fighters who are schooled in various martial arts disciplines perform well in this competition and these (MMA) fighters have become much more well-rounded athletes (UFC, 2011). The world is also now enthralled by a highly effective Brazilian derivative of a previously Japanese martial art, *Jiu-Jitsu*. Brazilian (Gracie) Jiu-Jitsu presently has practitioners all over the world.

The increased popularity of MMA events is showing that there are martial arts that can claim their home in countries outside of Asia. Some of the western martial arts tradition has been preserved in sports such as numerous styles of amateur wrestling, such as Graeco-Roman and Freestyle wrestling, boxing, fencing and French *Savate*. These western martial arts sports have resurfaced as effective forms of combat in MMA competitions. Indeed there are reference works, books and television documentaries showing martial arts from all continents. The Asian influence on the martial arts world and movies have left an indelible impression which has even led to people that I have met believing that martial arts can only originate in Asia. Even dictionary definitions allude to this belief. Sinclair (1995, p. 1021) defines a martial art in the following way:

A martial art is one of the philosophies and techniques of self-defence that come from the Far East, for example kung fu, karate, or judo.

The above definition implies that no other region of the world has martial arts. The MMA matches have brought many forgotten or unheard of martial arts to the fore, such as *Russian Sambo*, *Graeco-Roman wrestling* and boxing. Some types, such as wrestling and boxing, are not normally considered as martial arts, but rather fall into the category of sports. The point is that during such matches the idea that there are ‘supreme fighting styles’ and that they all originate in Asia has been partially dispelled. Contestants and winners can come from any martial arts or combat background from any part of the world.

There are so many other perceptions relating to martial arts and martial arts learning that can derive from logic based on the *argumentum ad populum*. Some of the more serious are: (1) Martial art X is the best, (2) Technique X is best for dealing with situation Y, (3) Martial art X is best because it is affiliated to Organization Y, (4) Martial art X is better because it is older than martial art Y, and (5) Teaching method X must be good because it has been used for thousands of years. It is the job of the RAT practitioner to challenge such perceptions that may lead to narrow-minded attitudes. In addition the RAT practitioner needs to develop a large and varied martial arts skill-set and broad and flexible knowledge schema. I have observed that not only novice martial artists, but even seasoned traditionalist martial artists hold beliefs reflecting the *ad populum* fallacy. So when the idea was introduced of teaching and learning RAT, a South African martial art, many scorned at the idea. Some of the comments and questions included the following: “Martial arts do not originate in South Africa. Why do you do grappling? You will get confused by different skill-sets.” Despite this scepticism the RAT practitioner explores the multiple possibilities in self-defence and tests what works and what does not work without relying on the beliefs typical of the *argumentum ad populum*. The RAT practitioner is required to be open-minded and look at self-defence problems in different ways, develop a wide variety of skills as well as context specific skills, and a broad and in-depth knowledge of all aspects of self-defence, which includes strategic and psychological knowledge and skills.

Those who were especially sceptical about RAT were the ‘traditional’ martial arts followers who were even more sceptical about the idea of teaching and learning RAT online. This is not meant to imply that being a traditional martial arts practitioner is bad. It does depend how these traditional beliefs are applied though. In my experience I have met two main groups of traditional martial artists, including: (1) those who rigidly follow the beliefs and traditions of their art without question, and (2) those who understand the underlying principles of ancient martial arts traditions and can apply principles and techniques to modern day situations to give one an advantage during combat. RAT practitioners could in the latter sense be considered traditionalists too, as they attempt to develop solutions to deal with all kinds self-defence situations based on a mindset typical of the ancients (i.e., using whatever is available to gain an advantage in combat, provided that it is ethical and legal). The ancients were driven by the need to find solutions to practical martial arts problems and thus developed martial arts techniques and principles

around such needs. For example, developers of the Okinawan martial art of *Kobujutsu* developed fighting styles from farming implements, such as the *nunchaku* (rice flails) and *kama* (sickle) because ordinary citizens were forbidden to own weapons (Mitchell, 1989, pp. 110-112). Like ancient martial arts, the kinds of skills developed by RAT practitioners requires them to embrace attitudes and guiding philosophies that would guide them on an ethical path, otherwise if misused their skills would no longer be of benefit to their wider community. In my view, it is the traditionalists who fall into the former group who have fossilised the ancient techniques as mere physical movements for self-defence rather than principles that govern the techniques and preserved more so for posterity than for the principles underlying them. For example, in ancient weapons martial arts systems a practitioner may learn how to use a certain weapon which may now no longer be in use. The practitioner often only learns the physical techniques without making the connection between the principles governing the characteristics of the weapon and the possible ranges of motion allowed by such a weapon. The true traditionalist should be able to use the principles afforded by the characteristics of the weapon and apply them to other weapons with similar characteristics. Thus ancient martial arts may always have a historic value, but can also have a current relevance.

The next section is an overview of the teaching and learning approach of RAT.

1.2 RAT: introduction to the learning approach

The learning and teaching of RAT requires drill and practise of martial arts techniques to develop automatic skills so that practitioners can respond to a multitude of different attacks and scenarios without having to think about the response. Attack and response is fast paced and time for thinking about a response is minimal. However, thinking while being attacked might be required in order to strategise for a good outcome, preferably escape, evasion, or avoidance. Within the competitive fighting arena there are a set of rules and fixed surroundings where a bout takes place, and that is challenging enough. However, in self-defence situations very little about the context is predetermined. Thus even though many scenarios are practised, the likelihood of any two situations being exactly the same is minimal. RAT techniques and principles are abstracted so that they can be applied to multiple situations, but in reality a situation might be so unique that the RAT practitioner

will be required to think and strategise and use creativity and apply skills to solve a complex self-defence situation. In addition to the knowledge and skill required to deal with complex situations, without an appropriate attitude it can be difficult to successfully deal with a self-defence situation.

Practitioners in RAT classes use a drill and practise approach to develop skills in established and effective techniques, but much of the learning is geared towards the development of creativity so that practitioners can develop new techniques and instances/variations of existing techniques to deal with novel situations. This learning takes place with the collaboration of class participants. More experienced practitioners help the newer practitioners, but the novice practitioners' opinions and solutions are treated with equal regard to those higher in RAT rank. Self-defence problems are viewed in the light of no one correct approach, but reality dictates to a large degree the importance of considering multiple viewpoints and factors. In this light, the teacher's views are not considered as the only correct viewpoints, similar to how Lowry (2010) contends that the teacher might lead others in classes, but is also on a learning path. During the learning process many possibilities are first considered before the optimum solutions are attained. During the RAT learning process much effort is invested in the development of an open-minded approach to learning and self-defence, as well as persistence and determination, and a high regard for fellow RAT practitioners and other martial artists, other martial arts, humans, and nature and the environment.

The next section introduces the RAT Online project.

1.3 What is the RAT Online project about?

The main purpose of this project is to determine through successive rounds of evaluation whether RAT can be taught and learned in computer supported learning environments. At the initiation stage of this project there was minimal research about teaching and learning martial arts online using the approaches utilised in this study. The reasons for this lack of research are not clear. Perhaps it was because people were not confident that physical knowledge and skills, especially martial arts skills, could be learned online. Furthermore, there was no research about teaching and learning RAT in computer supported learning

environments. The RAT Online project was focused around both formative and effectiveness evaluation (Reeves & Hedberg, 2003) of the learning environments. The project process consists of several iterations of design, development, delivery and evaluation. Each evaluation round was an attempt to improve upon the design, development process and delivery/implementation of the learning environments. Thus, in this way I view the two main components of this study as being always in a formative state. Just as RAT is in a constant state of flux and enhancement, so is the RAT Online initiative.

Next the two components of the study are introduced.

1.4 Components of the study

This study is an evaluation of two main components of the RAT Online project. The first component is a multimedia RAT knowledge resource, known as the RAT CD-ROM. The second component consists of a series of online collaborative martial arts courses: the RAT Online courses.

This project consists of three main questions to guide the evaluation and help determine the effectiveness of the learning environments to make design decisions to improve the RAT Online learning environments.

1.5 Research questions

The first question is broad and prompted this research in the first place, while the next two questions are more specific. Answers to the questions require evaluation and analysis of a complex interaction of factors, such as martial arts knowledge, learning approaches, computers and learning, and computer interface design. The main questions in this study are:

- a. Can RAT practitioners facilitate the learning of RAT martial arts knowledge, skills and attitudes (KSAs) in computer supported learning environments?
- b. What design would constitute effective martial arts computer supported learning environments?

- c. What kinds of learning activities and technical tools are effective in martial arts computer supported learning environments?

This research was prompted as a result of several problems, which are described below in the background to the study.

1.6 Background to the study

This study evolved as a practical response to an increasingly geographically dispersed RAT learning community. The reasons for this dispersion vary. Some learners re-located to other cities in South Africa for improved employment prospects, some re-located because of study internships, some emigrated to other countries because of work or other social reasons, while others went abroad for working holidays. The effect is that members of the RAT learning community experienced a void in their training and close social relationships with their fellow learners/practitioners. Although some learners did find other places to learn and train in other martial arts, they commented that they found it difficult to locate other schools offering the same sort of open-minded attitudes and variety in learning. They commented positively on the value of learning other martial arts, but expressed an interest to continue their RAT learning.

The RAT learning group has never been larger than sixty members at any single point in time, although more than one thousand learners have experienced RAT training to date. It takes a long time, many years, for a RAT practitioner to qualify as an instructor (learning guide/facilitator). This means that there are very few learning facilitators, making it difficult to set up clubs/learning groups throughout all South African cities and various locations in the world. Cost implications impede travel to various locations in South Africa and the world to deliver RAT classes. If RAT learners who are geographically dispersed from the RAT learning group really wanted to continue their learning relationship with other members of the RAT learning community, then clearly a solution was required for the problem. Once this problem was identified, it was a catalyst to evaluate the RAT learning situation and identify other issues affecting the effective teaching and learning of RAT.

Before the inception of the RAT Online project each learner received a paper text-based syllabus documenting the requirements of each major learning unit. The main learning units or milestones are known as ranks or grading levels. It is customary in many martial arts to have a ranking system for each unit of knowledge and skills. In many Asian martial arts participants wear different coloured belts to signify their rank, with the white belt representing the beginner and the black belt representing the point at which the practitioner is skilled at all the basics of their art. After black belt, the practitioner earns *dans* or *degrees* which are the more senior levels in the art. In RAT the senior RAT learners (members of the age of 12 and above) do not wear different coloured belts, but are required to prepare for knowledge, skills and attitude assessments for each rank or grade. Each rank has a name and prescribes different learning outcomes. We moved away from the traditional coloured belt ranking system, because of the stereotypes, negative and positive that are often associated with coloured belts. We still use a coloured belt ranking system for Junior RAT practitioners (members under the age of 12) from white belt level and end at black belt level, at which point the learner graduates to the senior RAT syllabus. Each rank in both the senior and junior classes typically consists of assessments in fitness, sparring (practice fighting), strategy, as well as a more formalised set of techniques and principles. Learners are expected to demonstrate improvement in all of these areas and meet the minimum required outcomes for each component.

Senior RAT practitioners provide a syllabus for every learner so that learners know beforehand what will be expected of them at each rank level. Not all martial arts schools that I or my martial arts colleagues have attended provide their learners with a documented syllabus. These learners are instead expected to memorise and repeat the skills without having to refer to a set of notes. While there is a structured syllabus in RAT, the classes are not so rigidly structured. Learners have open-ended tasks and creative activities as part of their formal syllabus. For this they require useful reference material to prepare for assessments while they are practising on their own or with other RAT practitioners outside of class times. Although the text-based strategy was a useful method of documenting and representing the technical and theoretical requirements for each rank, it was not always effective, mainly because of the difficulty of representing physical actions in the form of text. It is difficult for an inexperienced martial arts practitioner to visualise the textual description of a martial arts technique. For example, it will be difficult to understand what ‘major hip throw’ means without having learned the technique and grasped the concept of

what the name represents. Furthermore the problem is compounded, as many techniques are given abstract or arbitrary names in some martial arts, such as ‘needle on the sea bottom’, ‘grab sparrow’, and ‘break the chicken’s wing’. Even an experienced martial artist will have difficulty understanding the meaning of such technique names or labels, although when you know the technique the names are quite descriptive. Thus the paper text based syllabus was not highly effective for face-to-face learners, as well as geographically dispersed learners. This meant all learners required access to more effective and meaningful learning material that is more visual in nature. More recently there has been an unrestrained proliferation of visual martial arts material made available on the Web on sites such as Wikipedia and Youtube. At the time the RAT Online project was initiated these rich resources were in their infancy, but nowadays through personal relationships alone, I am aware that they are quite heavily used as informal martial arts learning tools.

The way that learners spent their time in face-to-face RAT classes also became a problem.

Martial arts classes are by nature learning environments where physical practice is highly regarded. For the most part learners engage in physical training, drill martial arts techniques such as punches and kicks, and practice sparring, rather than engaging in lecture type theoretical discussions. Classes are highly visual and tactile, but do not always require the learner to think about how the theory is applied. Learners, especially newcomers, mostly view theory as something that the ancient masters devised and might not question the validity or appropriateness of such theories to the modern context. In other words, learners might not question why one needs to learn to use a certain ancient weapon that no longer has a use for modern street self-defence situations. Indeed there are many theoretical reasons why such weapons are still practised, but the point is that learners often do not question the reasons why and may fail to make the connection between the theory and the practical. Although it is the responsibility of the instructor or learning guide to either tell learners or make an attempt to allow learners to discover the connection between theory and practical for themselves, the instructor might not understand this connection either. Learners making these sorts of theoretical - practical connections can benefit both in terms of their knowledge growing and they can learn to transfer skills from one situation to other similar situations or to develop the skills to use a multitude of different weapons with similar characteristics. For practical reasons and to use skills practice time effectively, classes are devoted mostly towards developing kinaesthetic ability based on previously

agreed upon theory. This approach works well, but is not ideal in a world that is constantly changing, bringing different self-defence challenges with it. As mentioned above, a degree of theoretical insight is required from the RAT learner. Furthermore, the ‘practise according to agreed theory’ approach may not be appropriate cross-culturally, as each country, nation, or region of the world may present different self-defence challenges. More is required of RAT practitioners than merely to accept pre-defined theories. Practitioners are required to question, test and discuss such theories and gain a deep personal understanding of why and how such theories are appropriate. In addition, learners are encouraged and required to challenge the conventional and commonly accepted theories and practices around unarmed and armed combat so that they can further their own understanding, skills and attitudes. This questioning and testing leads to discussion with peers and may result in new knowledge, insights and martial arts techniques that can be used to enhance RAT and contribute to the martial arts body of knowledge in its wider context.

Learners are encouraged to engage with both theoretical knowledge and combat situations in realistic simulated situations. Learners are required to develop knowledge resulting from their experiences in these authentic contexts, as well as to devise possible situations and scenarios where theories and techniques can be used. These experiences often lead to new practical techniques, which learners can then use to practise specific skills required for multiple situations. For example, learners might discover through experience that low kicks are generally more useful than high kicks in self-defence situations because of factors such as clothing, balance, and whether the surface they are standing on is stable or not. They can then drill the techniques many thousands of times to develop the automatic skills required for multiple self-defence situations.

Based on observations over the years of teaching, the requirements for RAT practitioners to practise skills, learn established theories and techniques, create new knowledge and develop attitudes that promote open-mindedness and motivation have contributed positively to the RAT learners’ experience. However without a forum to engage with other learners outside the class environment and lack of time during classes for the development of such knowledge, RAT is disadvantaged. Conversely if valuable practise time is used for discussing theory, then RAT is again disadvantaged, as practitioners would not have sufficient time to practise the all important physical skills. The RAT learning experience

needs to include environments where learners can discuss and engage with theory outside the face-to-face class context, as well as include as much physical practise time as possible within the face-to-face class environment.

There would be little point in developing new knowledge without recording this new knowledge so that other learners can use it in the future. Thus, in order to record theory and physical techniques RAT practitioners require mechanisms to build, represent and store knowledge of various types, such as texts, mind or concept maps, photos, video clips, diagrams, and animations. Practitioners can use these various media types as reference material and because learners are required to develop new knowledge and interpret old knowledge they can add to a RAT knowledge database so that it can continually grow and change. Learners will have the opportunity to gain varying viewpoints and view, engage with and create more appropriate and visual media types than the previous paper based texts.

The problems presented are reasons of concern for RAT practitioners and the main reasons for engaging in this research. However, another reason for engaging in this project is that little is known about computer supported learning environments where kinaesthetic knowledge and skills are taught and learned. This means that this study may be of a wider practical and theoretical educational value.

The reasons for undertaking this study can be summarised as an attempt to find and develop effective learning solutions to the following problems:

- Geographical dispersion of RAT learners;
- Ineffective text-based learning material;
- Limited face-to-face class time for effective practise and development of physical skills;
- Limited time in face-to-face classes to discuss theory;
- The lack of a central collaborative forum for learners to discuss theory across national and international boundaries;
- The lack of effective mechanisms to record, store, and represent knowledge to be used by other learners;

- The lack of a central knowledge repository to store media and learning artefacts; and
- Sparse research involving online learning and physical kinds of knowledge.

The problems and reasons given above prompted the decision to pursue the two components of this study:

- A multimedia RAT knowledge resource (which has become known as the RAT CD-ROM) to store knowledge artefacts and is accessible in the convenience of the learners' own location and time; and
- Collaborative online learning environments (which has become known as the RAT Online courses) to discuss, record, learn new knowledge, practise skills, develop attitudes, and represent knowledge across national and international boundaries.

After conducting a small scale pilot online martial arts course I concluded that computer supported online martial arts learning environments might help to provide solutions to the problems presented above. Since this area of research does not have an established set of 'rules', as researcher I was faced with many questions and decisions. The structure of this thesis represents the stages and thought processes involved in the study to answer the research questions and make appropriate design decisions. The project will be used as a design blueprint to pursue the RAT Online project as a sustainable learning platform for the teaching and learning of RAT.

1.7 Structure of the project

The RAT Online project was initiated with a broad analysis of the literature. The literature review provided a basic background for the theoretical framework described in the theoretical foundations chapter. The methodology chapter describes the mixed methods research approach used in this study. The following two chapters cover the two components of the RAT Online project: first the evaluation of the RAT CD-ROM and then the evaluation of the RAT Online courses. Finally, in the last chapter, I conclude with some recommendations for creating, delivering, and evaluating computer supported RAT

courses and some thoughts about other learning environments that incorporate kinaesthetic knowledge and skills. The following sections briefly describe each chapter of this study.

Literature review

What makes a project of this nature complex is that there are a variety of seemingly unrelated disciplines all brought together as part of the same study: martial arts, evaluation, learning, and computer supported learning. This issue has to be dealt with by placing these different disciplines into some meaningful framework in order to reduce complexity for the evaluator.

The literature review chapter is a review of literature covering the main theoretical sections used in this study: learning approaches, computers and learning, martial arts, and evaluation.

The theoretical foundations chapter is an extension of the literature review and focuses only on the chosen theories in this study.

Theoretical foundations

The theoretical foundations chapter describes a cohesive framework for this project. The main focus of this research is the pragmatic evaluation of computer supported learning environments so that learners of RAT can actually use these learning environments in real training. These evaluation goals are not dissimilar to those described in Reeves & Hedberg (2003).

The task of designing and implementing an interactive learning system is difficult and is confronted with “competing theoretical foundations ... and an often bewildering array of technological delivery options” coupled with the problem of conflicting methods of evaluation (Reeves & Hedberg, 2003, p. 3). Reeves & Hedberg (2003) espouse a pragmatic approach to interactive learning systems evaluation. Following the RAT practical approach to self-defence teaching and learning, it was considered that the pragmatic approach suggested by Reeves & Hedberg (2003) would support effective decision making during the design and delivery of such systems. The paradigm in which they conduct their evaluations is called the ‘eclectic-mixed methods-pragmatic paradigm’. The ‘eclectic-

mixed methods-pragmatic paradigm' underpins this research project providing a cohesive framework for the other theories used in this study.

There are three main theory categories in this project:

1. Eclectic-mixed methods-pragmatic paradigm;
2. RAT; and
3. Learning.

The eclectic-mixed methods-pragmatic paradigm allows for flexibility, multi-dimensionality and practicality. The approach allows researchers to make practical decisions based on the needs of each project. Appropriate, but different theories may be chosen for each project based on practical needs assessments (Reeves & Hedberg, 2003). Thus, this project incorporates various theories/approaches useful to describe RAT and appropriate learning approaches.

The flexible nature of the RAT approach to martial arts learning is similar in nature to the eclectic-mixed methods-pragmatic paradigm in that practitioners can draw from other disciplines and theories to help practitioners solve complex self-defence problems using the appropriate method to do so. Some of these theories may have nothing to do with martial arts at all. Many disciplines have borrowed or linked theoretical approaches from other fields of study in this way. For example, linguistics has borrowed genealogical trees from biology to create tree diagrams representing the various language families. In this study two linguistic theories are used as a means of providing a conceptual approach to RAT and ways of learning RAT. These two theories are:

- Chomsky's Universal Grammar (Chomsky, 1965; Cook, 1988; Cook & Newson, 1996); and
- Prototype categorization (Taylor, 1989, pp. 38-39).

The third category, learning, offers a diverse range of theories from which to choose. This study uses learning theories that support teaching and learning methods used by practitioners during RAT training, as well as approaches that are useful for computer

supported and social learning environments. The following three theories make up the learning category in this study:

- Social constructivism (Vygotsky, 1978);
- Cognitive flexibility theory (Kearsley 1992); and
- Bloom's Taxonomy (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; Krathwohl, Bloom, & Masia, 1964; Singer, 1982).

Each of these theories will be described in greater detail in the theoretical foundations chapter.

While the 'eclectic-mixed methods-pragmatic paradigm' underpins the theoretical framework, it also underpins the research methodology used in this project.

Methodology

This research is an attempt to solve practical problems and to develop principles to design, deliver, implement and evaluate effective computer supported martial arts learning environments. Development research (design experiments) (Amiel & Reeves, 2008; Brown, 1992; Joseph, 2004) is an appropriate methodology for such projects of a practical and complex nature (Reeves & Hedberg, 2003, p. 273). Reeves & Hedberg (2003, p. 275) state that a basic tenet of this type of research is "collaboration among practitioners, researchers, and technologists." This study is a collaborative effort among RAT practitioners, the researcher (me), and learning and computer user interface experts to create effective computer supported learning environments in order to find solutions to the practical problems mentioned in the background section previously.

This project included successive iterations of evaluation and development in an attempt to create new knowledge of how senior RAT practitioners can create and implement effective computer supported RAT learning environments. Development research is formative in nature as each iteration is a step towards a more effective end 'product'. These effectiveness evaluations are used to inform decisions about further development and provide insight to possibilities for learning and teaching a topic involving kinaesthetic knowledge with the support of computers.

Two rounds of development and evaluation on the RAT CD-ROM and four rounds of development and evaluation on the online courses were carried out.

Several research instruments were used to gain insights from various participant groups, each appropriate for the information required. The research instruments include: (1) expert reviews (user interface rating form, teaching evaluation form, and content expert evaluation form), (2) observation (cognitive walkthrough and participant observation), (3) learner feedback (semi-structured interview, focus group, online questionnaire, post grading and course interviews), (4) records (anecdotal, development and implementation records), and (5), learner output of various types including discussion and chat text, mind maps and video recorded material.

The methods to analyse the data include both quantitative and qualitative means, such as basic statistical analysis, visual scale diagrams, text analysis and course assessment analysis.

The two main chapters follow the methodology section. First, the RAT CD-ROM is discussed followed by a discussion of the RAT Online courses in the next chapter.

The RAT CD-ROM

Following a description of the purpose, rationale, and design and development of the RAT CD-ROM, the main part of the chapter is divided into a description and discussion of two rounds of evaluation conducted for the RAT CD-ROM. Each evaluation round is a description of how the data collection methods were used, their results, and a discussion of the findings which resulted in a number of conclusions and design decisions.

The RAT Online courses

The RAT Online chapter describes each of four evaluation rounds, including evaluations of: (1) the Bear Hug course, (2) the Wheel Spanner course, (3) the Belt course, and (4) the Pen course. Each course except the Bear Hug course was a full and complex course involving development of new knowledge, skills and attitudes and each was carried out over a period of more than a month. Since many participants had already trained in various martial arts, course topics were chosen in areas that none of the participants had trained in before.

Like the RAT CD-ROM evaluations each course evaluation included a description of how the data collection methods were applied, their results, and a discussion of the findings which resulted in a number of conclusions and design decisions.

Discussion

The final chapter of the study is a summary of the project, including the project conclusions, the implications and limitations of the study, finishing with a few thoughts about future directions of the RAT Online project.

The next chapter is a review of relevant literature in this study.

Chapter 2: Literature Review

This chapter is a focused review of the literature of the four main theoretical categories in this project. These categories include: (1) learning approaches, (2) computer supported learning, (3) martial arts, and (4) evaluation of computer supported learning environments. The purpose of this chapter is also to provide the background for the theoretical foundations discussed in the next chapter.

The learning section of this chapter covers the major approaches to learning that have influenced education within the last 100 years, but will also draw minimally on topics going further back in history. The learning section is included, as appropriate learning approaches are considered as the major consideration in the design of RAT Online learning environments, as they might or might not be in other computer supported learning environments.

Following on the description of learning approaches, a brief account of computers as used in learning environments is provided. This section provides a brief history of computer supported learning and describes some of the issues and successes of this mode of learning as well as how learning approaches might have influenced the design of computer supported learning environments.

The chapter then takes a new direction with a descriptive overview of martial arts. This section covers key terminology, characteristics of martial arts, how martial arts are traditionally taught, and how RAT fits in as a martial art.

The final section in this chapter is a description of how computer supported learning environments are evaluated, some of the problems of evaluation, and several common evaluation models.

The first section focuses on learning approaches.

2.1 Learning Approaches

This section describes two divergent views of learning: behaviourism and constructivism. This section also includes a brief account of cognitivism, which sits in the middle of behaviourism and constructivism and can be seen as a catalyst for a move away from deeply entrenched behaviourist teaching and learning practices.

Before describing each view of learning, a look to the past is presented to illustrate that the link between learning research does not translate to fast-paced implementation in practise.

A look to the past

Since antiquity there have been examples of educational doctrines and approaches aiming to improve human learning, some of which have continued right up until modernity. For example, there is the wisdom of Confucius' teachings in ancient China, the dialogic approach to teaching of Socrates, and the various religious doctrines that have influenced what children should and could learn. While many of these approaches continued to exert an influence for hundreds if not thousands of years, not all approaches have gained immediate acceptability. Take the case of realism for example:

Realism, deriving from the increased interest in the natural sciences, attempted to replace humanistic education with its excessively theoretical orientation by an education which would prepare man practically for his daily duties, teaching him to think and judge independently. Rather than the teacher telling the child things, the child must now study those things directly.

One must however remember that Realist doctrines were put into practice only years – and even centuries – after their time, since schools were too hidebound by existing views.

(Verster, Theron, & van Zyl, 1982, p. 46)

The excerpt from Verster et al (1982) illustrates that whenever a new school of thought is on the rise it might be met with resistance of one sort or another resulting in slow uptake. Whether the ideas are good or not seems irrelevant. This resistance can be a healthy checkpoint causing people to think carefully before accepting new and fashionable viewpoints, but it may likewise serve to stifle progress.

Verster et al's (1982) claim that schools are "too hidebound by existing views" to change even hundreds of years later is not a sobering thought, given that rapid change in educational practice is what may be required to help learners keep pace with rapid scientific and technological advances, as well as new problems associated with a modern lifestyle, such as climate change, unsustainable poverty, and disease. Even though new advances in technology and education technology have come such a long way in recent years, it does not imply that its use in education has kept pace with these latest developments. In the Conference on Information Technology in Higher Education (CITTE) presentation titled "The idea of a university in the information age" Greaves (2002) explained how the world had progressed scientifically and how technology is used and has affected almost every sphere of life, but that its effect in the pedagogical realm is limited. He claimed that classrooms still look much as they did hundreds of years ago with the teacher occupying the central role in the front of the classroom telling the students what needs to go into their heads. From my observations, when technology is used for teaching it is often used in a way that conveys such antiquated teaching practices. For example, I have observed a tendency of educators in my workplace to upload their notes online for students, but do no more than this to facilitate learning. While there are benefits of this anytime anywhere access to course material, is it the best use of technology and is it making use of best teaching and learning practise? Bigge and Shermis (1999, p. 3) contend that new theories of learning are only typically "translated into educational practice" around 25 years after they have been published.

It is beyond the scope of this study to answer why there is such slow uptake of learning research in practice. However considering the above situation prompted the decision to pursue the practical application of appropriate theory in this study. This study is a challenge to conventional martial arts teaching practises as much as it is a challenge to current online learning possibilities.

The three main education paradigms in the last century or so have been: *behaviourism*, *cognitivism*, and *constructivism*. These three paradigms are complemented by a host of other learning theories and approaches (in particular humanism) that have played a significant role in education. This review is limited to the theoretical viewpoints that provide a background to the theoretical foundations of this study. Done otherwise, the

plethora of learning theories could easily form a critical literature review spanning this whole study.

What is learning?

Collins Cobuild English Dictionary defines learning as “...the process of gaining knowledge through studying.” (1995, p. 946) This definition is somewhat restricted as it implies that learning occurs only through the conscious act of studying and that learning is equated with gaining knowledge. What of any learning that might take place as a result of observing another person doing something in the workplace? Or what about the learning gained through experience? It also begs the questions “what is knowledge?” and “what is studying?” and “does knowledge include attitudes and skills, such as learning to be a more responsible person and learning to play a sport?”

Gagne states that “[l]earning is a change in human disposition or capability, which can be retained, and which is not simply ascribable to the process of growth (1965, p. 5).” This definition encompasses more than the previous definition as it includes affective traits with the use of the term ‘disposition’. Furthermore, the use of the term ‘capability’ is broad and can mean knowledge and skills. The definition also implies that something (possibly a process) takes place during learning, as learning is not simply “ascribable to the process of growth.” Assuming that reference is being made to a process occurring during learning, then this too is a broader and less restrictive use of terminology than implied by the word ‘studying’ in the first definition. A process could mean a series of actions that people perform when learning, interactions between individuals, or even something that occurs within the head, such as thinking. Kolb & Kolb (2005, p. 194) summarise six learning propositions shared by a number of notable learning theorists, including Dewey, Lewin, Piaget, Rogers and others, which all highlight learning as a process. Thus Gagne’s definition provides a perspective from which the term ‘learning’ will be viewed in this project, that is, that during learning changes occur in people’s affective attributes as well as their capabilities and that these changes occur as a result of a process or processes.

It is the various views of the process of learning which are central to the various, quite often divergent, learning theories. One can see why an understanding of the learning process is so important, as this understanding can guide educators to place learners in the

right kinds of situations and environments that foster the learning process to occur. The next three sections highlight three of these divergent approaches to learning.

The first part of the next section covers behaviourism as a theory of learning and the impact it has had on education.

2.1.1 Behaviourism

Behaviourism was a reaction against the introspective psychology (Watson, 1970, pp. 1-6) as typified by *mentalism*. In Watson's work *behaviourism* is described as a school of thought in psychology in which it is theorised that observable behaviour can be measured, trained and changed and that one cannot measure what goes on inside the head in any meaningful way. As such, the behaviourists contend that only observable behaviours should be studied. *Mentalism* in this usage refers to a paradigm of psychology in which its proponents are interested in observing and analysing the functions of the human mind. Wilhelm Wundt is considered the first scholar to engage in introspective psychology (Uttal, 2000, p. 9). Since introspective psychologists are interested in feelings and thoughts more so than observable behaviours, the behaviourists saw this as unscientific, as experiments could not easily be controlled. Since its inception behaviourism has had a significant influence on the study and practice of animal and human learning.

So strong were the beliefs in the behaviourism movement that led its founder, John Watson to claim the following:

Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select--doctor, lawyer, artist, merchant-chief, and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestor.

(Watson, 1970, p. 104)¹

Watson's claim suggests an approach to human teaching and learning where control over learning is determined by a more knowledgeable teacher/trainer/person and that

¹ This work was first published in 1924 and has been republished several times since.

behaviourists assume that every learner starts off life the same as any other learner. This identical starting point is often referred to as a blank slate (*tabula rasa*), a phrase often attributed to John Locke (a 17th Century philosopher) (Hull, 2002, p. 251; Tait, 1928, p. 397), although it is disputed that it was Locke who coined the phrase (Moore, 2008, pp. 97-98). Also implied in the above claim is that if the training is administered in the same way for each learner the outcome of the learning will be the same for each learner.

There are two main strands of behaviourism: classical conditioning and operant conditioning.

Classical conditioning

The most well-known examples of classical conditioning were demonstrated by Ivan Pavlov in his experiments with dogs. Pavlov (1941, p. 75) demonstrated that dogs can be conditioned to salivate when presented with an artificial stimulus as if they were being presented with a natural stimulus, such as the odour of food. This is known as a conditioned reflex.

Normally a natural or unconditioned stimulus causes an unconditioned reflex/response. For example, if one presented a bowl of food (unconditioned stimulus) to a dog it would begin to salivate (unconditioned response). Pavlov found that it was possible to associate an unconditioned stimulus with an artificial/conditioned stimulus and repeat the pairing until presentation of only the conditioned stimulus produces the conditioned reflex/response. So if one were to ring a bell each time the dog was presented with food, eventually only the ringing of the bell would produce the salivation reflex. Classical conditioning is also known as *associative learning* (Learning Theories Knowledgebase, 2011) because of the association between unconditioned and conditioned stimuli.

Watson (1970, pp. 159-164) demonstrated classical conditioning in humans, even though the work is unethical by today's standards. He used an 11 month old infant as his subject, named Albert. The series of experiments started out by presenting a white rat to Albert. Albert reached out to the rat and was unafraid. Then Watson banged a long metal rod with a hammer to produce a loud sound, which startled Albert. Through repeated exposures to this event pairing, Albert eventually became scared of the rat and in fact he became scared of other animals and even fluffy toys. I should add further that Watson (1970, p. 159)

himself commented that Albert “was a wonderfully good baby” and that in all the months that they worked with him they never saw him cry until after their experiments were made.

Edward Thorndike’s work catalysed a shift from classical conditioning to *operant conditioning*.

Operant conditioning

Operant conditioning takes learning a stage further than classical conditioning. Where classical conditioning involves the modification of natural responses, operant conditioning involves using consequences to develop and modify a wide variety of behaviours in the social world in which we live (Nye, 1979, p. 25), such as the voluntary activities we engage in, e.g. “...reading, studying, writing, playing sports, working...” etc (Nye, 1979, p. 26). The difference between operant and reflex behaviour is that the former is voluntary and the latter is involuntary (Skinner, 1974, p. 40). Operant conditioning has strong implications for teaching and learning in the classroom; because conditioning would no longer be limited to the basic reflex conditioning studied by Pavlov, but could be extended to other types of learning. And indeed these strong implications continue to exert a powerful influence on education.

Edward Thorndike’s (1898) stimulus (S) response (R) theory (also known as connectionism) illustrates how consequences can influence and modify behaviours. Thorndike (1898) experimented with cats in a puzzle box. Through trial and error the cats learned to press a lever (S), and associated the action with opening the door and escaping (R). The escape is a reward or consequence that helps to strengthen the S-R connection.

Another influential behaviourist was Skinner. His brand of behaviourism was so strongly associated with operant behaviour that it is often referred to as “operant behaviorism” (Nye, 1979, p. 26).

Skinner placed great emphasis on the direct observation of behaviour and to him this was the only research data of any use in psychology research; theorising to him was considered futile (McCabe, 1992, p. 15). Skinner did not reject all types of introspection (such as self-observation) like other behaviourists had done previously, however he did question the reliability of such observations (Skinner, 1974, pp. 16-17). In fact, he posited that

everything we do is behaviour, including feeling a certain way about something (Skinner, 1974, pp. 47-49). Skinner explained behaviour in terms of *reinforcement*, where the consequences of behaviour can strengthen/reinforce behaviour for future similar situations (Skinner, 1974, p. 39). Reinforcement was at the heart of Skinner's brand of behaviourism. There are two types of reinforcement: positive and negative. Drinking a glass of water when thirsty is positively reinforcing and might strengthen the behaviour of drinking water when thirsty (Skinner, 1974, p. 46). A negative reinforcer on the other hand strengthens behaviour that reduces the reinforcer, such as when a person removes a shoe that is pinching and decreases the pressure on the foot (Skinner, 1974, p. 46).

Aspects of human behaviour as described by behaviourist theory, such as learning conditioned reflexes, can be useful in a martial arts situation where a quick response is essential when attacked. Furthermore Singer (1982, p. 8) states that practise is necessary to improve physical skills and later attests to the effectiveness of the "drill technique" of behaviourism (1982, p. 24) to develop the skills of large groups of participants. Martial arts classes typically consist of multiple learners in the same class. He also refers to reinforcement and punishment as espoused by Skinner and its potential positive impact on developing sporting skills (Singer, 1982, pp. 162-165). The final phase in skill acquisition is the autonomous phase in which the practitioners require only minimal control over their movements allowing the brain to attend to other things at the same time, such as the strategy of a game (Singer, 1982, p. 88). This development of autonomous skills is highly desirable in self-defence situations which might require strategic considerations as well as dealing with the physical confrontation. The drill technique is common in martial arts teaching classes that I have attended and as I have observed it can be an effective way of developing mastery over already established martial arts techniques. However, Harrow (1972) shows that developing psychomotor skills can become a complex activity. Complex situations, requiring novel solutions are characteristic of unknown self-defence scenarios. While, I would not want to discount the advantages of some behaviourist learning approaches, the limited focus on developing a set range of skills does not satisfy the learning requirements of a RAT practitioner, who needs not only to develop specific skills, but also needs to respond to complex and unknown situations. Thus behaviourism alone is insufficient as a supporting learning approach for RAT learning environments.

Even though behaviourism gained such a strong foothold in the scientific community, there were research psychologists and theorists that disagreed strongly with the overly pseudo-scientific dogma of the behaviourists and sort to demonstrate the role of the ‘thinking human’ over the ‘machine human’ in learning. Ironically, some of the support for the ‘thinking human’ came from research conducted in computer processing models. Cognitivism and humanism broke the trend of viewing learning as a series of stimulus response behaviours and its focus on observable behaviour.

2.1.2 Cognitivism

This section does not cover *cognitivism* in great detail, but is described as the bridge between behaviourism and constructivism.

Chomsky (1967) criticised Skinner’s view of language learning. Chomsky’s criticism of behaviourism is an important development in the shift to cognitive theories of learning. Cook explains how Chomsky argued in favour of the creative aspect of human language (1988, pp. 62-63) and the poverty of the stimulus argument (Cook & Newson, 1996, pp. 81-86). Chomsky questioned how it is that children can produce novel sentences in the absence of reinforcement of those novel sentences (Cook, 1988, p. 62). Moreover, the grammatical errors produced by children’s utterances were used as further evidence against behaviourism (Cook, 1988, p. 64). For example, a child might generalise the past tense rule of ‘go’ to ‘goed’, instead of ‘went’, which is technically correct. ‘Went’ is an exception to the past tense rule. The arguments of Chomsky’s imply that children have knowledge in their heads that is present because of some other process than reinforcement.

Cognitivism is a paradigm of learning where its advocates are interested in the structure and processes involved in organising knowledge within the brain (Mergel, 1998). Other researchers, such as Tolman and Piaget also provided evidence of cognitive learning contributing to the cognitive shift in psychology.

Tolman (1948) showed rats placed in a maze would not go down routes that were blocked as if they had some mental map of the maze. While Tolman acknowledges that the learning

of the route might be as a result of reinforcement, there is still the issue of the route (map) becoming established in the rat's brain. Tolman abstracted his research to human learning.

Piaget (1929) proposed that children go through several developmental stages in their learning. He also proposed several mental processes children go through when learning new knowledge. These processes: assimilation, accommodation, adaptation, and equilibrium suggested in the first instance that human learning involves internal mental processes, and in the second that learning goes through a process and seems to be created and modified in the mind of the learner. This is similar to constructivism, described next. Piaget can be considered a notable catalyst to the constructivist movement.

2.1.3 Constructivism

Constructivism is a view of learning in which it is believed that learners construct “their own interpretations of the world based upon their past experiences and their interactions in the world (Cunningham, 1992, p. 36).” Advocates of constructivism believe that the learning process is not simply a case of transferring external knowledge existing outside learners' heads into the learners' minds (Cunningham, 1992, p. 36). This approach is far removed from the objectivist and reinforcement ideas expressed in behaviourism, because firstly it implies that learners will not learn the same things due to their differing views of the world. Secondly, it implies that learners do not enter a new learning situation with the same blank slates; they have prior knowledge that influences their future learning. Thirdly, control of what learners actually learn seems much less in the control of the teacher and more controlled by the learner. Thus in the constructivist view learners construct their own knowledge, implying that learning is an active process.

Another of the notable contributors to constructivism, Jerome Bruner (1973, pp. 406-409) suggested there are intrinsic and extrinsic motives for learning, which goes against the stimulus rewards and punishments as motives in behaviourism. He also noted the importance of the satisfying feeling of discovering information (discovery learning) and going beyond the information given in a learning situation. Perkins (1992, pp. 49-50) distinguished ‘beyond the information given (BIG)’ and ‘without the given information (WIG)’ types of constructivism. In BIG, learners might be presented with a piece of knowledge and then be asked to perform certain learning activities to develop their

understandings further of the information presented. In WIG, on the other hand, learners would not be presented with the information, but might instead be presented with some problem and the learners would need to interact with the situation and other learners to discover and develop their understandings of the situation. This process requires careful mediation by a teacher/facilitator and might also result in alternative explanations by different learners. 3D immersive computer games, such as Quest Atlantis (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005), Gamma Khozi (Baxter, Seagram, & Amory, 2006) and Active Worlds (Dickey, 2005) provide opportunities for learners to develop understandings based on presentation of problems.

Duffy and Jonassen (1992, p. 3) recognise that there will be different meanings of events and concepts and that there is no single correct meaning. This recognition of different views in some sense implies a value for the various opinions/views of others, indicating at the same time a value for social interaction in learning situations.

Vygotsky (1978) asserted that learning is preceded by a social context in which there is someone with more knowledge (not necessarily the teacher, but quite plausibly another learner) and it is with guidance and scaffolding from those with more knowledge that facilitates learning to occur. This aspect of constructivism is expanded upon in the theoretical foundations chapter.

In constructivism experience is considered an important part of the learning process, providing the impetus to situate learning experiences within authentic tasks (Brown, Collins, & Duguid, 1989). Authentic learning is seen as an appropriate means of incorporating complexity into the learning environment, as well as real world outcomes that are satisfied by the completion of relevant tasks (Herrington, Reeves, & Oliver, 2006). As mentioned in their article, this runs counter to the common reductionist approach of clearly defined and linear online courses. There are a number of studies demonstrating the usefulness and effectiveness of authentic learning, complex learning activities, as well as the integration of technology in these learning environments (Barab, Squire, & Dueber, 2000; Oliver, Herrington, Herrington, & Reeves, 2007).

Cognitive flexibility theory (Spiro, Feltovich, Jacobson, & Coulson, 1992a, pp. 57-73) with its emphasis on ill-structured learning activities to accommodate complex knowledge values multiple representations of knowledge and supports an authentic learning approach.

These views of learning are consistent with the learning requirements for the RAT Online learning environments.

There are indeed other strands of constructivism, such as radical and cultural constructivism. Proponents of radical constructivism assume that knowledge is always in the minds of the learner and that no matter what the objective reality of knowledge, the interpretation by the learner is always subjective and there is no way of knowing whether it matches that of another person (von Glasersfeld, 1995, p. 1), for example a teacher. In cultural constructivism it is assumed that the tools that we use as part of our culture, such as physical objects and symbol systems such as language influence the way that we think (EduTechWiki, 2010).

The purpose of this section was to provide an overview of constructivism with an introduction to its social strand. This is expanded in the theoretical foundations chapter in the social constructivism section.

Critics of constructivism question the constructivist belief that there is no external reality other than that created in the minds of individuals, but constructivists respond that they do not deny that things exist in the world, it is just that humans all experience them differently (Cunningham, 1992, p. 37). It is all about the context. Also critics argue that some knowledge is already established and one simply needs to tell the learner, e.g., that a chair is useful to stand on to change a light bulb (Cunningham, 1992, p. 37). Furthermore Allen (1992, p. 187) points out that in group learning situations members of the group will not necessarily develop the same level of mastery in the learning material.

Despite these criticisms, constructivism offers a sufficiently complex framework to account for the types of knowledge and skills required in the learning of RAT. This is not to discount the importance of developing skills in already established knowledge.

The next section provides a brief account of computer supported learning.

2.2 Computers and learning

Reeves & Hedberg (2003, p. 3) acknowledge that the field of interactive learning is exceedingly complex grounded in competing theoretical foundations “and an often bewildering array of technological delivery options.” Furthermore, buzz words describing computer supported learning abound, such as computer based training (CBT), computer assisted training (CAI), web based training (WBT), web based instruction (WBI), e-learning, online learning, Internet based training (IBT) and others are often used synonymously to label learning situations or products that are supported by computers. These applications can of course be extended to learning with any form of technology, not just computers.

In my own working experience I have noted that many of these terms denoting the activity of learning with computers are entrenched very much in fluctuating understandings of these terms. Indeed this view is shared by Reeves & Hedberg (2003, p. 15) who claim that the various acronyms designating all the technology options are not used consistently. For example, many people might view ‘e-learning’ merely as a multimedia information resource. The resource might lack or have very little pedagogy behind the design. In this view, e-learning is a self-access resource that includes texts, images, videos and other multimedia and perhaps a summative quiz at the end. In addition, the learning is linearly structured with a restricted navigation limited to back and next buttons with the added frustration of navigation buttons that are only released upon completion of some quasi-learning activity, such as clicking a link. Often this link is provided more for the sake of satisfying some legal requirement, rather than a concern for what the learners will learn. For others however, e-learning is much more and extends to online collaboration amongst learners to construct and upload new knowledge through the use of online discussion tools. While these buzz words might be used synonymously, they can just as well be used more specifically to distinguish the different modes of learning, such as CBT, which is usually delivered on a hard drive, or other storage medium (e.g. CD-ROM) versus WBT, which is similar to CBT, but delivered via the Web.

Due to these varying understandings of the terminology, in this study I will use my preferred term “computer supported learning”, but might also use “online learning environment”, or “computer supported online learning environment” as appropriate in an

effort to reduce attachment to any understandings about the other more commonly used terms mentioned above. Of course people will have and develop views about my use of terminology, but in my opinion the terms I have chosen are more broad and generic and cover a wide ambit of computer supported learning possibilities, such as self-paced learning, multimedia learning resources, online collaborative learning, as well as computer learning resources/environments that complement face-to-face learning situations (sometimes referred to as blended learning). Thus “computer supported learning” in this study serves as an umbrella term for any learning activity requiring learners to interact in some way with a computer, or for a computer program, website, or other such computer resource to be used for the purpose of learning and/or teaching.

Computer supported learning is driven by the designers’ views on learning. Some of these views are considered next.

Learning approaches and computer supported learning

Amiel and Reeves (2008) concede that the promise of technology enhanced learning has often led to disappointing results. Furthermore, learning technology innovations are driven by approaches or theories of learning. For example, programmed instruction gained momentum in the 1950’s due to Skinner’s behaviourism. Programmed instruction placed emphasis on the positive effects of reinforcement and the capability to have built in technology mechanisms for efficient reinforcement to occur in learners (Levy, 1997, p. 50). According to Reeves & Hedberg (2003, p. 12) behavioural learning theory has had a significant influence on computer supported learning. In my own observations of working in the e-learning field, I concur with this view, as well as with their observation that behaviourism continues to influence the pedagogical design of computer supported learning (Reeves & Hedberg, 2003, p. 12).

Bigge and Shermis (1999, p. 306) relate the state of much computer supported learning and its reliance on behaviouristic design tendencies which they believe is based on an assumption that learners are passive psychologically. To highlight this observation they (1999, p. 307) provide the example that much learning leverages off drill and practice and tutorial learning and that learners are only permitted to the next stage of the tutorial if they get an answer correct (similar to my example above), which is designed to reinforce learner behaviour. According to Bigge and Shermis (1999, p. 331) computer specialists in

education often make unsupported claims and fail to distinguish the differences between behaviourist drill and practice versus learning that encourages learners to “identify and explore problems” and this contributes to perceptions about the limited usefulness of computer supported learning. This dominant view of computer supported learning promulgating the transmission of standardised curricula falls within an “instructivist” pedagogical paradigm (Reeves & Hedberg, 2003, p. 12). While there are elements of an instructivist approach, such as the drill and practice of safety procedures, the RAT Online learning environments require approaches that would encourage increased activities requiring learner engagement with complex problems as encountered by RAT learners and in self-defence. Therefore an underlying constructivist learning approach is adopted in the design of the computer supported learning environments for this project.

Therefore these constructivist learning environments designed for the learning and teaching of RAT would require computer tools that are appropriate for the application of constructivist learning approaches. The use of multimedia has potential for providing different representations and of expert performances (Herrington & Oliver, 2000), asynchronous (Barab et al., 2000) and synchronous communication tools can provide learners with opportunities to collaborate, simulation tasks (Dickey, 2005) enables learners to safely explore and engage in potential harmful situations as well as engage in complex activities, and finally use tools as ‘tools of the mind’ (Jonassen, 2003; Jonassen, Carr, & Yueh, 1998) and to represent their knowledge in different ways, such as through mind maps.

If we consider Jonassen’s idea of computers as mind tools rather as ‘extensions of the mind’ it makes for an interesting analogy when we say in martial arts that weapons are extensions of the body. In this study then, participants will be extending their minds and their bodies.

The next section is a brief relation of a few different viewpoints of the term ‘martial arts’.

2.3 Martial Arts

To answer the question: “what is a martial art?” the Collins Cobuild English Dictionary definition cited in the introduction chapter is repeated: “A martial art is one of the philosophies and techniques of self-defence that come from the Far East, for example kung fu, karate, or judo.” (1995, p. 1021)

While there are numerous martial arts that do indeed originate in Asia, there are numerous that originated in other parts of the world too. The definition also says little about the history and characteristics or purpose of martial arts. Were it true that martial arts only originated in the Far East, one could almost accept such a definition, but only because of misinformed stereotypes. However two out of the three examples given in the definition stand on the borderline of what counts as a martial art. Both karate and judo fall within the ambit of disciplines known as the *do* or “way” in the Japanese language. Strictly speaking these are not martial arts. The *do* embody the principles or ways, whereas *jutsu/jitsu* means the “art or practice”. *Judo* translated from Japanese into English means “the Way of gentleness”, while *Jujutsu/Jiu-Jitsu* means “the gentle art.” (Kano, 1986, p. 16)

Many of the *do* disciplines have become popular sports, as their founders removed many of the more dangerous techniques that are found in the *jitsu* so that the sports can be practised more safely. Judo, being one example, which was introduced as an Olympic sport in the mid twentieth century (Fromm & Soames, 1982, p. 15) and up until recently was the only martial arts sport in the Olympics. The Korean art of *Tae Kwon Do* or “hand and foot way” was later accepted as an Olympic sport (Ferrie, 1989, p. 13). Many of my martial arts peers do not consider sports to fall within the category ‘martial arts’.

Yet another controversy is that martial arts are a ‘philosophy’ from the Far East. This is true in that many members of the category ‘martial art’ do have philosophies attached to them, such as judo, which is “... more than an art of attack and defence”, but a way of life (Kano, 1986, p. 16), but one could argue against this in favour of the original purpose of the martial arts, which was essentially to defend oneself and/or third parties. The Japanese martial art, Jujitsu, seems to fall in line with the original aims of a martial art, because its practitioners are concerned with the fighting techniques used in warfare. Martial arts were designed to have a practical purpose in times of war.

A further misleading part of the definition is the reference to a martial art being a “technique of self-defence”. The term ‘technique’ as used here seems to require further clarification. The author may have used the term in a broad sense to describe a system of techniques, because a martial art does not consist of a single technique, but rather a whole system of techniques often bound together by set of unifying principles and philosophies. There is often one main strategy or philosophy to approach combat in a particular martial art. Judo, ‘the gentle way’, is once again used as an example. Practitioners of judo apply this gentleness approach when they are attacked. Rather than meet force with force, the practitioner will yield and redirect the attacker’s energy in order to apply a technique such as a throw (Kudo, 1967, p. 15). A whole system of numerous techniques is based on this one philosophy.

The term ‘self-defence’ also limits the definition, as a martial art may also be used to defend a tribe or a nation, and may well be used for attack rather than defence. There are other definitions that are seem to be more accurate, but may also lead to controversy.

Lewis (1993, p. 6) defines the term martial arts in the following way: “The term ‘martial arts’ simply means arts concerned with the waging of war.” This definition more accurately includes the term as describing an art used in warfare, but does not explain that the art has anything to do with fighting. The art itself could just as well be a painting art. Mitchell (1989, p. 6) makes a similar definition: “Strictly speaking, a martial art is a collection of techniques used in waging war. Typically these involve using weapons of one kind or another.” This last definition highlights another flaw in the Collins definition above. Neither judo nor karate practitioners do not characteristically use weapons, except at advanced grades in judo during *kata* practice. *Kata* is a Japanese term used to describe a ritualized set of techniques practised in a particular sequence. These *kata* can even seem dance-like and for many practitioners the *kata* have become no more than rituals. The words *kara* and *te* mean “empty” and “hand” respectively in the Japanese language. So *karate do* is “the way of the empty hand”. Hence, its name implies no use of weapons.

Notwithstanding the fuzziness involved in the definitions of the term *martial art*, even experts who use the term use it to denote a great many disciplines. Even Mitchell (1989, p. 6) before his definition says that the term is applied to many different activities, which may

not have a military connection. Does this mean that sports such as western boxing and Graeco-Roman Wrestling qualify as martial arts? Most people do not consider these to belong to the category martial art. Gilbey (1963) uses the term ‘fighting art’ to denote various methods of combat. Perhaps this is a much better term encompassing a much broader range of activities and removing the uncertainties of membership to the category ‘martial art’. The term ‘fighting art’ however might exclude activities or martial arts that no longer include the actual practice of fighting, as there are members of the category martial art in which practitioners train for the perfection of self rather than injuring others, such as *Aikido*, “the way of harmony” in Japanese.

Other terms include ‘unarmed combat’, ‘armed combat’, and ‘self-defence’, all of which connote other limitations in the range of activities possible. The term ‘martial art’ is used in this study to broadly include all fighting arts that are certain as well as unclear members of the category. Where the researcher considers an art as belonging outside the category, other appropriate terms may be used, such as *fighting art*, *combat art/sport*, *unarmed/armed combat*, or *self-defence*. The point is that all are relevant in this study. As the researcher’s Eskrima teacher always says: “It’s all about labels.” (du Preez, 2002, p. Personal Communication) Here du Preez means there are so many labels for the same activity and they often serve only to confuse. Humans have physical attributes that allow a certain range of possible movements and techniques and during combat it does not matter what labels are attached to them.

If the term ‘martial art’ is broken down into its component definitions we can see that the martial arts are more than haphazard fighting encounters. The term ‘martial’ is defined by Hanks (1986, p. 516) as: “of or characteristic of war, soldiers, or the military life.” Amongst other definitions they (1986, p. 38) define ‘art’ as: “human creativity as distinguished from nature.” The Collins Cobuild English Dictionary adds (1995, p. 82) : “If you describe an activity as an **art**, you mean that it requires skill and that people learn to do it by instinct or experience, rather than by learning facts or rules.”

Lewis (1993, p. 6) speaks of people developing scientific principles throughout the ages to subdue their opponents. The terms relating to martial arts and fighting arts in this study are used in Lewis’ broad sense, as well as of being creative and requiring skill. Furthermore, any categories, martial art, or fighting art names are used in the sense that there has been

some systematic development of such arts and these arts may originate from any quarter of the earth.

Finally, this section closes with a look at the ideals of judo, which in a way also reflects the learning ethos behind RAT. In the foreword to Professor Jigoro Kano's (Prof. Jigoro Kano is the founder of judo) book titled Kodokan Judo this is what the president of the Kodokan (the headquarters of world judo, located in Tokyo, Japan), Yukimitsu Kano, had to say of Professor Kano and judo:

Professor Kano aimed at human perfection through judo and the betterment of mankind in the spirit of mutual prosperity. This lofty ideal is at the heart of the Kodokan philosophy and its realization has been pursued unceasingly from the very beginning, and will without doubt continue to be pursued in the future throughout the world.

(Kano, 1986, p. 11)

This study is an evaluation of online learning environments characterised by complex learning tasks and a myriad of contributing variables. As such the project requires a consideration of the various evaluation paradigms to determine an appropriate fit between the pragmatic realities of the study and an evaluation paradigm.

2.4 Evaluation

According to Reeves & Hedberg (2003, p. 29) the professional practice of evaluation of instructional design systems/learning environments is rife with various paradigms, which seem for the most part at odds with each other. They add that this problem confuses researchers, but at the same time provides more choices. Reeves & Hedberg (2003, p. 34) further allude to the view that technology instructional innovations and the evaluation thereof have largely failed to "transform practice in education and training".

Reeves (1997a, p. 165) categorises four evaluation paradigms relevant to instructional design in computer supported learning environments. These include: (1) the analytic-empirical-positivist-quantitative paradigm, (2) the constructivist-hermeneutic-interpretivist-qualitative paradigm, (3) the critical theory-neomaxist-postmodern-praxis paradigm, and (4) the eclectic-mixed methods-pragmatic paradigm.

Analytic-empirical-positivist-quantitative paradigm

Reeves & Hedberg (2003, p. 30) describe this paradigm as being chiefly concerned with analysing causes and effects between parts of an external reality that are explained in a physical or observable sense. Empiricism guides this type of research and as such is dominated by experiments (deduction) and experience (induction) in order to define, predict, control, and explain physical phenomena. Positivists value objectivism, or a faith in the scientific process. Finally, this paradigm emphasises quantitative methods, such as statistical measures, to analyse data.

Reigeluth and Frick (1999, p. 634) found that “traditional research methods”, such as experiments, surveys and correlational analyses are not useful “for improving instructional design theory”. Brown (1992) attests to the difficulty of applying laboratory style methods to research in the classroom. She adds that there are a myriad of things that can go wrong. To her “classroom life is synergistic” and part of a “systemic whole”. Therefore it is problematic to divorce elements making up this whole and study them independently, as is typically done in laboratory experiments.

The analytic-empirical-positivist-quantitative paradigm on its own is not sufficient or appropriate as an evaluation approach in the RAT Online study.

Constructivist-hermeneutic-interpretivist-qualitative paradigm

Reeves & Hedberg (2003, p. 32) maintain that proponents of this paradigm believe that reality is constructed, either individually or socially. This belief is not dissimilar to ideas expressed in Berger and Luckmann (1966). They (2003, p. 32) also say that the hermeneutic aspect of this paradigm relates to the analysis of learning environments to uncover the values underlying such environments. Hermeneutics originally derives from the analysis and interpretation of biblical texts. The interpretivist aspect reflects a value for explaining the context of research, as well as for multiple interpretations of various stakeholders involved in the process of evaluation. Johnson and Onwuegbuzie (2004) stress the importance of multiple-constructed realities (to qualitative purists/constructivists/interpretivists) and that context free generalisations are not in fact desirable, because research is value-bound. Lastly, the qualitative aspect indicates the use of human-centred research methodologies, such as observation (Reeves & Hedberg, 2003).

I believe the constructivist-hermeneutic-interpretivist-qualitative paradigm offers a useful fit with the goals of the RAT Online evaluation, but might not be sufficient through its lack of value of quantitative measures, which might be required.

Critical theory-neomarxist-postmodern-praxis paradigm

Reeves & Hedberg (2003, p. 33) claim that proponents of the critical theory-neomarxist-postmodern-praxis paradigm criticise the previous two paradigms described, the former as being reactionary and the latter as being unengaged. The chief concern of critical theorists is with social constructs, such as power and justice, education, ideologies, gender, education, and religion and how they interact forming part of the social system in which they are embedded (Zou & Trueba, 2002, p. 90) and any unbalanced benefits one group may have over another. Reeves (1997a) says that researchers using the neomarxist approach are interested in exposing hidden agendas behind instructional technology and educational programs. For example, according to Amory (2010) education technologies are part of an “instructivist neo-liberal agenda” and computer games, even as used for educational purposes, commonly perpetuate a male dominated world. Postmodernists make use of text deconstruction to reveal hidden meanings of texts, ascertaining whether minority group interests are excluded or if a particular agenda is being promoted (Reeves & Hedberg, 2003, p. 33). Reeves (1997a, p. 171) use Anderson’s (1993) assertion that the praxis aspect is an abandonment of empirical truth and interpretivist understanding for the recognition of “situationally appropriate” “little truths”.

Elements of this paradigm point to important considerations in the educational design of the RAT Online learning environments, such as the recognition of cultural sensitivity. However, this paradigm is not appropriate for the RAT Online study because the purpose of the study is not to criticise or uncover a hidden agenda, but rather to evaluate the effectiveness of the learning environments.

Eclectic-mixed methods-pragmatic paradigm

The eclectic-mixed methods-pragmatic paradigm is identified in Reeves & Hedberg (2003, pp. 34-36) as being a useful approach for the evaluation of interactive learning systems. This paradigm is adopted as an overarching framework for the RAT Online project and is described in further detail in the theoretical foundations chapter.

The final section of this chapter is the conclusion.

2.5 Conclusion

This chapter covered the four theoretical areas of this study, which included: learning approaches, delineation of this project with respect to computer supported learning, martial arts, and evaluation of computer supported learning environments.

The learning section introduced behaviourism, cognitivism and constructivism and a brief description of each. Behaviourism was considered as a useful learning approach for drill and practise of established knowledge and to develop automatic skills, but was insufficient as an approach to account for the advanced and complex knowledge required for the effective practise of RAT. A more cognitive approach is required to account for multiple representations of knowledge as is valued in the constructivist approach. Thus constructivism was adopted as the underlying theoretical contribution from the perspective of this project's learning goals. It was then established that computer supported learning that could sustain constructivist learning goals would be appropriate in the learning design. The term 'martial arts' was then briefly explored and it was put forward that the term will be used in a broad sense. Finally this chapter explored four evaluation paradigms and it was noted that the eclectic-mixed methods-pragmatic paradigm would be appropriate for a project of this nature.

The next chapter, theoretical foundations, extends topics introduced in this chapter, but provides a more focused account of the selected foundations of this study.

Chapter 3: Theoretical Foundations

This chapter narrows the focus from the broader theoretical viewpoints highlighted in the literature review chapter and describes the theoretical foundations used in this study. These theoretical foundations are the basis to the various facets of this study, which include the evaluation approach taken, the depiction of RAT as martial art, and the theoretical underpinnings for the design of the learning environments. Taken together these different theories/approaches form a complex whole, but no one theory in this study has the power to explain all of the parts on its own. Furthermore, each facet has the potential to be informed by a multitude of other theories, but for simplicity those that are described in this chapter provided an overarching guidance for this research.

The first section described is the evaluation approach used in this study, the eclectic-mixed methods-pragmatic paradigm, as espoused by Reeves & Hedberg (2003, pp. 34-36). Next RAT as an approach to martial arts is described. Two theories of linguistics are incorporated as analogies to help explain the RAT approach to martial arts: (1) Chomsky's Universal Grammar (Cook, 1988; Cook & Newson, 1996), and (2) prototype categorisation (Taylor, 1989). Lastly, the learning dimension is explained. Three learning approaches are used to provide the basis for the educational design of the RAT Online learning environments evaluated in this study. These approaches include: (1) social constructivism, taken from Vygotsky's perspective (Vygotsky, 1978), (2) cognitive flexibility theory (Spiro et al., 1992a), and (3) Bloom's Taxonomy (Bloom et al., 1956; Harrow, 1972; Krathwohl et al., 1964).

Before embarking on the brief descriptions of the theories, I would like to set an innovative and perhaps unconventional tone for this research by quoting an excerpt from one of Lewis Carroll's stories, 'Silvie and Bruno Concluded'.

Silvie was arranging some letters on a board – E-V-I-L. “Now, Bruno,” she said, “what does *that spell?*”

Bruno looked at it, in solemn silence, for a minute.

“I know what it *doesn't* spell!” he said at last.

“That's no good,” said Silvie. “What *does* it spell?”

Bruno took another look at the mysterious letters.

“Why, it’s ‘LIVE’, backwards!” he exclaimed. (I thought it was, indeed.)

“How did you manage to see that?” said Sylvie.

“I just twiddled my eyes,” said Bruno, “and then I saw it directly. Now may I sing the King-fisher Song?”

“Geography next,” said Sylvie. “Don’t you know the Rules?”

“I think there oughtn’t to be such a lot of Rules, Sylvie! I thinks-----“

“Yes, there *ought* to be such a lot of Rules, you wicked, wicked boy! And how dare you *think* at all about it? And shut up that mouth directly!”

(Carroll, 1996, p. 478)

Carroll is cited often in the linguistics literature. His stories frequently involve characters who speak in strange ways and who see the world very differently. Bruno, in the story cited above is one such character. Carroll cleverly portrays juxtaposed ideas through his characters and their use of language; in this instance, Bruno the rebellious boy, and Sylvie the law abiding citizen.

The excerpt makes for a useful analogy in this study, which emphasises multiple viewpoints and its use of theories from varying subject areas. The challenge for the reader is not necessarily to “twiddle one’s eyes”, but rather to recognise and acknowledge that multiplicity and alternative viewpoints are necessary ‘evils’ to produce practical outcomes in the evaluation of complex learning environments such as those described in this project. The recognition of the possibility of multiple viewpoints is further extended as a challenge for other researchers to look at ways in which the findings of the RAT Online project may have wider value in the educational context. To take the topic of teaching martial arts online and applying some of the challenges of this undertaking, such as learning self-defence strategy and kinaesthetic skills online and abstracting them to online learning in other areas would be one such valuable use. There might also be some insights useful in subject areas such as in the education of medicine and engineering that could be carried over and applied. This study aims to strike a balance between the ‘rebellious boy’ who is unconventional and creative on the one hand, and the ‘law abiding citizen’ who conforms to rules and conventions, such as positioning this research within a framework and methodology on the other hand so that others can follow and perhaps apply it in different ways.

Next, the eclectic-mixed methods-pragmatic paradigm is described.

3.1 Eclectic-Mixed Methods-Pragmatic Paradigm

The eclectic-mixed methods-pragmatic paradigm as described in Reeves & Hedberg (2003, pp. 34-36) and introduced in the literature review chapter is the overarching theoretical foundation for this project.

Reeves & Hedberg (2003, p. 34) state that “[t]he concept of complexity is exceedingly relevant to evaluation within the context of instructional design.” They (2003, p. 34) assert that the eclectic-mixed methods-pragmatic paradigm is an approach that is “capable of handling the complexity” that is characteristic of human computer interaction in our modern society.

The paradigm provides a foundation for flexible thinking about conducting evaluations. One could think of the paradigm as a conceptual toolset enabling researchers to evaluate learning environments from a practical perspective. For example, the paradigm provides a framework for researchers of interactive learning systems to analyse the needs of a particular learning situation and apply different learning theories suited to the situation to guide development and implementation of the learning environment for an effective outcome. The researcher can then apply various and appropriate methods of evaluation to gather and analyse data, rather than approaching the research from a single research method. This contributes to the pragmatism and multi-dimensionality of the paradigm. To add to this example, Reeves & Hedberg (2003, p. 35) declare that proponents of the eclectic-mixed methods-pragmatic paradigm “do not value one tool over another any more than a carpenter would value a hammer over a saw.”

The eclectic nature of the paradigm allows researchers to borrow from the other evaluation paradigms described in the literature review chapter, taking advantage of their strengths and using them to complement each other as well as to off-set any inherent weaknesses of the various paradigms. This means that various learning theories and approaches can be employed to fulfil the goals of a computer supported learning project, even though one theory might be dominant in a particular project. It also means that the research methods

that commonly become entrenched in different paradigms can be used in this complementary and mixed way, much like one carpenter's tool is used for certain tasks, while another would be used for different tasks. Such an approach can be more broadly applied to multiple situations, analogous to the way a carpenter with a complete toolbox and skills would be able to construct a whole house rather than only one individual component of the house. Similarly different house styles can be constructed from different designs. The process of construction may be improved when several carpenters work together in a way not dissimilar to the various participant groups in this study. The mixed methods approach enables researchers to form a view built on multiple perspectives (Johnson & Onwuegbuzie, 2004; Johnson, Onwuegbuzie, & Turner, 2007), which according to Reeves & Hedberg (2003, p. 35) are crucial to *triangulation* and *bracketing*, two concepts discussed in the methodology chapter.

The eclectic-mixed methods-pragmatic paradigm fits this project's research goals, which are to (1) design, develop and implement practical and creative online learning environments for RAT, as well as to (2) contribute to a body of broader online learning knowledge. So the project has applied goals in (1) and more abstract basic research goals in (2). Reeves & Hedberg (2003, pp. 271-272) contend that researchers with the research goals of developing solutions to practical learning situations and "constructing a body of design principles that can guide future development efforts" have *development goals* as the basis to their research. Ultimately researchers using the eclectic-mixed methods-pragmatic paradigm take a holistic and multidimensional approach to make better decisions about their designs. This is useful for uncovering potential flaws and issues, as well as strengths. It is almost as if researchers working in this paradigm are their own worst critics, but this has the potential for producing excellence, because of the formative and iterative nature of the evaluations.

Formative research as design experiments

Research conducted with development goals is also known as 'design experiments' (Brown, 1992), as well as 'formative research' (Nieveen & van den Akker, 1999; Reeves & Hedberg, 2003, p. 272; van den Akker, 1999). Design experiments embody both a pragmatic research direction as well as a basic theoretical research ideal (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003). According to Collins, Joseph and Bielaczyc (2004, p. 15) "design experiments were developed as a way to carry out formative research to test

and refine educational designs based on principles derived from prior research”.

Furthermore The Design-Based Research Collective (2003) add that design-based research also helps researchers to understand the complex relationships involved in educational research, such as, among learning theory, learner artefacts, and practice. Reigeluth and Frick (1999, p. 633) state that the intention of formative research is actually to improve design theory of educational design practices.

Each RAT learning environment/design experiment is designed with a theoretical underpinning, but practical influences affect the design and the evaluation, prompting changes in subsequent evaluation rounds in order to continuously improve – all lofty ideals. However, as van den Akker (1999, p. 11) points out development research is not without its issues, such as the tension that can occur between members of large project teams collaborating on the same project. Creative designers might be eager to create innovative solutions, while the researchers might be more tentative and spend more time seeking for correctness. I can attest to this tension experienced in the workplace, when the larger project teams tend to push out project timelines. As van den Akker points out, this tension is not necessarily negative, as it can develop a more balanced input between the dominance of the creative designers early in the development process and the critical perspective of the researchers in the later stages.

Formative evaluation is almost implicit in design experiments, because changes to aspects of the design and implementation of the learning environments are made at various intervals during development, as well as to the evaluation itself for the best overall outcome (Maslowski & Visscher, 1999, p. 138). Successive rounds of evaluation and development are carried out to improve quality and catch issues early rather than having to deal with large scale changes once a learning environment’s development is complete. According to Reeves & Hedberg (2003, p. 139) formative evaluation is useful because the information it provides can guide decisions concerning bugs in the learning environments and serves to improve the learning environments at different phases of their development. In this project, formative evaluation is used while creating each learning environment, but the whole study in its entirety can be considered a single formative evaluation. For example, various evaluation protocols were carried out during evaluation round 1 of the RAT CD-ROM. Changes were then made before further development of the RAT CD-ROM. Then a second round of evaluation was carried out in order to make more changes.

The same process applied to each of the four RAT Online courses. These evaluations together contribute to the goal of creating learning environments to support the learning and teaching of RAT online, a formative evaluation. More details about the evaluations are provided in the methodology chapters as well as the respective chapters about the RAT CD-ROM and the RAT Online courses.

An important part of the eclectic-mixed methods-pragmatic paradigm includes effectiveness evaluation.

Effectiveness evaluation

Effectiveness evaluation is important in learning environment evaluations, as the purpose is to determine whether there is any change or gain in learners in terms of knowledge, skills, or attitudes as a result of using and/or interacting in the learning environment. Furthermore, Reigeluth and Frick (1999, p. 635) stress the importance of determining the degree “to which the application of the theory (or guideline or method) attained the goal in a given situation”. An important element of this study will not only be to determine whether participants had gained in knowledge, skills, and attitudes, but also to gather evidence of how the various theories influenced the outcome.

In addition to determining if learners gained in knowledge, skills, and attitudes, effectiveness evaluation includes determining how appealing the learning environments are for learners (Reeves & Hedberg, 2003, pp. 178-180). According to Reigeluth and Frick (1999, p. 635) appeal relates to how enjoyable a learning environment design is for users of that environment.

Furthermore, the implementation is part of effectiveness evaluation and this includes the experiences of all participants, such as learners, experts, course facilitators, designers, and developers. According to Reeves & Hedberg (2003, pp. 179-180) if the implementation was not evaluated, it would be difficult to determine if the effectiveness was a result of the learning environment as designed, or how events really occurred during implementation, which could have been very different from the original design plan.

Reeves & Hedberg (2003, p. 178) suggest that effectiveness evaluations are often based on testing, but useful data can also be “...derived from questionnaires, interviews, focus

groups, observations, ratings...” etc. The methodology chapter and the chapters on the RAT CD-ROM and the RAT Online courses respectively discuss in more detail how these multiple methods are used in this study to gather useful feedback and evidence on the degree of effectiveness of learning RAT online.

As a conclusion to this section I use the comparative diagram depicted in Reeves & Hedberg (2003, p. 274) to illustrate more clearly the difference between traditional empirical research and development research/design experiments (Fig. 3.1).

The differences between empirical research and development research

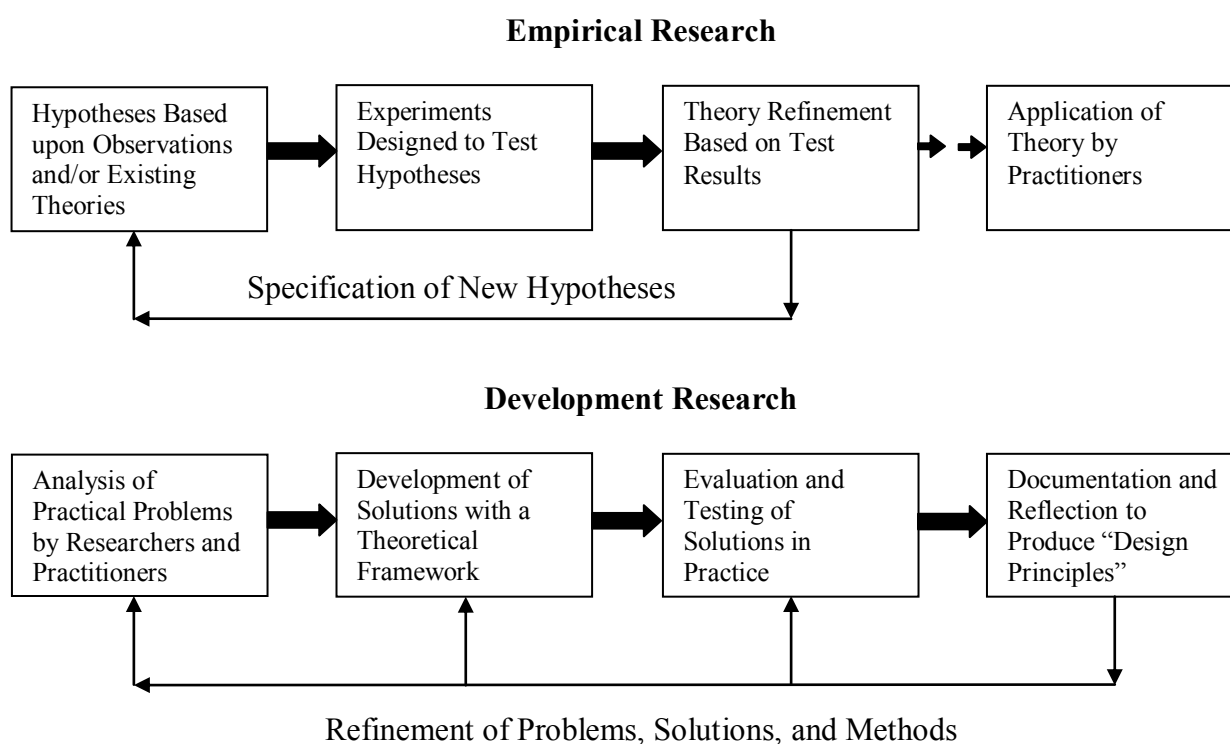


Fig. 3.1: The differences between empirical research and development research - redrawn from (Reeves & Hedberg, 2003, p. 274)

The empirical research portion of Fig. 3.1 shows how emphasis is placed on the development of theory as a primary focus with application by practitioners as an activity that occurs later as a secondary event. This approach has been very useful to develop abstract theories, many of which have also contributed significantly to applications in many disciplines. But the underlying focus is on conducting basic research to contribute to

our understanding of the world, not necessarily to be applied in the real world. The issue of theory being translated into practice having slow uptake is expressed earlier in this study.

The development research portion of Fig. 3.1 on the other hand shows how researchers and practitioners discuss and develop solutions to practical problems with a theoretical framework to inform their designs. These solutions are tested in practice and thus application is much more rapid than in empirical research. While not usually perfect in design, these solutions might go through several iterations of evaluation and refinement, but there is a real life and rapid use of the research. This practical application of the solutions, coupled with successive rounds of evaluation helps to evolve an improving learning solution. The documentation of the entire process reflects the emergent design principles for that learning situation. These findings can then be abstracted to basic research and better inform researchers and practitioners for future design efforts.

The topic of teaching and learning RAT (and other martial arts) online is not conventional and to the best of my knowledge other martial arts teaching online appears to be done in a more shallow way than is done in this study. For example, much other martial arts teaching online seems to be done only by means of instructional video clips and self-guided learning. In this study, I assumed the character of Bruno - quoted in Carroll (1996, p. 478) above - by having an unconventional approach to the design and delivery of the online learning environments and looked for ways to extend what might be thought impossible online. I looked across disciplines for theoretical insights, sometimes only analogically and at other times to establish a firmer standpoint from theories of learning to guide learning design and delivery.

Next I will briefly describe the characteristics of RAT as a martial art. As the subject matter of the learning environments in this study, this description is provided as a background for the reader.

3.2 RAT

In terms of the way martial arts are categorised RAT could be considered an eclectic or hybrid martial art (Crudelli, 2008, p. 292), because it borrows principles, concepts, techniques, and training methods from other martial arts in order to achieve the best result

in a particular situation. For example, if in a self-defence situation the attacker grappled the victim to the ground, the RAT practitioner should be equipped with the skills to deal with that situation. Likewise, if the victim was attacked with a strike attack such as a punch or kick, the RAT practitioner's training should provide him or her with the knowledge and skills to deal with that situation too. The underlying thinking is that one cannot choose how one will be attacked. The eclectic nature of RAT is befitting of the eclectic-mixed methods-pragmatic paradigm. This forms a useful synergy and guides thinking at all levels of this project. As a martial art RAT is more than a mere collection of eclectic tricks or techniques to deal with different self-defence situations. So what is RAT?

RAT was conceived as a universal approach to martial arts. I use Chomsky's Universal Grammar (UG) (Cook, 1988; Cook & Newson, 1996) as an analogy to explain this universal approach to martial arts.

Chomsky's Universal Grammar

Noam Chomsky's theories of linguistics have had a significant impact on the study of linguistics since the mid 20th Century (Akmajian, Demers, Farmer, & Harnish, 1995, p. 4). Many have followed his theories, while there are those who disagree with his theories of language acquisition (Blackburn, 2005). Chomsky, as was noted in the literature review chapter, was also one of the early adversaries of behaviourism, challenging its underlying philosophy and presenting evidence to show that it was flawed as a theory of learning language. Even though Chomsky presents convincing arguments in favour of language acquisition, this section is used for analogical purposes only. It is not to argue that learning martial arts is the same as learning or acquiring languages. Neither is it to advocate Chomsky's theories of language acquisition.

Chomsky argues that there is a universal grammar representing all human languages (Fromkin & Rodman, 1993, p. 18). He further argues that all human children's brains are hard-wired with a language acquisition device (LAD) (Cook & Newson, 1996, pp. 79-82). This Universal Grammar contains all the grammatical 'rules' of every possible human language and languages are instances of the rules contained with the Universal Grammar (Cook, 1988, pp. 1-2).

Universal Grammar is explained in terms of principles and parameters (Akmajian et al., 1995, p. 452). Principles are the abstract rules (or grammar) of languages, while the parameters are like switches turning different types of principles on or off in specific languages (Cook, 1988, pp. 1-2). Hence you might find certain grammatical rules manifest in some languages, while in others they do not.

In this Universal Grammar analogy I am not arguing that every martial art has a complete set of martial arts principles with specific parameters turned on or off in the same strict sense that Chomsky explains the theory for language acquisition. Neither am I arguing that there is an equivalent LAD for martial arts. But where the analogy is useful is as a conceptual approach to martial arts and for establishing all possible categories of martial arts principles, concepts and techniques. For example, while there are many martial arts that do not make use of ground grappling techniques (e.g. karate, kung fu, tae kwon do, Zulu stick fighting and others), that does not imply that ground grappling is not a possible form of self-defence. Similarly there are martial arts that focus on grappling techniques (e.g. Graeco-Roman wrestling, Brazilian Jiu-Jitsu, judo, and numerous others). Again, that does not mean that striking techniques are not viable forms of self-defence too.

It is not aim of RAT to claim that RAT is THE Universal martial art, but rather RAT practitioners think of RAT as a universal approach to learning martial arts. RAT is a martial art of exploring and establishing the widest variety of possibilities in martial arts and through application and practise of those possibilities working out which are practical and which are not. In fact, this has often resulted in producing fewer principles and techniques that can be applied across a greater range of situations. This approach has entailed creating a taxonomy in the form of the RAT framework, represented as a large mind map on the RAT CD-ROM. The RAT framework is presented as an example during all stages of learning. This way, learners can see where the techniques they are learning fit into the greater framework. Since this framework represents the ideas on my own thinking as founder of RAT, the RAT learner is encouraged to challenge and constructively criticise the framework during various stages of their learning. At higher ranks, learners are required to design their own framework and RAT syllabus reflecting their own understanding of martial arts. As far as I am aware, this approach to martial arts learning is unique.

Because RAT was created to deal with multiple scenarios, it increases the range and complexity of finding possible solutions to self-defence situations. But complexity is not what is required in highly stressful self-defence situations. The more a person can use simple and automatic skills in such situations the better, as complex movements can result in more mistakes. However during training learners have time to solve complex problems by practising, discussing and reflecting. They are regularly faced with different scenarios and are required to find simple solutions to these complex problems. These types of learning environments are challenging. RAT instructors/learning facilitators share the concept of *Multiple Contextual Training* (MCT) with all learners and how it can be used as an effective tool to think of complex problems in a multi-dimensional way in order to develop simple solutions to self-defence problems. MCT was developed from another linguistics theory: semantics – *prototype theory*. Prototype theory and MCT are discussed next.

Semantics - Prototype Theory and Multiple Contextual Training

Not unlike Universal Grammar, prototype theory is exceedingly complex and detailed and the purpose of this section is not to describe it fully. However I will attempt to describe it in sufficient detail to show the linkage with RAT and MCT and to acknowledge the theory as forming the basis to MCT in RAT.

Even though we think we have a common understanding when we talk about everyday things, the situation is that multiple perspectives is a more accurate reflection of reality and that commonality varies from one person's mind to another. Taylor (1989, p. 2) argues that "Reality is merely a diffuse continuum, and our categorization of it is ultimately a matter of convention, i.e. of learning." This work of his is an in-depth look at the categorisation of words and concepts.

Taylor's work draws on the work of others, such as Berlin and Kay (1969) and Heider (1971) who discussed differences in the categorisation of colour in different cultures, and Wittgenstein (1978) who expressed the difficulty in finding properties common to all examples in a range of instances of the use of the word 'game'. Speakers of some languages might use one word to express different colours. Zulu speakers for example use the same word *luhlaza* for both green and blue, while speakers of other languages might have a wider range of words for a single colour expressing a number of the various shades

of the colour. The point is that it is not the characteristics of the colours only that make us want to call them by different colour names, but our perception of them and how those colours are perceived and used in different cultures. Membership to a word category is not really a case of ‘either-or’ membership as posited in earlier objectivist approaches to semantic categorisation. Taylor (1989, p. 38) highlights Wittgenstein’s problem in finding a shared set of common properties for the word ‘game’ by suggesting that membership of words to the category ‘game’ consist of “a criss-crossing network of similarities.”

Wittgenstein coined the term ‘family resemblance’ for this network of similarities (Taylor, 1989, p. 39). Taylor (1989, p. 40) also refers to research conducted by William Labov who categorised household receptacles, such as cups and bowls, etc. Labov’s research showed that the participants in his experiment unanimously agreed that certain line drawings of items were examples of a category, e.g. cup, while others became less clear as attributes of the item were changed. For example as the width of the top of the cup was increased relative to the width of the bottom participants increasingly used the word ‘bowl’ instead of cup, showing that boundaries between categories are not clear. The research also shows that some examples seem to contain optimum qualities making them better examples of a word category and that there is a range of other examples that become less and less clear examples. Those items possessing the optimum qualities can be referred to as prototypes, while those with fewer optimum qualities are more marginal members of the category.

Taylor (1989, pp. 99-121) shows how prototype theory and the notion of family resemblance can be extended by discussing the varied senses that words, such as ‘climb’ and ‘over’ can have. He (1989, pp. 108-109) asserts that rather than the different senses of a category being bound by a common “semantic denominator”, that they are rather related by “meaning chains” and family resemblance. He proposes that meanings can be related to adjacent items in a chain due to one or more shared attributes (i.e. family resemblance). For example meaning B is related to meaning A. A subsequent meaning, C, can be related to meaning B and so on. Taylor (1989, p. 108) represents this relationship as follows:

$$(1) \quad A \rightarrow B \rightarrow C \rightarrow D \text{ etc.}$$

Each meaning can give rise to a new link to another meaning. Below are some of the uses of climb listed in Taylor (1989, pp. 106-108) to further illustrate the idea of meaning chains:

- (2) The boy climbed the tree
- (3) The locomotive climbed the mountainside
- (4) The plane climbed to 30,000 feet
- (5) The temperature climbed into the 90s

As you can see the use of ‘climb’ in (5) is somewhat different to its use in (2) and if you had to compare the two extremes of the chain one could think that little similarity exists. Through the successive relationships in the chain the linkage between senses can become clearer. It is in this sense that this extended version of prototype theory is used in RAT to develop MCT.

Multiple contextual training

Multiple contextual training is a way of developing martial arts principles and techniques and is a useful ‘tool’ in the learning and teaching of RAT. MCT consists of two major components: (1) forming many new related martial arts techniques from one technique/situation using the idea of meaning chains, and (2) applying a single martial arts technique to many situations.

To form new techniques and variations of techniques, practitioners evaluate the attributes of a technique and then make minor changes to the attributes of the techniques to produce new techniques. This collection (family) of techniques can form a useful category or toolbox of techniques to help people with differing abilities and to suite different situations. For example, the standard way to execute a hip throw technique is to hold the opponent’s one arm while placing your other arm around their hip. You then turn in to face the same direction as your opponent as you throw the opponent to the ground with your hips lifting the opponent’s hips off the ground. This technique can be modified by changing the grip action. So instead of grabbing the opponent’s arm, you can grab their lapel. You could also place your other arm around their neck instead of their waist and so on. Eventually these techniques move from a possible prototypical representation of the technique through fuzzy areas of the chain until they become different techniques, which if looked at in isolation, the original technique and the resulting technique might look completely unrelated.

Applying a single technique to multiple situations takes an opposing but related view. Instead of changing the technique, in this approach learners look for ways to re-use a single technique or principle for multiple situations. So instead of modifying attributes of the technique, one might change attributes of the situation. This has the advantage of reducing complexity and economising on the automatic skills built through physical practice.

Not only does MCT provide RAT practitioners with a framework to create new techniques, but it can be used by any practitioner of any martial art to extend and apply their own martial arts techniques beyond the ‘prototypical’ family of techniques belonging to that particular martial art. For example, a typical response to an attack by a karate practitioner might be to block the incoming attack and counter attack with a punch. Using MCT, the practitioner can expand the range of possibilities beyond that which is normally trained. MCT also provides a way for different practitioners to develop their own set of options more suited to their own strengths and weaknesses.

The RAT framework and syllabus was created by using MCT and the learning activities within the syllabus encourage the multiple representation of knowledge.

In the next section the three main learning approaches adopted in the RAT study are described: social constructivism, cognitive flexibility theory, and Bloom’s Taxonomy.

3.3 Learning

The literature review chapter described some of the major standpoints about human learning and their resultant approaches to teaching. In this study, I take a predominantly social constructivist learning viewpoint, but in so doing I do not exclude the possibility of including any approach that may suit a particular situation. In other words, the eclectic nature of the chosen paradigm for this study is applied throughout the project.

The social constructivist (Vygotsky, 1978) approach is an underlying and guiding theme in the design and development of the RAT learning environments and reflects the RAT ethos of sharing and helping each other to learn. Cognitive flexibility theory (Spiro et al., 1992a) was used in this study to guide the design of the progression of the ranks in the RAT

syllabus, as well as the progression of tasks in the RAT Online courses. Lastly, Bloom's Taxonomy (Bloom et al., 1956; Krathwohl et al., 1964) is discussed, which is a well-established method of defining educational outcomes. Although RAT, and martial arts more generally, already have defined criteria for determining suitable learning outcomes, as well as methods for testing whether learning has occurred, Bloom's Taxonomy is a powerful frame of reference and provides a way to extract evidence of learning and place it within this frame of reference.

Next Vygotsky's social constructivist views on learning with an emphasis on the Zone of Proximal Development are described.

Social Constructivism

Social constructivism has its philosophical roots embedded in constructivism, but as might be implied by the name, the construction of knowledge by learners is mediated through social interaction.

One of the leading figures of social constructivist learning was Lev Vygotsky. Jerome Bruner, another leading figure, attributes Vygotsky's work as genius (Bruner, 1973) and himself went on to significantly advance research into learning as a result of Vygotsky's work. It is to this work by Vygotsky that I predominantly draw on for this study, with an emphasis on the Zone of Proximal Development (ZPD) as described below.

According to Vygotsky there are at least two developmental levels in the learning process (1978, p. 85). The first is the "*actual developmental level*" and the second is "*the level of potential development*" (Vygotsky, 1978, p. 86). Vygotsky (1978, p. 85) describes the actual developmental level as the "already completed developmental" level of a child. This is the level that is normally determined by standard tests, such as end of year school exams. The level of potential development is the level of learning and problem solving that can be achieved with the assistance of someone more knowledgeable, usually an adult or peer. So it is learning that has not occurred as yet. This level of potential development is known as the Zone of Proximal Development (ZPD).

Vygotsky describes ZPD more precisely as follows:

It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers.

(Vygotsky, 1978, p. 86)

Vygotsky (1978, p. 90) further maintains that ZPD is an essential feature of learning and that the learning stimulates internal developmental processes that manifest when the learner interacts and cooperates with others.

Even though a simplified and brief description, the social constructivist approach to learning and ZPD impacts the learning design in the RAT study significantly. In this study I apply social constructivist learning to all ages of learners, including adults. There are some striking similarities between the RAT learning and teaching ethos and the ethos of equality and sharing encapsulated in social constructivism.

At the start of RAT face-to-face classes all practitioners stand in a circle to greet each other. This reflects the flat power relationship between instructors/facilitators and students. Everyone is considered equal in the learning relationship. This is different to many other martial arts schools where there might be one or two instructors at the front of a class and the students line up at the beginning and the end of the class to take a bow. During training circles are used to discuss techniques and learners work in small groups to practice their learning material. This is different to more conventional methods of training in rows.

The RAT syllabus is structured in such a way that learners have set material to learn, as they form the basic foundation techniques and principles, but learners are also required to apply their creativity and produce their own adaptations of techniques and principles through the demonstration of scenarios and sparring. In RAT learners produce/construct learning material, which is another point of difference with other martial arts where learning is 'fed' from top down and simply repeated.

During face-to-face RAT classes learners are encouraged to honestly and openly discuss and share ideas. RAT practitioners work together to help each other achieve a good level of knowledge and skills, as well as develop appropriate affective qualities. Learners have

reported that the attitudes espoused in RAT training have provided them with a positive and determined approach to handling other situations in life.

ZPD is a natural theoretical fit to RAT learning (albeit applied to both children and adults) and is applied in the design of the RAT CD-ROM through the textual descriptions of the learning tasks in the syllabus (i.e. group work activities) and more overtly in the design of the online courses, with the use of discussion forums and chats. It is assumed from the start that everyone in the group in the online courses will be able to contribute and scaffold others in the group, each contributing to a growing body of knowledge and understanding. The facilitator takes on the role of mediating this process providing input as the learning needs change.

Learning occurs continuously and is assessed by virtue of working through the process and producing various learning outputs during the learning tasks. There are also more formalised tests to determine skill level and application of knowledge.

The next section is a brief description of cognitive flexibility theory which is used to design the sequencing of learning activities on the RAT CD-ROM and the online courses, as well as to design the learning activities themselves.

Cognitive Flexibility Theory

Cognitive flexibility theory (CFT) falls within the constructivism paradigm. Within CFT the construction of knowledge by learners is highly valued, as well as the multiple perspectives developed by learners in learning situations (Spiro, Feltovich, Jacobson, & Coulson, 1992b, pp. 122-123). Spiro and Jehng (1990) assert that cognitive flexibility is our ability to restructure our knowledge in multiple ways, adapting in response to the varying demands of the context and situation in which we may find ourselves. According to them this ability is a function of knowledge representation along multiple dimensions and the mental processes that assemble new mental schema in our brains. This implies multiple perspectives of knowledge are valued and that variety in learning stimulates new schema and therefore more learning. Interestingly, Spiro and Jehng (1990) also mention Wittgenstein's idea of concepts having a criss-crossing of many meanings. The complexity demanded of CFT is similar to the multidimensionality of prototype theory and MCT.

Spiro, Feltovich, Jacobson and Coulson (Spiro et al., 1992b, p. 122) state that cognitive flexibility theory as found in ill-structured learning supports multiple truths. Problem solving that is ill-structured involves complexity, open-endedness and they relate to the real world (Xun & Land, 2004). Coulson, Feltovich, and Spiro (Coulson, Feltovich, & Spiro, 1997) use their study in the field of medicine to highlight previous observations that ignoring complex knowledge can lead to simplified comprehension of knowledge and Heath, Higgs and Ambruso (2008) demonstrated that advanced learning had occurred in a medical course using CFT as the learning design. The ill-structuredness enables learners to develop their own solutions to problems and draw on existing knowledge representations as well as forming new ones. Spiro et al. (1992b, p. 125) further claim that learning in ill-structured domains works best for learners at advanced levels, while learning can be more structured for less advanced learning or routine knowledge. The beginner ranks in RAT require a familiarisation with basic skill sets and knowledge, so beginner RAT practitioners do not necessarily the same degree of complex engagement with the learning material as their more advanced counterparts.

Proponents of CFT use case-based scenario kinds of activities so that learners can get a sense of applying their learning to multiple situations while relying on the strengths of context-dependent learning (Spiro et al., 1992b, p. 125).

A good example of CFT in action would be a doctor learning to diagnose a patient with diabetes. The student doctor might be presented with a number of videos, phone calls, or even texts depicting different situations and with varying attributes. The doctor would diagnose correctly if she could identify diabetes as the cause of the symptoms. The various situations and attributes add complexity. Thus this is a more realistic test of the doctor's application of knowledge than completing a less complex assessment, such as a multiple choice quiz.

CFT is applied at a high level in the design of the RAT syllabus, with earlier ranks being more structured, while the higher ranks being far more ill-defined. For example, in earlier ranks learners have set techniques and principles to practise and demonstrate, while in later ranks learners would have to design their own syllabus to demonstrate. This does not mean that learners in early ranks are not posed with ill-structured and complex scenarios. From the first rank learners have creative activities as well as scenarios in which to apply their

knowledge. It is just that the ratio of structured versus ill-structured changes as the learners become more experienced and knowledgeable.

Within individual ranks learning is more structured in the beginning and more ill-structured later. A lot of the 'structuredness' is in the form of the description of tasks themselves. For example, the mere fact that there is a syllabus with tasks means there is a structure. Thus evaluators of the RAT syllabus might easily misconstrue the RAT syllabus as being highly structured. It is the requirements of these tasks that makes them ill-structured and complex. A good example is the creative activity in the first RAT rank where learners are required to create a fight scene with a partner or several partners using techniques and principles learned in the first rank, or drawing upon any previous knowledge that they may have.

Each of the RAT Online courses was designed in a similar way, even though they ran for different durations. Activities were more structured at early phases and more ill-structured at later phases. Learners were required to represent their knowledge and skills in various ways in the form of discussion texts, video clips, and mind maps. Tasks such as virtual self-defence rooms furthermore served to challenge learners' knowledge by requiring insights into much more than self-defence techniques alone, but strategy, ethics, law, and the environment.

The RAT CD-ROM is the main artefact representing the RAT syllabus. It is a vast network of different representations of knowledge: HTML texts, video clips, mind maps, animations, photos, and diagrams. Early versions of this resource consisted of my own input with the intention that the resource would grow into much more of a learner developed resource.

The final section of the learning section, and of this chapter, is about how Bloom's Taxonomy was applied in this study.

Bloom's Taxonomy

The development of Bloom's Taxonomy was an attempt by a group of educationists and researchers (in the 1950's), led by Benjamin Bloom to create a classification system for educational objectives. They intended the taxonomy to be useful for curriculum builders

who would be able to more easily specify objectives and plan learning experiences and assessments (Bloom et al., 1956, pp. 1-5).

As with previous theoretical approaches discussed in this chapter, this discussion is not exhaustive and only touches on sufficient detail to explain how it is used in this study.

Bloom et al. (1956, pp. 7-8) categorise educational objectives into three high level domains. These include the cognitive, affective and psychomotor domains, commonly referred to as knowledge, skills, and attitudes (KSAs). An interesting comparison can be drawn between the Asian martial arts learning approach of mind, body and spirit, three aspects which cannot be separated.

The cognitive domain is concerned with “the recall or recognition of knowledge and the development of intellectual abilities and skills.” (Bloom et al., 1956, p. 7). The affective domain on the other hand deals with attitudes, feelings, and the development of consistent inner values (Bloom et al., 1956, p. 7; Krathwohl et al., 1964, p. 7). Lastly, the psychomotor domain is concerned with objectives requiring some form or other of muscular control or manipulation (Krathwohl et al., 1964, p. 7).

The group established a coherent taxonomy for the cognitive domain, but Bloom et al. (1956, p. 7) admitted difficulty establishing the objectives for the affective domain, as they claimed that teachers were not very clear about learning experiences that are appropriate to affective objectives and admit that testing for such objectives was not well established. In both Bloom et al. (1956, pp. 7-8) and Krathwohl et al. (1964, p. 7) the developers of the taxonomy claim that so little had been done about the psychomotor domain that they did not develop a taxonomy for it. Others such as Dave (1970), Harrow (1972), and Simpson (1972) have however developed different taxonomies for the psychomotor domain.

RAT practitioners need to demonstrate learning in the cognitive, affective, and psychomotor domains and together these domains form the main means for establishing the learning outcomes and then determining the effectiveness of the learning environments in this project. In this study the cognitive domain objectives of Bloom’s Taxonomy are followed more closely, while the affective and psychomotor domains are applied more generally at a high level. That is, as far as affective and psychomotor evidence is sought, it

will be in the form of merely identifying whether affective and psychomotor learning has occurred, but not the specific types of each described in the taxonomies. However the types of affective and psychomotor attributes required for RAT will be identified in the evidence.

Bloom et al. (1956, p. 18) describe a comprehensive set of six objectives ranging from the lower cognitive levels of knowledge, through comprehension, application, to the higher levels of analysis, synthesis, and evaluation. The revised edition of Bloom's Taxonomy (Anderson, Krathwohl, & Bloom, 2001, p. 5) lists these categories as verbs and changes the order of the highest two levels (i.e., evaluation and synthesis are swapped around) to become: remember, understand, apply, analyse, evaluate, and create. In RAT, learners are expected to demonstrate knowledge through memory activities, knowledge tests, and physical performances, they need to comprehend the learning and apply it to scenarios and in sparring exercises. Learners also need to analyse self-defence scenarios and other learning activities and synthesise new knowledge as a result. They are also required to perform self- and peer-evaluation activities. Bloom's Taxonomy provides a useful guideline to ensure learning activities cover these various domains and that appropriate assessment methods are sought.

In RAT the affective traits of persistence and determination are highly valued. But these personal attributes are tested over a period of many years in RAT learning and not appropriate for this online study, however certain activities would require persistence and determination to complete, so minimal evidence for these traits will be sought. Krathwohl et al. (Krathwohl et al., 1964) provide a useful taxonomy for the affective domain, but as mentioned previously, rather than following each level of this domain, the domain is itself used at its highest level (i.e. affective evidence). Affective evidence important in RAT learning environments and for the social constructivist nature of this study is sought. These factors include motivation, collaboration, willingness to consider others' ideas, and willingness to change and improve one's ideas.

As mentioned various taxonomies for the psychomotor domain have been developed, but the duty of the RAT learning facilitator is not to ensure that each of the objectives in these taxonomies is fulfilled. Rather facilitators need to test that an acceptable level of physical skills relevant to the martial art are developed. These are usually tested by means of physical demonstrations of the skills, as well as application of these skills in sparring drills,

and the development of physical attributes associated with these skills, such as power, strength, accuracy, and speed. The overarching psychomotor objective is similar to that expressed in Singer (1982, p. 88): the development of automatic skills, so that the practitioner can execute the skills while using the brain to focus on strategy. This idea is expressed well in Godhania (2010, p. 153) who quotes our Eskrima grandmaster Abner Pasa: “Use a drill to instil a skill. Learn the skill and forget the drill. You fight with your skill and not the drill.” In RAT face-to-face classes testing of physical skills is a predominant form of assessment. Therefore in the RAT Online courses learners will also be required to demonstrate the development of physical skills to an acceptable level given the limited course durations.

Finally, I will conclude by summing up this chapter.

3.4 Conclusion

This chapter began by encouraging the reader to adopt an open mindset personified by the characters in Lewis Carroll’s story. This flexible approach was applied by bringing together theories and constructing analogies to describe the multiple aspects of the RAT Online study.

First the eclectic-mixed methods-pragmatic paradigm was described, which forms the underlying theoretical framework for this study. Rather than a single method approach, the paradigm allows for the use of varying theoretical underpinnings and the use of mixed evaluation methods suited to various requirements. The paradigm is practical and is the basis to the ‘design experiment’, which values formative evaluation.

Next, RAT was described as a martial art, using Universal Grammar as an analogy and prototype theory to help account for MCT.

Finally, the approaches to learning in this study were described. These included social constructivism, with an emphasis placed on the ZPD and collaborative learning, cognitive flexibility theory with its emphasis of structured and ill-structured learning, and Bloom’s

Taxonomy which is used to categorise various educational objectives and the main areas of determining effectiveness of learning in this study.

Chapter 4: Methodology

This chapter outlines the methods used to evaluate the different components of the RAT Online project in terms of their functionality, usability, appeal, and effectiveness, which Reeves & Hedberg (2003, p. 143) maintain are commonly used criteria for conducting formative evaluations.

Functionality evaluation is concerned with how well the learning environment/system works and whether it works without errors. Usability evaluation has to do with the relative ease of use of the system for learners. Appeal relates to the design of the learning environment and how much the learners like or dislike it. In effectiveness evaluation researchers are interested in determining whether learners actually learnt anything from using the system or by taking part in the activities in the learning environment. All these evaluation factors necessarily involve an evaluation of how the learning environments were implemented.

The four evaluation dimensions are integrated into a number of evaluation instruments to help answer the main questions of this study, which to recapitulate are:

- a. Can RAT practitioners facilitate the learning of RAT martial arts knowledge, skills and attitudes (KSAs) in computer supported learning environments?
- b. What design would constitute effective martial arts computer supported learning environments?
- c. What kinds of learning activities and technical tools are effective in martial arts computer supported learning environments?

This chapter furthermore depicts a practical application of the eclectic-mixed methods-pragmatic paradigm (Reeves & Hedberg, 2003, p. 34) discussed earlier in the theoretical foundations chapter. It is intended that the evaluation findings derived from a mixed methods approach will closely align with the various (eclectic) theoretical underpinnings used in this project and that useful practical outcomes will be achieved.

The RAT Online courses and RAT CD-ROM were modelled on the various RAT approaches described in the theoretical foundations chapter. Feedback about the RAT CD-ROM and experiences in the courses will help to shed light on whether the overarching RAT approach is effective in this mode of learning RAT. To determine whether learners had gained in RAT knowledge, skills and attitudes, Bloom's Taxonomy (Bloom et al., 1956) is used as the underpinning approach. Then to determine if cognitive flexibility theory (Spiro, Feltovich, Jacobson, & Coulson, 1991) and social constructivism (Vygotsky, 1978) contributed to the effectiveness of the RAT CD-ROM and the online courses further evidence is sought from various types of participant feedback and learner output. The various theories are intended to contribute to creating learning environments that can and do facilitate the learning of RAT knowledge, skills and attitudes. They are furthermore used to contribute to an effective design, and to create suitable learning activities and computer learning tools for learning RAT online.

In this chapter the components of this study are first explained, followed by an overview of the mixed methods evaluation approach taken. There are several participant groups in this study, each of which is then described, followed by a section on ethics and informed consent. The majority of this chapter will then be devoted to an account of the data collection instruments used, the protocols employed to administer each instrument, the analysis procedures and the computer software utilised to analyse the data. Finally I will address issues of validity and reliability in this study.

In the next section the two main components of the RAT Online project are explained, including an insight to the different nature of each.

4.1 Components of this project

As described in earlier chapters there are two main components in this study: (1) the RAT CD-ROM, and (2) a series of RAT Online courses. These two components are different in nature, in that the RAT CD-ROM is a self-access resource, but the online courses are collaborative in nature. Also the design of the two components is different; with the RAT CD-ROM requiring learners to navigate and use a vast set of resources on their own covering the entire RAT syllabus, while in the RAT Online courses learners have access to a live facilitator to ask for guidance using a much more limited set of resources designed

for specific courses. The technology platforms driving each of the components are different and are described in the relevant chapters too.

Owing to the above differences some of the evaluation tools used to make design and implementation decisions are different and appropriate to the component being evaluated. Any constraints of the design, implementation, and evaluation also determined which evaluation instruments were used and how they were used. For example, for the RAT CD-ROM I had face-to-face access to the learners, which meant I could use data collection methods where I could interview or observe the learners in a one-on-one setting, but for the online courses this was not always the case and I had to rely on online methods of data collection. Each data collection instrument is described more fully later.

This project started with a small scale online collaborative course on how to deal with a specific aspect of self-defence. The course was titled the **Bear Hug Course**. After conducting an evaluation of the course and determining the feasibility of teaching RAT online, I began creating the RAT CD-ROM, as well as setting up further online courses.

An initial prototype of the RAT CD-ROM was created and given to learners for general impressions. Based on their feedback, the RAT CD-ROM was further developed to become a large multimedia resource covering the entire syllabus. The RAT CD-ROM was then fully implemented by providing each learner with a copy of the RAT CD-ROM. A computer for the training venue was also acquired. The RAT CD-ROM was loaded onto the computer's hard drive for learner access during face-to-face classes. Once the CD-ROM was in use by learners, the first round of evaluations was conducted. Based on the results of round 1, further changes were made to the RAT CD-ROM and additional resources, such as video clips and images were created and added. After these changes were made, a second release of the CD-ROM was given to each learner and the training area computer was updated with the second release too. After extended use, a second round of evaluations was conducted using a variety of data collection tools and analysis methods. The second round of evaluations prompted further design decisions and further development of the RAT CD-ROM. The description of these two rounds of evaluation and any conclusions drawn is within the scope of this component of the RAT Online project.

The development and implementation of the RAT CD-ROM ran concurrently with the online courses. Once feasibility of learning RAT online was established after the Bear Hug Course, a further three online courses were conducted consecutively, forming the second component of this project.

As mentioned above, after the Bear Hug Course, three other online courses were designed, developed, implemented, and evaluated, bringing the total of online courses for this component of the RAT Online project to four. This process was repeated four times because course participant numbers were usually small, making it difficult to draw significant statistical conclusions and it was felt that repeating the evaluations would contribute to reliability of this study. Moreover due to certain technologies not working as well as they should have, I had to experiment with different technologies in each course and then check their suitability to the learning activities as part of a continuous improvement process. The second course was designed around a more in-depth topic on how to use a wheel spanner for self defence: the **Wheel Spanner Course**. Not only was the course more in-depth, but it also ran for a longer period than the Bear Hug Course. Based on the evaluation of the Wheel Spanner Course, a third course was created and implemented: the **Belt Course**. The evaluations guided further design choices for the fourth and final course in this component of the project: the **Pen Course**. The final evaluation was smaller in scale compared to those conducted for the second and third courses, as I wanted to confirm aspects of RAT Online course design from the learner's and participant observer's perspectives only. The unconventional topics and weapons were chosen because having realised that a fairly niche group of individuals would be interested in learning RAT online and given that some of these might be experienced in other martial arts, I thought I could reduce bias by providing courses that were new to all who participated.

This study is complex with several participant groups as well as multiple sources of potentially useful data. To take advantage of the diverse data available appropriate methods to deal with this type of complexity are required. A mixed methods research approach was deemed suitable to deal with such complexity.

4.2 Mixed methods approach

The mixed methods approach forms the second part of the theoretical paradigm chosen for this project: eclectic-**mixed methods**-pragmatic paradigm (Reeves & Hedberg, 2003, pp. 34-36).

Researchers using the mixed methods evaluation model make use of quantitative and qualitative data and research methods (Johnson & Onwuegbuzie, 2004) in order to investigate a complex problem. Quantitative methods make use of empirical studies, objective and detached from context, while qualitative methods use context as a way of gathering rich and varied information (Johnson & Onwuegbuzie, 2004). For example, a typical quantitative study might use a controlled experiment and use statistics to describe the data, while a qualitative study might make use of participant observation and interviews with long texts as sources of information. It is claimed that mixed methods research is the third research paradigm, alongside quantitative and qualitative approaches (Johnson & Onwuegbuzie, 2004; Leech & Onwuegbuzie, 2009). Johnson, Onwuegbuzie and Turner (2007) further contend that an underlying pragmatic position supports the mixed methods research approach. The pragmatic part of the methodology becomes more evident in the paragraphs below where an account of the participant groups is provided and the associated tools used to gather data from them.

Reeves & Hedberg (2003, pp. 36-45) describe eight competing evaluation models: (1) Tylerian objectives-based, (2) Experimental, (3) Patton's qualitative, (4) Fourth generation, (5) Eisner's art criticism, (6) Postmodern, (7) Stake's responsive, and (8) Multiple methods.

The first seven of the competing evaluation models if used individually were insufficient for this study. Proponents of each model tend to direct their research from a specific and narrower standpoint, but at the same time it is worth noting that each model has its merits. On these grounds, the mixed methods model was used and I could use aspects of any of the other models, for example, the Tylerian Objectives-Based Evaluation Model (Reeves & Hedberg, 2003, p. 37) could be used to measure whether the outcomes specified for the RAT Online courses were achieved by learners, Patton's Qualitative Evaluation Model (Reeves & Hedberg, 2003, pp. 39-40) can be used to include rich data obtained from

observations and interviews, and Eisner's Art Criticism Evaluation Model (Reeves & Hedberg, 2003, pp. 41-42) is applied by including experts in the evaluations. The combination of these different approaches contributes to corroborating findings, as well as develop a more complete understanding of the evaluation of the learning environments as implemented in practice.

Quantitative data in this study is derived from cognitive walk-throughs, questionnaires and semi-structured interviews. The frequency statistics generated from different data collection results provide a basis to ask further questions around the design of the RAT CD-ROM and the online courses. Qualitative methods, such as observations, interviews, visual scale diagrams (generated from expert reviews), learner output, records such as anecdotal information, and development logs are used to examine the data from various perspectives. More detail about all the instruments is provided in the data collection instruments, protocols and analysis section.

The mixed methods approach is conducive to *triangulation* and *bracketing* methods, both of which are used in the evaluation of complex issues from multiple perspectives (Oliver-Hoyo & Allen, 2006; Reeves & Hedberg, 2003, p. 45). These two methods are similar in that they both may use multiple measures to examine a variable. The important difference is that in *triangulation* researchers would use multiple methods to uncover the true value of a variable with the weaknesses of one approach cancelling out the weaknesses of another (Johnson et al., 2007), whereas in *bracketing* researchers would use multiple methods to gain a broader picture of alternative 'truths' about the variable, thereby eliciting a richer range of potentially useful findings (Oliver-Hoyo & Allen, 2006). To illustrate this difference more clearly consider a researcher examining the navigation of a website. The researcher using triangulation might use observation, questionnaire, and interview tools to find out if the navigation is intuitive. The researcher using bracketing might use the same tools and find that the website is intuitive, but the data might show that there are differing levels of intuitiveness for different users.

I think of the methods used in this study as a 'survival methodology', because as well-intentioned and optimistic as one can be; the reality is that often one has to resort to using whatever instrument and data that can be obtained. And this is probably more reflective of evaluation of learning systems in a naturalistic setting where decisions and continuous

improvement are still required. Indeed this is the situation I find in the workplace. With a bit of creativity, evaluation can still be conducted and more informed decisions can then be made to improve the learning environments.

There are a number of participant groups in this project, each of which is described next.

4.3 Participants

This project not only reports the learner results of a series of online courses and matches them against intended learning outcomes, but also considers the entire design, development, implementation, and documentation phases. In other words, a holistic approach is taken where effectiveness evaluations are an attempt to improve the complete life-cycle of developing and implementing RAT Online learning environments in order to make the process easier for all stakeholders involved. Stakeholders include experts, designers, course facilitators, and learners. This line of thinking is similar to Amiel and Reeves (2008) who contend that development research is a collaboration among various stakeholders. As such this type of collaboration may involve different participant groups. There is little point in courses being successful from the only learners' point of view, but the effort involved by multiple other participants to implement such courses might be so labour intensive, costly, unsafe, or unpredictable that it is too much trouble to run the courses in the first place.

Three main participant groups were involved in the evaluation: (1) learners, (2) experts, and (3) participant observer.

Learners

The learner group varied during different stages of the project and is described accordingly in the chapters that follow, however the learners can be grouped into the following general categories: (1) learners in face-to-face classes, (2) distance learners, (3) online course participants, (4) learners and instructors, and (5) instructors.

Learners in face-to-face classes are the learners who attend conventional live RAT classes at prescribed venues and at prescribed times.

Distance learners are learners who cannot attend live face-to-face RAT classes, usually because they live in different cities or countries. These learners might have trained in RAT previously or may have never trained in RAT before.

The learner and instructor group are learners who have trained in RAT for a prolonged period (usually a few years) and are also involved in teaching some RAT face-to-face classes.

The final group includes instructors of RAT.

Experts

Experts were consulted for their specialised knowledge and skills in three main evaluation areas: martial arts content or subject matter, the design and usability of computer learning environments and interfaces, and online teaching and learning. The experts were expected to be able to provide valuable insights into the usability, functionality, appeal, and effectiveness of the various components of the RAT Online project. Experts were consulted when and if available and if appropriate to a particular segment of this evaluation.

Experts were grouped into three categories: (1) content experts, (2) usability experts, and (3) online teaching experts.

Content experts acted as the martial arts subject matter experts and were chosen based on their martial arts knowledge, expertise, rank, and years of training in martial arts. Their role was to evaluate the RAT syllabus and/or learning activities and rate them against various evaluation dimensions. Many martial arts keep their syllabus content closed to outsiders, especially to competitor martial artists or different martial arts styles. But an open approach was taken in this study and caution was thrown to the wind with the view that serious and experienced martial arts teachers would view the opportunity to contribute as a positive experience. I might add that the approach taken is a real risk in the martial arts industry, as it is typically fraught with ‘political’ disputes. All content experts held advanced black belts (the status of an advanced level practitioner), each had trained in more than one martial art, and each had more than 20 years experience training in and/or teaching martial arts.

Usability experts and online teaching experts were one and the same group. Their input to this study was to evaluate the user interface and pedagogical dimensions of the RAT Online project. Experts in this group were chosen according to knowledge and experience. Two had a Master's degree and one a Ph.D and all had developed online learning environments and/or taught online, had other teaching experience, and had conducted research related to online learning environments.

Participant observer

The participant observer in this project is me as researcher, course/resource designer, developer, facilitator, and founder of RAT.

Discussed next are the protocols used to ensure the study was conducted ethically and how participants provided informed consent.

4.4 Ethics and consent

A number of protocols have been used to protect the privacy and maintain the anonymity of the participants in this project. These protocols include: (1) informed consent forms, (2) digital data storage and disposal procedures, (3) paper-based data storage and disposal procedures, and (4) ways to deal with online learner output and content.

Each member in this study, including reviewers and learners, was provided with an informed consent form giving permission to use the results of all data collected for the purposes of this research. The forms were available either online or on paper. Participation was voluntary and acceptance of the content of the form established the informed consent, but each participant was also given the option to withdraw at any time, in which case none of the data or artefacts produced by the participant in the course of the study would be used. Participants under the age of 18 years were required to have the form signed by their legal guardians. The informed consent form also described the nature and purpose of the research, as well as the types of data that will be used and how it will be used.

Any digital data generated during the study will be stored on the computer used for this project which is password protected and in a locked non-public environment. The data are

regularly backed up and stored in a secure environment. All digital data will be deleted from the research computer two years after the project is complete.

Similarly, all paper-based data and material is stored in a locked filing cabinet in a secure non-public environment for the duration of this study, after which it will be shredded and disposed of accordingly.

Participants in this project generated a number of artefacts, such as discussion forum messages, mind maps, images, video clips and a number of others. All data in this study are treated as confidential and measures were put in place to ensure anonymity as appropriate. Where images or video clips are generated, they were shared with other participants in the study, but not publicly, except for the purpose of presenting findings at research conferences. The nature of this study is collaborative and sharing content was part of the process of learning and the content was used in its original form or published to a format that can be used for easy viewing. When used outside the project environment, the data and artefacts produced by participants were coded and made anonymous. No real names were used and participants would be referred to as ‘the participants’, ‘the learners’, ‘the experts’, or other appropriate names. For example, names were blocked out in discussion forum posts and chats and faces in photos were also blacked out. As a courtesy participants were also asked before any public presentations if their material could be used. This was in addition to them already having provided informed consent.

The informed consent form discussed the risks involved in taking part in this study. There is an obvious risk of physical injury due to the physical nature of martial arts and weapon training. Each online course contained strict safety requirements in a prominent position on the sites. Safety was taken very seriously and was made a part of the overall evaluation. The project and the project owner were indemnified of any associated medical costs involving injured participants should such injuries have arisen from participating in the study.

The informed consent form also explained the benefits, equipment and costs associated with being involved in the project. Participants were not remunerated in any way or given any other incentive or reward, except that their involvement was free of charge, where normally people would pay to learn RAT. There would also be the benefit of any useful

knowledge, skills, or attitudes gained from taking part in the study. Furthermore, learners on such courses would gain full credit and recognition for any courses that they completed. Each course in RAT is assigned a number and each certificate is assigned a certificate number. Upon successful completion of a rank or course in RAT, the candidate's name is added to the database and the certificate then becomes an item that can be used as part of the learner's personal portfolio and added to their curriculum vitae. Learners were expected to acquire their own necessary computer equipment, Internet connection, and associated costs to take part in the online courses. When required a computer and Internet connection in the research office was used by one of the learners because he did not have an Internet connection. For the face-to-face data collection activities linked to the evaluation of the RAT CD-ROM a computer was provided in the training venue.

Due to the nature of this study and the number of participants involved a number of data collection instruments and protocols were used to elicit data in various forms to provide a holistic perspective of the various components. These were then analysed in different ways and with different software tools. The data collection instruments, protocols and analysis methods are discussed next.

4.5 Data collection instruments, protocols and analysis

Five groups of data collection instruments were used in this project, although not all were used for the evaluation of each component or online course. A matrix is provided towards the end of this section showing the intended use of each instrument and which area of evaluation they are meant to address, that is, the functionality, usability, appeal, or effectiveness of the RAT CD-ROM and the four online courses. All of these evaluation areas help to answer the three research questions.

The five groups of data collection tools include: (1) expert reviews, (2) observation, (3) learner feedback, (4) records, and (5) learner output/assessments.

Under expert reviews the following tools were used: (1) user interface rating form to evaluate functionality, usability, and appeal, (2) teaching evaluation form to evaluate pedagogical effectiveness, and (3) content expert form to evaluate the effectiveness, appeal, as well as the quality of the content.

The observation category included: (1) cognitive walk-through for usability, and (2) participant observation covering all components of this project.

Learner feedback included the greatest number of instruments, including: (1) semi-structured interviews, potentially yielding useful information across all four evaluation areas, (2) focus group discussions, also with potential to provide data in all areas of the evaluation, (3) post grading interviews to determine effectiveness, and (4) questionnaires and post questionnaire interviews to cover all areas.

Records included: (1) anecdotal records about any aspect of the implementation of the learning environments, (2) development log depicting the history of changes and updates, and (3) communication (usually in the form of email) providing information perhaps not otherwise gathered from other instruments.

The learner output and assessments provide the most direct method of establishing the answer to the first research question about whether RAT can be learned online and the effectiveness of this approach. Some of the types of learner output might include discussion forum and chat texts, mind or concept maps (or other methods of representing knowledge), and video clips.

Next a more detailed summary of each of the methods is provided, starting with expert reviews.

4.6 Expert Reviews

Reeves (1997b) described how expert reviews can be conducted to evaluate and compare two different learning environments with each other along multiple pedagogical dimensions using a rating scale diagram. Even though this tool relies upon the subjective evaluations of the experts, the tool is a powerful means of visually representing a large number of evaluation dimensions and gaining a measure of the expert opinions. The example teaching evaluation form below shows a blank rating scale diagram used in this study (Fig. 4.1).

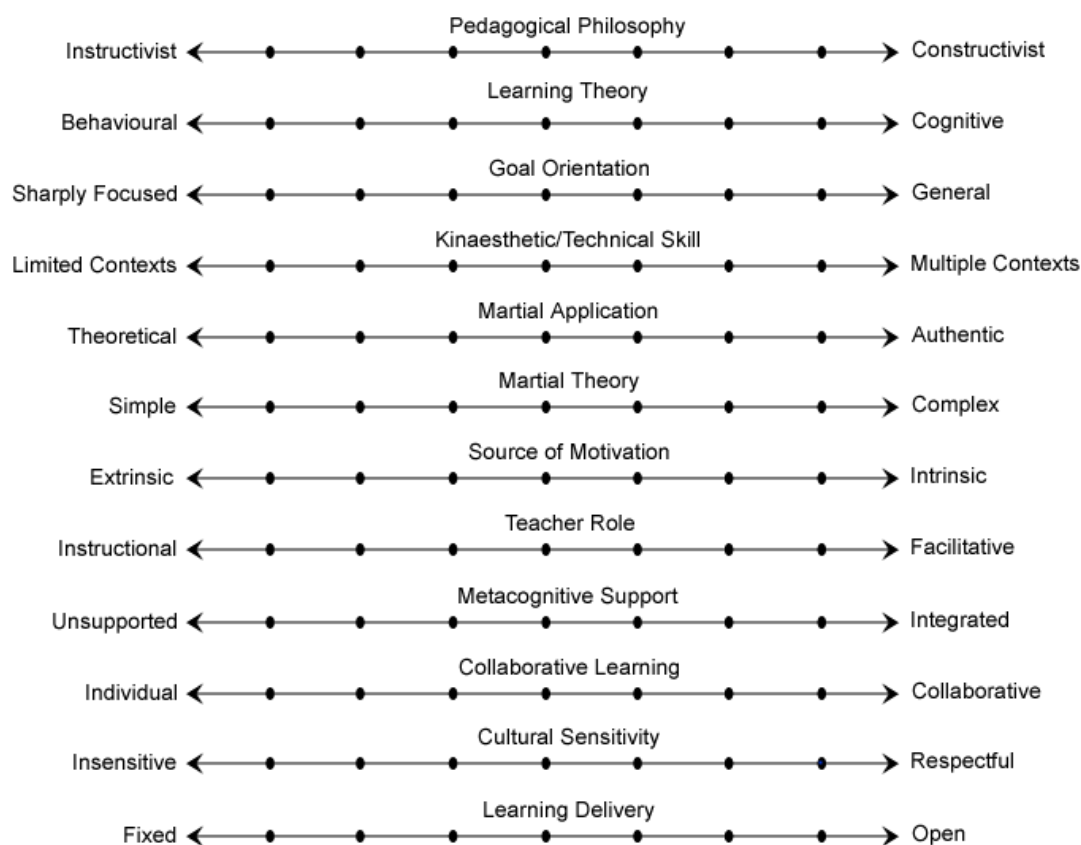


Fig. 4.1: Blank teaching evaluation form

The power of these rating scale diagrams derives from the ability to gain a quick overall view of the learning environment evaluation dimensions and interpret the data at a glance. So not only are the rating forms and visual scale diagrams used as data collection instruments, but they are also effective analysis tools. They enable researchers and online learning environment developers to make quick design decisions by comparing development goals, expected/anticipated ratings against actual ratings provided by the experts.

Whereas Reeves (1997b) used the pedagogical dimensions evaluation tool to compare two or more learning environments, in this study I have changed the purpose of the tool to evaluate a single learning environment but compare the evaluations of more than one expert of that learning environment. This way I could see whether the expert evaluations generate similar patterns in the visual scale diagrams and thereby contributing to the reliability of the instrument. Differences are treated as potential sources of further investigation. The same rating scale idea was applied to the user interface evaluation

(Reeves & Hedberg, 2003, p. 148). In addition to modifying the tool to be used to compare the evaluation results of several experts on one instrument, the tool was extended and used for the content evaluations too.

Each rating form included an introduction to the form and references to their sources, as well a statement about the purpose of each form. The forms also included brief instructions about completing the evaluations.

The evaluation dimensions were constructed by referring to other studies, as well as tailored to suit the nature of this study. Each of the expert evaluation rating forms is described next. I should mention that what is described below were the intended evaluation dimensions, but as the evaluation rounds unfolded it became clear that some evaluation dimensions were better suited being evaluated by different expert groups. Thus these dimensions were moved onto their appropriate evaluation rating forms. These changes are discussed in the relevant chapters to follow.

Teaching evaluation form

The teaching evaluation form is based on a similar tool discussed in Reeves & Hedberg (2003, pp. 190-196) used to compare two learning environments along pedagogical dimensions. It is expected that a match between development goals and the actual ratings will contribute to effective RAT learning environments. The wording and dimensions have been adapted to suit the RAT learning context.

Each of the evaluation criteria are described next.

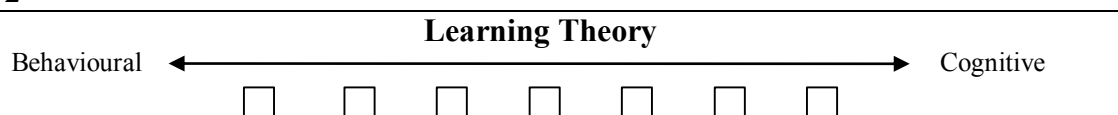
1



The pedagogical dimension ranges from *instructivist* to *constructivist*. An *instructivist* approach in martial arts learning would entail the step by step kind of teaching of pre-existing knowledge (or techniques), where learners are taken through a series of stages of knowledge, from beginner to advanced levels in a pre-defined sequence and where memory/physical recall tests are used as the basis to assess improvement. The learner, in

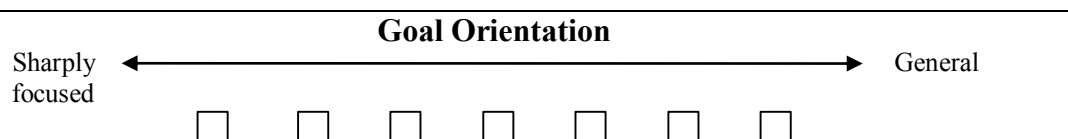
such an environment, would have no say over the content of the learning material. A *constructivist* approach in a martial arts learning environment, on the other hand, would allow for individual learners to integrate their prior knowledge into learning situations, create and use individually useful knowledge, discuss solutions with peers, and represent their own new knowledge in different ways. Learners would engage in simulated tasks (such as sparring) from the beginning stages of their learning and would be guided by those more experienced practitioners. Assessment in such a learning environment would entail both physical recall, as well as individual and group creative tasks, where prior and new knowledge is integrated into simulated and authentic learning tasks.

2



The learning theory dimension ranges from *behavioural* to *cognitive*. A *behavioural* learning approach in a martial arts learning environment could be typified by the instructor asking for a particular technique to be performed, the learner would then perform that technique, and the instructor would offer feedback as to the efficacy of such a technique. A good or correct performance might result in positive feedback and thus positive reinforcement from the instructor, and a bad or incorrect performance might result in negative feedback and thus seen in a negative light by the learner or even as punishment. A *cognitive* learning approach, however, might allow for a combination of strategies of learning, including instruction of techniques, knowledge representation, developing automatic skills (such as performing a throw) through drill and practise, deduction (using a martial arts principle to infer what could happen in particular self-defense situations) and induction (using particular self-defense situations in order to derive martial arts principles).

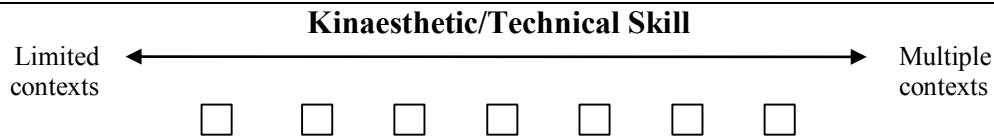
3



The goal orientation dimension ranges from *sharply focused* to *general*. An example of a *sharply focused* goal orientation in a martial arts learning environment would be learning a set of pre-defined and well tested techniques to an attack (e.g. front strangle). An example

of a *general* focus on the other hand might involve the development of solutions to complex problems, such as principles of dealing with multiple assailants in different environments. Such a general focus might require learners to engage in discussion and reflective thinking.

4



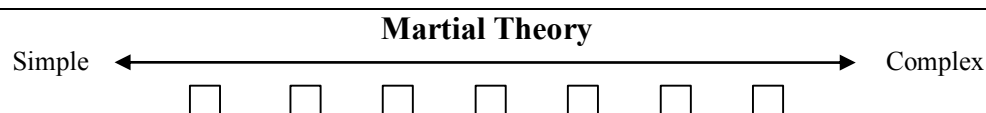
The kinaesthetic/technical skill dimension in martial arts learning environments ranges from *limited contexts* to *multiple contexts*. An example of a martial arts learning situation that fosters the development of skills in a *limited context* would be learning a specific technique to deal with a specific situation (e.g. a groin kick to an attempted front strangle). This kind of technical knowledge might become associated with this attack. Environments that foster the development of skills in *multiple contexts* however might re-use the same response (i.e. groin kick) against a multitude of different attacks. Conversely a single attack situation might be taught with a multitude of different responses. This kind of training is known as *multiple contextual training (MCT)*.

5



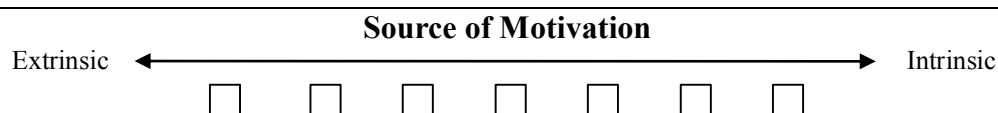
A complaint by many novice martial artists is that martial arts knowledge and skills can be too theoretical with a mismatch (perhaps because of cultural and historical reasons) between knowledge learned in the classroom and knowledge and skills required for real life. The martial application dimension ranges from *theoretical* to *authentic*. An example of a learning environment that is *theoretical* might be where learners are taught forms (pre-arranged dance-like sequences - usually performed solo) without any attempt to teach the application or principles of the movements in those forms. An *authentic* martial arts learning environment that uses authentic tasks as part of its curriculum would include sparring exercises with resisting opponents and simulated creative exercises where knowledge and skills can be applied in different situations.

6



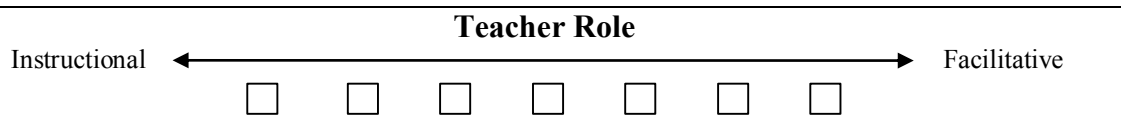
Martial theory relates to the theories and principles that guide the application, performance and creation of martial arts techniques and strategies. The two juxtaposed extremes of martial theory are *simple* and *complex*. In this dimension learners could engage with martial theory in a very *simple* way, for example by having a fixed set of rules for dealing with certain situations. In an environment where *complex* engagement with martial theory is encouraged however, rules would be used as reference points only and could be modified through negotiation with the context and with peers, and indeed new and different rules could be developed through such negotiation and represented in many different ways (e.g. mind maps, physical performances, written text, etc.). *Simple* engagement might be preferred at beginner levels of learning, but *complex* engagement would be preferred at advanced levels. The martial theory dimension here is similar to cognitive flexibility theory as discussed in Spiro et al. (1991).

7



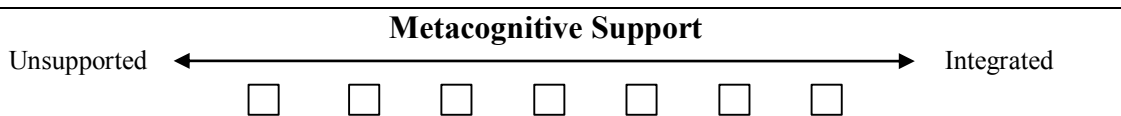
Motivation is often required in martial arts learning environments to help learners overcome obstacles and persist with their learning. Motivation can be placed on a scale from *extrinsic* to *intrinsic*. An example of *extrinsic* motivation in a martial arts learning environment is one where the instructor or peers have to issue statements of motivation to the learner to keep them interested in learning. An *intrinsic* source of motivation on the other hand would be one where the learner's own interest is kept alive, alternative views to information are provided, and the knowledge is viewed as individually useful by the learner. Multimedia might be used as a tool to promote *intrinsic* motivation, but it does not necessarily accomplish this end. *Intrinsic* motivation is an ideal goal for learning environments.

8



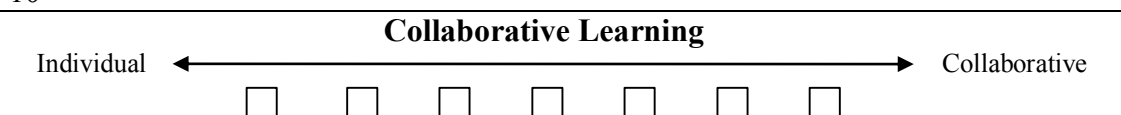
The role of the teacher in the martial arts can often be viewed as ‘instructor’ or ‘master’, where the teacher is the disseminator of a pre-defined and unchanging body of knowledge. Such a teacher role would be viewed as an *instructional* one. A *facilitative* teacher role on the other hand would be one where the teacher takes part in the learning process as a peer and encourages learners to develop their own representations of new knowledge that is dynamic and context dependent.

9



Metacognitive support relates to how well a learning environment supports learners to become aware of their own learning strategies, monitor their progress and modify their learning according to a known set of learning objectives. Metacognitive support can either be *unsupported* or *integrated* in the learning environment. An example of a learning environment where metacognitive support is *integrated* is one where the content is categorized in a way that matches the theoretical framework of the subject. For example, in a martial arts interactive programme, the navigation structure and hyperlinks could be mapped in such a way that the semantic units (meaningful names chosen for the links) represent parts of the whole and the parts are thus explicit in the context of the whole. The learning tasks created will challenge learners’ understanding of such structures and provide tools for learners to represent their understanding in different ways (e.g. mind maps, texts, physical performances) and also to monitor their own progress through simulated tasks such as sparring.

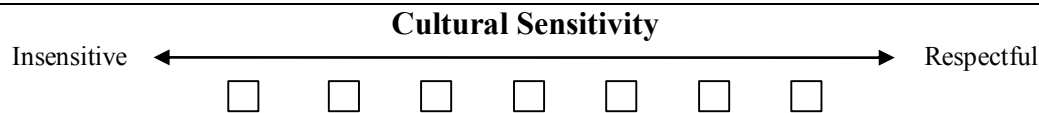
10



The collaborative learning dimension ranges from *individual* to *collaborative*. An *individual*-centred learning environment is one which does not encourage interaction between individuals and groups in the engagement with knowledge or the creation of new

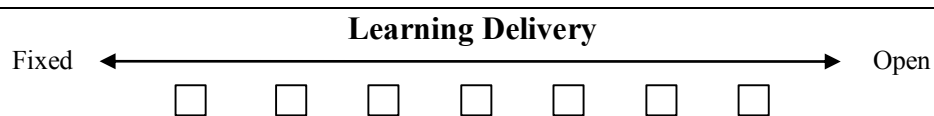
knowledge. A *collaborative* learning environment however encourages learners to work together on shared learning objectives and negotiate meaning of theories through discussion.

11



Martial arts learning environments can be culturally insensitive when they impose the values of the background religion, social group, or country of origin of the martial art onto the learners. Some religious learners might be put off learning a particular martial art that requires the learners to commence and end each training session with a bow to a picture of the founder. Such an environment might be viewed as being culturally insensitive. A respectful learning environment on the other hand is more informal, does not patronize its learners, and is flexible in its protocols (e.g. greetings such as bowing); the language is gender and culture neutral, and respects cultural diversity and differing values.

12



The learning delivery dimension of an interactive learning environment can either be *fixed* or *open*. A fixed learning environment is one which takes place at fixed times and venues. An *open* learning environment is one that can take place at the learner's convenience of both time and place.

While the teaching evaluation form provides useful feedback about the pedagogical dimensions and the effectiveness of the RAT learning environments, the user interface rating form is useful to cross-check the effectiveness from the interface and technology design perspective. This form also provides useful information about the usability, appeal, and functionality of the RAT learning environments and how well the intended development goals have been met. This information contributes to a richer understanding of the second research question in this study: What design would constitute effective martial arts computer supported learning environments? The user interface rating form is described in greater detail in the next section.

User interface rating form

The user interface rating form dimensions as used in this study are mostly based on Reeves & Hedberg's (2003, p. 148) sample user interface review form. However, it has been further developed and blended with criteria discussed by Nielsen (1994b) and Tognazinni (2003). The form has been simplified by removing the number ratings on the scale and reducing the amount of rating boxes to seven instead of ten. It was felt that ten was too fine a scale and would minimise the visual effect of the completed ratings, because a fine scale would mean that similar ratings would be close together and difficult to distinguish from each other.

Each rating criterion is described next.

1

Ease of Use

Difficult ← ☐ ☐ ☐ ☐ ☐ ☐ ☐ → Easy

Ease of use relates to how *easy* or *difficult* the resource/learning environment is to use.

Would a user be able to operate the resource/learning environment on first use, or is there a noticeable learning curve required to use the resource/learning environment?

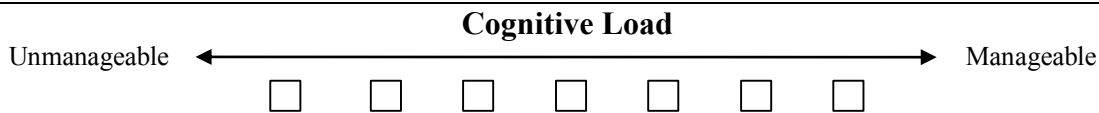
2

Navigation

Difficult ← ☐ ☐ ☐ ☐ ☐ ☐ ☐ → Easy

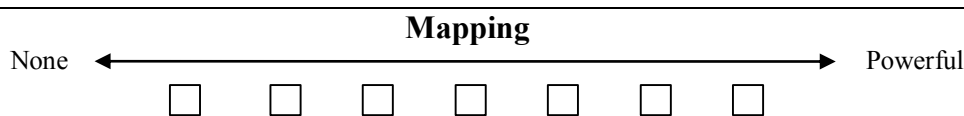
The navigation dimension has *easy* on one end of the scale and *difficult* at the other end. A navigational structure that is *easy* to use will be one that visibly shows the structure of a programme or website and provides easy access to the resources and functions contained therein with a minimum number of mouse clicks. The interface should be freely navigable without requiring users to build their own mental maps of the structure of the programme or site. A *difficult* or badly designed navigational structure sometimes locks users into a system (e.g. a particular page on a website) and requires that users do excessive backtracking through deeply-embedded links to return to the start page. Links should be clearly marked as such with appropriate semantic units as well as visual cues, such as colour, and users should never feel lost in the system.

3



Cognitive load relates to a person's working memory. The more options presented to a user of an interactive learning system places a greater cognitive load on the user which can make such a system *unmanageable*. Interactive learning systems should structure information in *manageable* chunks. By limiting the cognitive load users can concentrate on the tasks required of them.

4



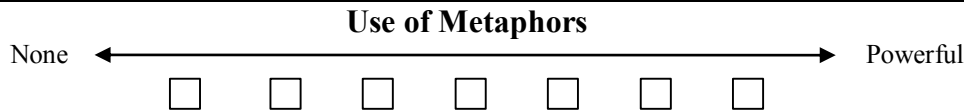
A system that can graphically represent the exact path a user takes through a programme and show the current position of the user in the information space may be considered as having a *powerful* mapping ability. On the other hand, a system that has no way of showing users what parts of the system they have visited and what parts they can still interact with may lead to user disorientation within the system. Such a system could be rated as *none* in the mapping continuum. Some useful mapping cues are 'bread crumbs' (which indicate position in a website) and coloured links (which may be coloured differently for visited and unvisited links).

5



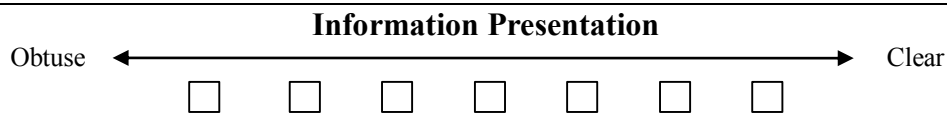
The screen design continuum has *poor* at one end and *strong* at the other end. There are several relevant aspects to consider when evaluating screen design, such as the text, graphics, icons, colour, and position of page elements such as texts and images. Texts should be readable, having large enough and easy to read fonts. There should be sufficiently high contrast in colour between texts, graphics, icons and backgrounds for easy viewing. Icons and graphics should be large enough for easy recognition and should also be of high display quality. Colours should be used conservatively and should take colour blind users into account.

6



Metaphors are often used to help users understand and use computer systems. For example, Windows Explorer uses the metaphor of an office with folders and files. Use of metaphors should be used judiciously in interactive learning systems. Well chosen metaphors may enable users to easily interact with and navigate a system. Such a system would have a *powerful* use of metaphors. On the other hand, badly chosen metaphors can cause confusion and the use of metaphors in such a system may be represented as *none* on the evaluation scale. Metaphors may be used that map conceptually to the subject matter, or to some other useful everyday concept.

7



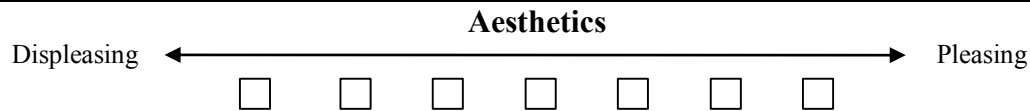
The information presentation dimension has *obtuse* at one end of the scale and *clear* at the other end. The ‘information presentation’ dimension refers to the writing style of the interactive learning system texts. Is the information presented in an understandable format, or could users become confused by an incomprehensible style of writing?

8



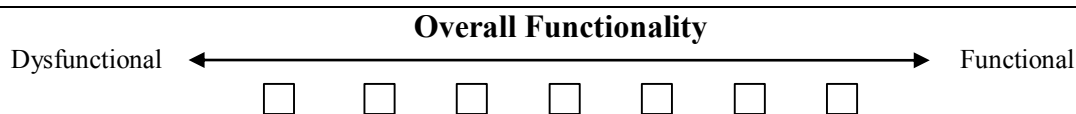
How well an interactive learning system’s media elements are combined and presented to produce a cohesive and effective whole is what is referred to as media integration. A *coordinated* integration of media elements would include necessary media at appropriate locations in the system (e.g. a movie clip link located below a reference to that movie clip). *Uncoordinated* integration of media on the other hand might be represented by interactive learning systems that include unnecessary media elements positioned in random locations in the system.

9



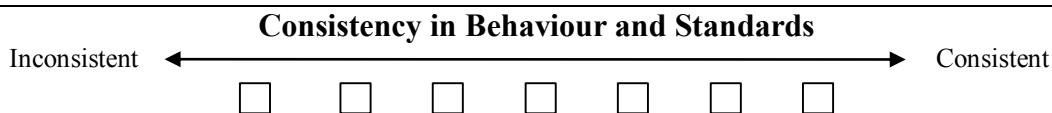
The aesthetics dimension of an interactive learning system ranges from *displeasing* to *pleasing*. The aesthetic quality of a *pleasing* interactive learning system may be minimalist in design and contain subtle design cues, such as matching and contrasting colours to produce an elegant whole.

10



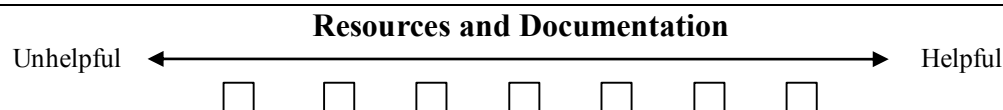
The use of overall functionality in this evaluation differs from the way that it is used in Reeves & Hedberg (2003), where it is used more as a way to evaluate ‘usefulness’. Overall functionality in this evaluation refers to how well the interactive learning system works as a whole. Such a system may work very well, or be *functional*, or it may be highly prone to produce errors, which would make it *dysfunctional*.

11



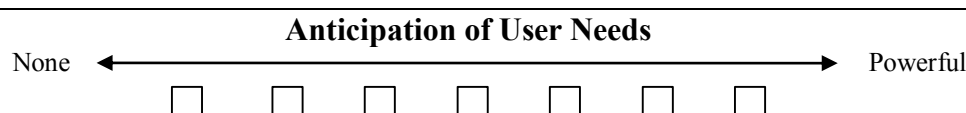
Consistency in behaviour and standards refers to the consistency in how objects in an interactive learning system behave and look. Objects that are the same should behave the same and also look the same. For example a movie clip icon located next to a movie clip file should be used consistently for all instances where movie clips occur in the interactive learning system. This means that the icon would have to look the same and that the icon should be used for every instance of a movie file. This way the user will know what to expect when clicking a movie file link. It is also important to make sure that different objects look different. This dimension ranges from *inconsistent* to *consistent*.

12



The resources and documentation dimension relates to how *helpful* or *unhelpful* the different resources, such as the inclusion of necessary software and links, as well as help documentation for installation or use of such software might be. Some systems may not require any resources and documentation, while others might require extensive use of resources and documentation for successful operation of the interactive learning system. The extent to which this dimension is *helpful* or *unhelpful* depends largely on whether there is a need for such support. This means that there might be minimal inclusion of resources and documentation, but the needs of the user might have been fully addressed.

13



The anticipation of user needs dimension ranges in a continuum from *none* to *powerful*. An application with *powerful* ‘anticipation of user needs’ incorporates what users might want and need from such an application. All the tools, media and information required for each stage or task should be available for the user in the context/s of such stages or tasks. An application rated as *none*, on the other hand, might require the user to conduct extensive searches for required tools or media.

It is all very well evaluating the teaching and user interface of a learning environment, but what about the quality of the material being learnt? To check that the learning material was of high quality and matched the requirements of martial arts teaching and learning environments, the RAT study was exposed to other expert martial artists for their rating on the content expert evaluation form, which is discussed next.

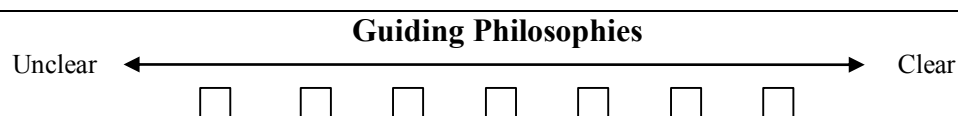
Content expert evaluation form

The content expert evaluation form is a new application of the rating scales discussed above. The criteria were constructed using core elements of the RAT learning teaching approach, but are also based on my experience in other martial arts. This component of the evaluation can be considered a risk in the martial arts community, as martial arts

practitioners can be highly critical and in a negative way of each other and of each other's martial arts. However, it was deemed more important to put our syllabus out there for the scrutiny of other martial artists with the goal to improve the learning. Elements of assessment and syllabus structure were derived from Spiro et al. (1991).

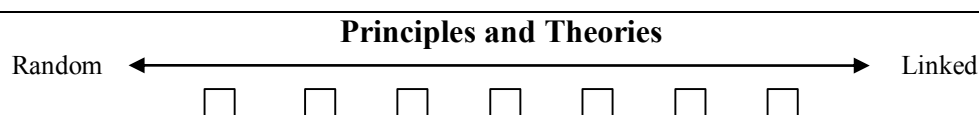
Each criterion is described below.

1



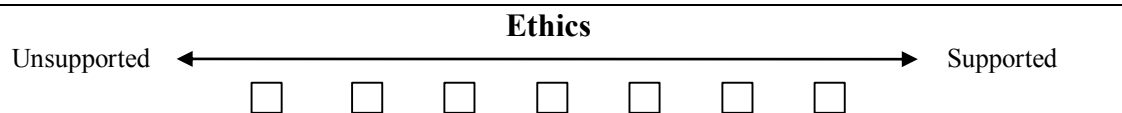
The guiding philosophies of fighting arts have a profound impact on how the art is learned, taught and practised. For example, in *Aikido* “The way of harmony”, all techniques are taught in such a way so as not to cause injury to your opponent. In RAT learners are expected to develop certain life skills deemed to be important in the proper learning of RAT and the most important of these are persistence and determination, humbleness, open-mindedness, leadership, and creativity. To what extent does the syllabus content in the RAT learning environments make these guiding philosophies *clear* or are they *unclear* in the tasks required of learners?

2



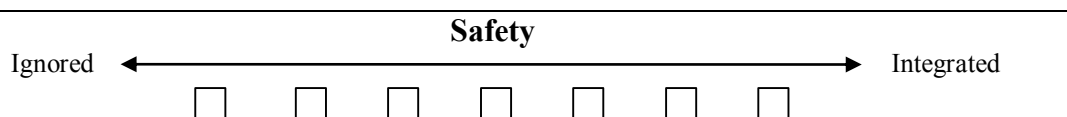
Fighting arts may be based on certain principles and theories and gear their training towards meeting the criteria involved in such principles and theories. For example, in Mongolian Wrestling, the objective is to throw one's opponent to the ground and thus all training and learning is geared towards this objective. In RAT, participants are expected to gain knowledge and expertise in a variety of possible types/ranges of combat initially and later to specialise in their individual preferences and strengths. To what extent is the RAT learning material *linked* to principles and theories, or are the techniques sequenced *randomly* without such linkages?

3



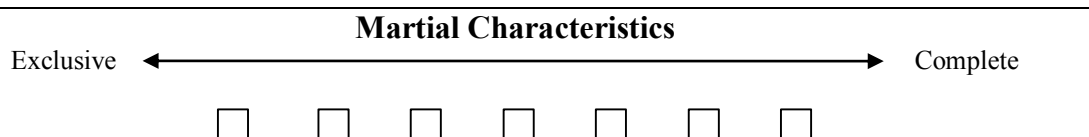
Ethics in the martial arts forms an important part of the learning of socially responsible martial artists. Such ethics are usually set in place through mutual respect in training to protocols of when it might be appropriate to use one's training. The ultimate goal should always be to avoid conflict. Is the development or awareness of ethics *supported* or *unsupported* in RAT learning environments?

4



Safety in the martial arts includes safety of 'self' and third parties (as in self-defense), as well as safety in training. Safety in training should involve development of an environment of mutual respect for all members. Such respect should be built into the syllabus where activities are planned in such a way that they will be safe for all participants. For example, there should be guidelines on how to safely use training equipment, and how to safely work with partners so as not to cause injury to one's partner or oneself. Is safety *ignored* or is it *integrated* in the RAT learning environments?

5



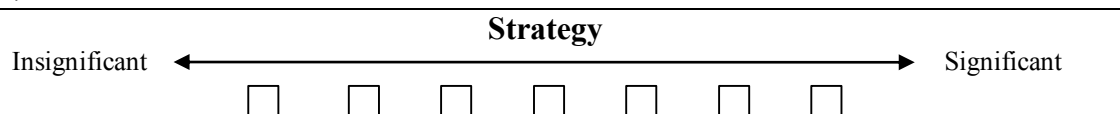
Martial characteristics include the major categories that comprise the various martial arts of the world. For example, striking (punches, kick strikes, elbow strikes, knees, head butts, etc), grappling (throwing, holds, chokes, locks, wrestling, etc.), use and defense of weapons, and self-defense are some of the martial characteristics. Do the RAT learning environments place an emphasis on one or only a few of such characteristics to the *exclusion* of others, or does the martial art attempt to stress a *completeness*, or inclusiveness, of such characteristics?

6



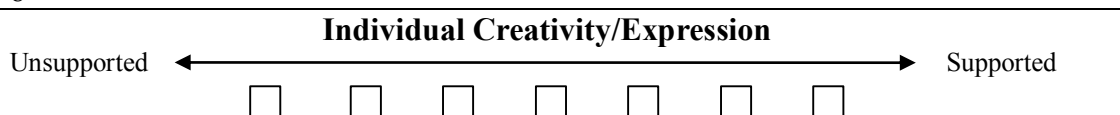
Martial attributes relates to the development of specific skills required to perform proficiently in a martial art. Examples of such skills include kicking; forearm strengthening for grappling, throwing, etc. To what extent do the RAT learning environments *stress* the development of such martial attributes, or is such development regarded as *unimportant*?

7



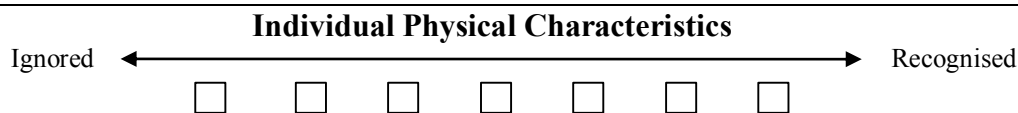
Strategy refers to knowledge and skills that include more than the mere execution of techniques. Strategy knowledge can be applied in several domains, such as in self-defense scenarios that include different environments (e.g. chairs as obstructions, more than one opponent, etc.) or it can be applied in more specific contexts, such as how a grappler fights a striker. To what extent is the development of such knowledge and skills *significant* in the RAT learning environments or is this aspect *insignificant*?

8



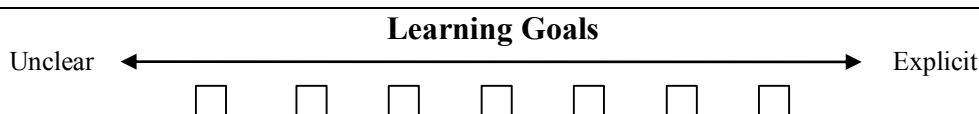
Many people involved in the martial arts may not be afforded the opportunity to express themselves; often as the result of fairly restrictive frameworks (i.e. Do as the teacher says and does). In this case individual creativity/expression may be considered to be *unsupported*. On the other hand other martial arts may recognise that learners may in fact find better solutions to problems than the teacher. To what extent do the RAT learning environments *support* individual creativity, or does this aspect seem *unsupported*?

9



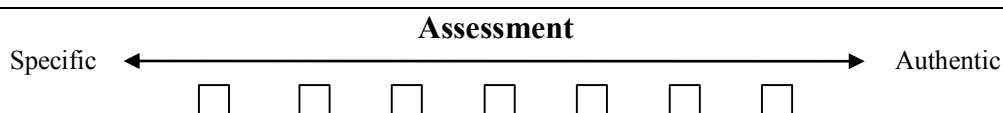
Individual physical characteristics relates to the physical capabilities of learners. For example, although in principle we as humans all have the same physical make-up, not everyone has exactly the same strengths and weaknesses and thus may not all be able to perform the same physical movements with equal proficiency. RAT practitioners recognise that the various martial arts of the world were designed by people who too had their own set of physical capabilities. Some martial arts expect learners to be able to perform movements based on the same skill set as the founder. This situation becomes problematic when learners want to advance in rank, or perform well in competition. Even more problematic is when development of an awkward individual skill set causes the person injury, or defeat in a self-defense situation. Such a person might have abilities that are more suited to a different martial art or skill set. Are individual physical characteristics *recognised* or are they *ignored* in the RAT learning environments?

10



The learning goals of some martial arts are shrouded in secrecy to the extent that in some schools a beginner will not even be allowed to observe an advanced class. In other martial arts however learners know exactly what to expect from the martial art as a whole, as well as for each rank or course. To what extent does the RAT syllabus have *explicit* learning goals for each rank, or are these goals *unclear*?

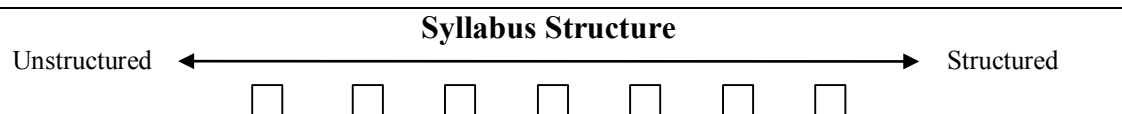
11



Assessment methods for promotion to higher ranks as well as for competitions can vary greatly in different martial arts and between different teachers of the same martial arts. Sometimes highly specific (or abstract) skills are tested and in other cases more ill-structured and authentic tasks are assessed. A mix of both forms of assessment may be required, depending on the purpose. Do the RAT learning environments support mostly an

authentic form of assessment (i.e. for the overall aims of RAT) or does it support methods of assessment that are mostly *specific*?

12



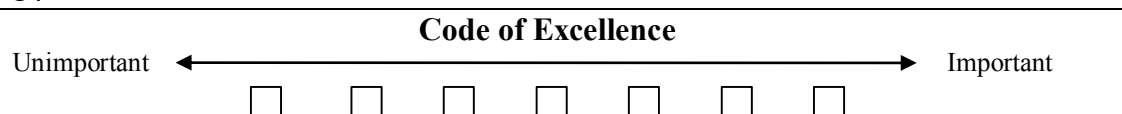
Syllabus structure refers to the way that the syllabus is constructed in a martial art. Some martial arts support a syllabus that is highly *structured*, taking students from the state of beginner to an advanced level, whereas others may be more *unstructured*. A structured syllabus has the advantage of clarity of expectations at all stages, whereas an unstructured one may allow the opportunity for individuals to express themselves and take their learning further. Some martial arts may include a mixture of both an unstructured and a structured syllabus and may indeed include different methods at different stages of learning. Do the RAT learning environments fall on the *unstructured* or the *structured* side of syllabus structure?

13



The topics in martial arts may be *irrelevant* or *relevant* to historical currency, social context and geographic circumstance. For example some martial arts may incorporate learning in ancient foreign weapons, whereas others may train with weapons that are current and found in the learners' geographic and social context. Some martial arts teachers on the other hand manage to facilitate learning of current and relevant topics through the training of such ancient weapons and thus such training can be seen as contextually relevant. Are the topics in the RAT syllabus presented in such a way that they are either *irrelevant* or *relevant* to currency, social and geographic context?

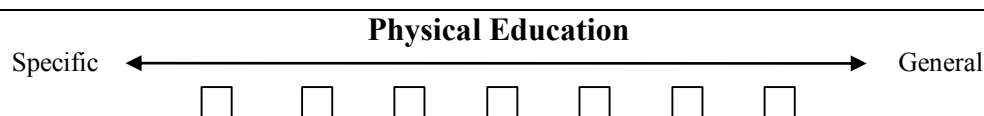
14



Generally martial artists adhere to a code of excellence, which is *important* both for their training and general daily activities. In some systems however this code may be

unimportant. Is such a code of excellence presented as *important* or *unimportant* in the RAT learning environments?

15



Physical education is an important aspect of most martial arts and some encourage the development of *specific* physical fitness requirements, while others encourage the development of all round *general* physical fitness. An example of *specific* physical fitness training would be where learners are required to perform repetitions of the martial movements themselves without any ancillary exercises. An example of an environment that encourages development of *general* physical education would be one that requires learners to perform many different types of physical education activities, such as flexibility training, strength and power training, endurance training, relaxation movements, etc. An ideal learning environment would include a blend of both the poles of *specific* and *general* kinds of physical education.

Observation, another of the methods used in this study, is described next.

4.7 Observation

Observation is a natural research method used for gathering research data (Hoepfl, 1997), such as when ecologists observe the behaviour of animals in their natural setting. We often engage in observation in our daily lives. From these observations we begin to collect memories of past events and we start to analyse this information to make decisions, or judgements. For example, we might deduce which person out of a crowd is going to beg for money. These deductions are of course assumptions and may be false, but the assumptions are derived from the observations and can be useful especially if to avoid danger. To avoid bias, one has to observe with an open mind.

Observation is a method commonly used in design research (Bayazit, 2004; Brown, 1992; Edelson, 2002). Reeves & Hedberg (2003, p. 149) support observation as being a valuable method for evaluating the effectiveness of learning environments. In this study, two forms

of observation are used: (1) cognitive walkthroughs, and (2) participant observation, each of which is described below.

Cognitive walkthrough

As described by Reeves & Hedberg (2003, p. 160) cognitive walkthroughs are an effective means of checking a user's performance when using a system. Furthermore they are useful for revealing system defects (Huart, Kolski, & Sagar, 2004). The advantage of cognitive walkthroughs is that one can observe both novice and expert users of the system (Reeves & Hedberg, 2003, p. 160).

Cognitive walkthroughs are conducted by providing users with a set of representative sample tasks that users are likely to perform in the system (Polson, Lewis, Rieman, & Wharton, 1992). Then the researcher observes the user perform each of the tasks while recording each step exactly as performed by the user and noting any issues along the way. Users are encouraged to think aloud during the process (John & Mashyna, 1995), but only if they are comfortable doing so. The way the tasks were actually performed by the users is then compared with the expected steps. The think aloud protocol is useful to provide further data about the thinking processes used by the learner and for exposing "cognitive overload" problems (Reeves & Hedberg, 2003, p. 160). According to Reeves & Hedberg (2003, p. 160) problems arise because software programs might demand too much of a learner's mental capacity, not leaving enough capacity for the learners to engage meaningfully in the learning.

Cognitive walkthroughs are used in this study to provide feedback on the usability of the RAT CD-ROM, by checking five areas of its navigation structure. It was expected that there might be some issues, because the system was designed with the assumption that learners would require some knowledge of the structure of the RAT syllabus in order to use the system. However, the correct balance needed to be established so that at least a moderately experienced learner could use the RAT CD-ROM.

Before each walkthrough the reasons for conducting the walkthroughs were explained to the participants. It was made clear that it did not matter if they could not perform any of the tasks. The purpose was to improve the RAT CD-ROM. Before commencing the participants were given a sheet of paper describing each of the five tasks. If they were

unsure of anything they could ask about the wording or meaning of the tasks, but they could not ask about how to perform them.

A cognitive walkthrough observation instructions form was created containing the correct steps in each of the tasks. This was used to compare the path in the task the learners actually took against the suggested path.

A cognitive walkthrough record form was used to document the actual path the learners took in each task. There was an additional column provided to record comments, such as anecdotal information.

After each walkthrough a semi-structured interview was conducted to elicit further information from the learner about the tasks, as well as other information as described below.

The cognitive walkthrough task results were entered into SPSS, a statistical software package to determine frequency statistics. Additional biographical information gathered from the semi-structured interview was included as part of the analysis.

Next, my role as participant observer is briefly described.

Participant observation

In participant observations researchers immerse themselves in the context to gain a better understanding of the social issues (Barab et al., 2005; Research Methods Knowledge Base, 2006). The role of participant observer was a natural fit for me in the RAT learning context, because as the teacher, I was a trusted member of the group and had spent years training with some of the members.

Observations were recorded in various ways, which is discussed in the records section in this chapter. Observations were expected to elicit useful information about any aspect of this study. The data was analysed by using coding and categorising of themes in NVivo 2 and NVivo8, a qualitative analysis software package.

Learner feedback was gathered to further interrogate observations, such as in the cognitive walkthrough tasks.

4.8 Learner feedback

More than using multiple tools to look at different aspects of the study, the study uses multiple audiences as a way of gaining different insights to see if there is any convergence between experts, learners, and participant observer insights. Depending on the component of the RAT study under investigation, four methods of learner feedback were used in different stages of the study: (1) semi-structured interviews, (2) focus group discussions, (3) post grading interviews, and (4) questionnaires.

Semi-structured interviews

The semi-structured interviews were conducted directly after carrying out the cognitive walkthroughs and were used for collecting data about the RAT CD-ROM. The learners' responses were recorded with pen and paper on a semi-structured interview record form.

The form was divided into seven sections: (A) biographical information, (B) martial arts experience, (C) computer experience, (D) RAT CD-ROM use, (E) task probe, (F) themes, and (G) any other comments.

The task probe was designed to extract further information about the cognitive walkthrough tasks and the themes section covered the four evaluation areas of usability, appeal, functionality, and effectiveness.

The data were entered into SPSS to look for trends in the data. Comments were entered into NVivo 2 and coded according to themes to highlight useful information.

Focus group discussions

Two focus group sessions were conducted: (1) a face-to-face focus group, and (2) an online focus group.

The face-to-face focus group was conducted after the cognitive walkthrough and the semi-structured interview in order to gather useful insights about the RAT CD-ROM in terms of

the cognitive walkthrough tasks, the semi-structured interview responses, and the four themes of this study, i.e., usability, appeal, functionality, and effectiveness. The group consisted of a number of participants who train in the face-to-face RAT classes. The discussion was video recorded and pen and paper notes were also taken.

The online focus group was more limited in scope compared to the face-to-face focus group and included online discussion forum topics relating to usability, appeal, functionality, and effectiveness of the RAT CD-ROM or the RAT Online courses.

Results of the focus groups were entered into NVivo and analysed for themes that would shed light on aspects of this study.

Post grading interview

Post grading interviews are short interviews with RAT practitioners after they have completed an assessment to advance to the next rank. The purpose was to find out if the RAT CD-ROM was useful in helping the learners prepare for their grading assessment.

The data was captured on a document and entered into NVivo.

Questionnaires and interviews

After each RAT Online course an online questionnaire was administered to elicit data about the usability, appeal, functionality, and effectiveness of the courses. These questionnaires were designed to obtain information about the design, the learning activities, and the technical tools used.

The data was entered into SPSS and basic frequency statistics were conducted and based on the results further questions were generated for post questionnaire interviews. These post questionnaire interviews were useful to interrogate the results of the questionnaires. This extra step was taken because the questionnaires were completed by so few respondents that they would not yield statistically significant information, albeit useful information for me as researcher. As the sample size for each evaluation was small (less than 20 respondents) the results were not reliable, but useful nonetheless to generate more questions based on the results. The questionnaire results repeated for several online courses

allowed for some degree of reliability. Furthermore it is the combination of instruments that contributes to a richer picture of this study.

As researcher, designer, developer, and implementer of the various components of the RAT Online study, it was important that I could document the major steps so that I could more easily manage the project. This was done with several types of record-keeping, discussed next.

4.9 Records

In addition to a special grading book and database designed for recording all ranks and courses completed by RAT practitioners and course participants, the other types of records kept were: (1) development and implementation log, and (3) communication – mostly in the form of email.

The records were used to document any peculiarities of the evaluations, unexpected issues and solutions, and any other concern not covered in the other parts of the evaluation.

The development and implementation log is a collection of mostly hand-written documents on each component of the project, which are chronological running documents to keep track of all development updates. More than depicting the number of updates required and time taken to implement the RAT Online project, they are invaluable pieces of information detailing how certain technology problems were solved. These documents will not be described in detail in this study, but used where appropriate to shed light on relevant issues.

The email communication is also used to shed light on findings in other parts of the study, but only where needed.

Where appropriate the records are coded into themes in NVivo 2 and 8, analysed and used as corroboratory evidence for any aspect of this study. Both deductive and inductive coding was used. In deductive coding researchers use pre-determined themes to code information/texts and in inductive coding researchers use texts to derive themes (Fereday & Muir-Cochrane, 2006; Kortendick & Fischer, 1996). Deductive coding was used to search explicitly for data, such as marking criteria in the assessment components of the

RAT Online courses, while deductive coding was used to uncover additional themes to provide a richer account of the data.

The final evaluation method described below helps to answer all the research questions, but is especially useful to find out whether martial arts can be learned online. The learner output and assessments align closely with what RAT practitioners will actually be required to do in face-to-face assessments.

4.10 Learner output and assessments

The learner output includes any material generated by learners during the RAT Online courses, although some of this material is added to the RAT CD-ROM for use by learners in the future. The kinds of material can include discussion forum texts, chat texts, mind and concept maps, and video clips. Much of this material was assessed against a set of marking criteria and covers the three main outcome domains of Bloom's Taxonomy, namely the cognitive, affective, and psychomotor domains (Bloom et al., 1956, pp. 7-8).

The learner output, especially the video clips is the most convincing evidence that martial arts can be learned online because of the physical skills involved.

The textual output was entered into NVivo 2 and NVivo 8 and coded against the marking criteria and a mark was awarded for the various tasks in the RAT Online courses. The marks were added together and a total obtained to determine whether the participants passed or not.

Below is a visual summary in the form of an evaluation matrices of the intended approaches used in the two main components of the RAT Online study.

4.11 Evaluation matrices

Table 4.1: RAT CD-ROM evaluation matrix

Methods	Instruments	Functionality	Usability	Appeal	Effectiveness
Observation	Cognitive walk-through		X		
	Participant observation	X	X	X	X
Learner feedback	Semi-structured interview	X	X	X	X
	Focus group	X	X	X	X
	Post grading interview				X
Expert evaluation	User interface rating form	X	X	X	X
	Teaching evaluation form				X
	Content expert evaluation form			X	X
Records	Development log (and anecdotal records)	X	X	X	X

Table 4.2: RAT Online courses evaluation matrix

Methods	Instruments	Functionality	Usability	Appeal	Effectiveness
Learner output	Learner contributions				X
Learner feedback	Questionnaire	X	X	X	X
	Post questionnaire interview	X	X	X	X
	Incomplete course interview			X	X
	Online focus group	X	X	X	X
Expert evaluation	User interface rating form	X	X	X	X
	Teaching evaluation form				X
	Content expert evaluation form			X	X
Observation	Participant observation	X	X	X	X
Records	Development and implementation log	X	X	X	X

SPSS and NVivo were the main analysis tools for this project, but a number of other software tools were used to complete the data collection and documentation.

4.12 Other software tools

For planning the writing of these chapters, I used Freemind, which is a free software program for creating mind maps. Freemind was also used during the online courses by the learners in the “represent your knowledge” tasks.

Microsoft Word was used to write up this project, but was also used to create the original drafts of the learning activities for the online courses (i.e. storyboards) and for the RAT CD-ROM content before being converted into a format suitable for the Web.

To manage the large collection of references, Endnote was used. This software package was also used to cite the references and automatically generate the reference list at the end of this study.

Lastly, a number of multimedia development tools were used to create the content and Web learning environments, but these will be described in the relevant chapters.

Another software package, Textstat, was used to generate word/theme frequency statistics of discussion and chat messages in the Bear Hug course.

The final aspect discussed about the methodology is how validity and reliability are treated.

4.13 Validity and Reliability

This study is qualitative dominant. Although this type of study uses mixed methods, qualitative dominant studies emphasise qualitative methods over quantitative methods (Johnson & Onwuegbuzie, 2004).

Qualitative and quantitative researchers treat validity and reliability differently. Welsh (2002) maintains that researchers claim that words such as “trustworthiness”, rigour, and “quality” are more appropriate descriptors of qualitative data. Welsh further maintains that what is important in qualitative studies is that there should be evidence to support the researchers’ interpretations of data and this contributes to validity. This evidence will enable other researchers to determine if the interpretations are accurate based on the

evidence. Furthermore, she contends that the use of software to analyse data, such as NVivo enhances “quality, rigour and trustworthiness” of research, because one is equipped with tools to reduce human error, such as searching, as well as tools to manually code texts. In order to provide sufficient evidence each component for evaluation in this study is extensively documented to reflect the evaluation as naturally as it occurred. Reliability is increased through repeated evaluations for each component, as well as the inclusion of various ratings conducted by different experts.

The Research Methods Knowledge Base website (2006) provides a useful summary of criteria proposed by Lincoln and Guba (1985, p. 189) for judging qualitative versus quantitative research. These include ‘credibility’ instead of ‘internal validity’, ‘transferability’ instead of ‘external validity’, ‘dependability’ instead of ‘reliability’, and ‘confirmability’ instead of ‘objectivity’. While I will describe the processes and procedures in terms of the qualitative criteria, this study is not to argue in favour of which position is correct, as both have merit. Terms might even be used interchangeably for convenience. This description is more to demonstrate how this project can be considered trustworthy, rigorous, and of sufficient quality.

Reigeluth and Frick (1999, p. 634) claim that in descriptive research validity is matched with “how well the description matches the reality of “what is”, whereas in design research it is more about which method is preferable to attain a “desired outcome”. In this project the primary method of building credibility is by matching similar conventional (preferable) techniques of assessing development of RAT knowledge, attitudes, and skills (the learning aims) in conventional face-to-face classes to this study, such as physical demonstrations/gradings and the submission of learner output (i.e. evidence). This is a way that this study might be taken seriously by other martial artists, as this assessment approach is common to most martial arts. Furthermore, all participant groups in this study (including me as participant observer) are given the opportunity to judge and report their experiences as they relate to martial arts learning and the computer learning environments evaluated.

Transferability in the RAT Online project, or the “degree to which the results of qualitative research can be generalized or transferred to other contexts or settings” (Research Methods Knowledge Base, 2006) is enhanced through an extensively documented account of the evaluations so that other researchers wishing to apply ideas in this project can follow the

documentation. To offer other researchers a more complete understanding, conditions of the contexts are also provided, as these may affect the implementation of the learning environments.

To handle dependability, the evaluation iterations are described in sufficient detail and accuracy to account for any differences between iterations. Due to the pragmatic nature of this study, changes in context were inevitable, but research methods and instruments were as consistently applied as was practicable and repeated.

Confirmability in this study is achieved through repeated evaluation iterations using similar research goals and methods, triangulation of data, as well as by using various participant groups to provide data and ratings.

Finally, this chapter closes with a brief conclusion.

4.14 Conclusion

This chapter recapitulated on the three main research questions, as well as serving to focus this research around four areas of evaluation: usability, appeal, functionality, and effectiveness. This study is formative in nature having various checkpoints along the way to ensure that development goals are being met during the development cycle. This continuous checking might seem onerous, but can save time, because changes can be made sooner rather than later when it could be more difficult or costly to make such changes.

The study makes use of a mixed methods approach with the purpose of triangulating and bracketing the findings in order to develop as comprehensive a picture of this study as possible. While there are multiple approaches described here, not all were used to maximum effect at all times, as the practical demands of each situation dictated which data collection instruments could be used and sometimes they were not as effective as they should be due to practical circumstances. Thus having other options available enabled one instrument to cancel out the weaknesses of another.

The subsequent chapter depicts the design, development, implementation, and evaluation of the RAT CD-ROM.

Chapter 5: The RAT CD-ROM

In this chapter I describe and discuss the design, development, implementation and evaluation of the RAT CD-ROM, one of the two main components of the RAT Online project. The main aim of this evaluation is to ascertain whether the RAT CD-ROM is an effective learning resource for RAT practitioners, whether it is usable, functional, and whether it is appealing to learners. Furthermore it is also to determine whether the development, implementation and evaluation procedures themselves are effective. This evaluation is also aimed at yielding documented design principles for creating and implementing learning resources of this nature for the benefit of RAT practitioners. There may be wider applications of these design principles, such as for designing and implementing other martial arts online courses, or even for other subject areas such as safety or medical training, which may also require a blend of knowledge and kinaesthetic skills.

In the first part of this chapter the background to the RAT CD-ROM component of this project is explained, including the purpose for developing the RAT CD-ROM, the rationale, and a description of the main technologies used in the RAT CD-ROM. Next the key elements of the design are described, highlighting the decisions about visual design and layout, the textual content, the media and software included on the resource, the learning design, and the content design. Before delving into the first round of evaluation the development process is described including an overview of the various computer software programs that were used to create the resource. In the next two parts of the chapter a detailed account is provided of the two rounds of evaluation conducted for the RAT CD-ROM. Each round can be considered a development cycle (see Fig 3.1) where the results contribute to more effective decision-making and improved developments. In each round of evaluation a number of data collection tools and methods were used. The evaluation sections reflect for the most part the chronological sequence in which the data collection instruments were administered with the participants. Thus, I try to depict as closely as possible the natural sequence of events while including analysis and discussion of the data as part of the discourse. This may make it easier for other researchers to follow the process and conduct similar repeatable evaluations in a practical and naturalistic way. Additionally this process helps me, as developer, to establish in the most efficient way what changes are

required to improve the design of the RAT CD-ROM. Finally, the chapter concludes with a summary of the findings and the discussion.

The RAT CD-ROM and the RAT syllabus is not only a multi-media resource designed to stimulate interest in RAT, but it is also a tool for individualised learning and is built on the premise that all learners will collaborate and contribute to improving the resource.

So what prompted the development of the RAT CD-ROM?

5.1 Purpose of the RAT CD-ROM

The RAT CD-ROM is a martial arts multimedia learning and reference resource for RAT practitioners. The RAT CD-ROM was developed so that it could either be deployed as a CD-ROM, or as a website.

The purpose of the RAT CD-ROM is to address some of the issues highlighted in Chapter 1. These include the following problems in the conventional face-to-face RAT learning environment: (1) geographic dispersion of learners and no access to the face-to-face classes, (2) ineffective text-based learning material that is not conducive to representing RAT movements, and (3) no medium for RAT practitioners to store new knowledge about RAT.

The RAT CD-ROM is a large reference resource containing the entire RAT syllabus with an interlinking web of useful multimedia types and documents. The CD-ROM also contains the syllabi and related multimedia for several other martial arts practised in the RAT school. The resource enables geographically dispersed learners to use the RAT CD-ROM to reference the learning material for the relevant parts of their syllabus and thus continue to practise even though they may not have access to face-to-face classes. Learners no longer have to rely on trying to decipher textual descriptions of martial arts techniques and principles, as the visual media on the RAT CD-ROM, such as the video clips, the instructional videos, the animations, the slideshows and the mind maps are designed to provide a richer and more useful way of representing such kinaesthetic kinds of knowledge than is possible with text alone. The RAT CD-ROM is designed to be useful not only as a reference resource, but the resource itself is intended to provide a platform and basis for

discussion and creation of learner developed material. This will add to RAT as a growing body of knowledge.

The RAT CD-ROM, through its interconnected web pages and media allows practitioner content to be added and new knowledge can thus be stored and re-used by other learners. The researcher expects that with time the RAT CD-ROM content will change from mostly researcher added content to mostly learner added content, in line with constructivist learning theories and the generation of learner developed artefacts. It is expected that this change in structure and content would only occur after many years, as learners would require time to advance in ranks and the CD-ROM would need the time to mature. The content added will provide a useful resource for learners taking part in RAT Online courses (the other main component of this project). Conversely, the learner output generated through RAT Online courses will be added to the CD-ROM as learning resource material. Although the RAT CD-ROM was initially released as a CD-ROM the plan is to release the RAT CD-ROM on the World Wide Web (WWW or Web) eventually. This will tie the two components of the RAT Online project (i.e. the RAT CD-ROM and the RAT Online courses) together as one delivery medium.

The RAT CD-ROM was originally designed as a learning reference for practising RAT learners and not as an instructional resource to learn the entire RAT syllabus or replace the conventional teaching and learning methods already used. It was designed as a complement to both RAT face-to-face and online learning. However after extended observation the RAT CD-ROM has frequently been used by learners to learn new material in addition to being used as a reference. This chapter documents the evolving nature of the RAT CD-ROM in these two rounds of evaluation, first as a learning reference for existing RAT practitioners and then as a learning resource for new knowledge, skills and attitudes.

In the next section the RAT CD-ROM is described in greater detail, covering its main facets, such as the content, the media types and the thinking behind the design.

5.2 Rationale for CD-ROM delivery

The RAT CD-ROM, although delivered on CD-ROM, is built with the aim of eventually being implemented as a website. As designer there were a number of design choices that I had to take into account. The choice of eventual delivery medium was a critical decision, as the type and extent of the target audience dictated this to a large degree. The RAT community of practitioners is small and not all participants had access to Internet connections at that time. Furthermore the face-to-face training venue did not have an Internet connection. However, it is anticipated that Internet connectivity will improve and the RAT Online project was initiated to also grow its community over time with other new members in other parts of the world. On this basis, the decision to compromise and go half way seemed sensible initially. By half way I mean creating a resource that can be used without an Internet connection, but which is built with a view to its future direction of increased online participation and membership. The idea to pilot this initiative with a small user base before releasing it to the wider world also seemed sensible given the enormous task of creating the multimedia resources. The aim was to identify and rectify defective design elements before releasing publicly, but at the same time to have a useful and effective resource available for existing students and which could be used as soon as possible to enhance their learning. On the basis of the above factors I decided to initially release the first versions of the RAT CD-ROM on CD-ROM format.

Having decided on the delivery platform, the next task was to decide on the delivery technology, which is discussed next.

5.3 Web as eventual delivery medium

The audience on the WWW is potentially enormous and viewers of a website may range from young children to the elderly depending on the nature of the content. While it would be tremendous if the audience of RAT Online content is limited only by the number of people connected to the Internet, the reality suggests a much more limited audience. The audience is restricted in terms of martial arts interest and even then the audience would be a specific niche of martial arts practitioner interested in RAT. Internet users have access to differently powered computers with different specifications and connections to the Internet

with different speeds, and this was especially the case at the time this study was conducted with the RAT Online participants. These computer users may also have varying skill sets and abilities to use a computer. During design these factors had to be taken into account and the overall aim was to develop a resource that could download quickly, would not overuse computer resources, and would be fairly easy for RAT practitioners to use.

The decision to use Web technologies opens up more questions, such as: Which Web technology to use? What kinds of media will be included? How will the media be displayed and linked? What content will be included? The next few sections of this chapter discuss design decisions around these questions.

5.4 HTML as core technology

The RAT CD-ROM is constructed using *hypertext markup language* (HTML) forming a complex network of web pages containing the entire RAT syllabus and resources. HTML is the core technology behind web pages on the WWW. HTML generates small file sizes and is therefore suitable for fast downloading of pages on the Web. The small file sizes allow storage media such as a CD-ROM to store many pages.

HTML enables developers to create web sites in a modular way. By this I mean, one can create a coherently structured system, including information, software tools, different types of media such as images, animations, videos and sounds files, but each component can remain separate from the main HTML structure. The components are bound together by a system of hyperlinks and a menu. The strength of this ‘modularity’ is that developers can edit media content externally from the website without affecting the overall structure and functionality of the site. For example if you wanted to edit one of the video clips on the website, you can perform the editing in a video editing program and as long as the file name remains the same, only the video clip will be updated, keeping the rest of the site intact. A modular approach was essential when developing the RAT CD-ROM considering the scale of the site and the large amount of linked multimedia files included throughout the CD-ROM.

There are other effective Web delivery technologies available, such as server-side scripting technologies (e.g. *Active Server Pages* (ASP), or *PHP Hypertext Preprocessor* (PHP) combined with the power of databases). These technologies enable Web developers to create dynamic websites. Dynamic websites allow published content to be manipulated and updated live. For example, when a user on the Internet adds to a Web log (blog) and submits a form, the web page is immediately updated. There is no need for a Web developer to edit the page and re-upload the file. This kind of technology hands over much control to users and makes the Web into the dynamic environment which it has become in the Web 2.0 net. Such pages still display HTML pages, but websites can be built much more flexibly. One area of website maintenance that can be significantly enhanced with dynamic Web technologies is the (navigation) menu system.

A navigation menu is a group of hyperlinks that is accessible by all the pages in the website. The menu enables users to click links and view the various sections of a website. It is difficult to create and manage the navigation menu in HTML, because of the degree of manual effort required in large and complex sites. When changes are made to a navigation menu in a static HTML website, it usually means that all pages within a website also need to be changed, because all pages need to reference the menu links. This amounts to substantial investments in development time and is therefore not efficient if a website is to become large and/or updated regularly. Dynamic websites on the other hand allow developers to create a single menu file and when updates are required, only the menu file requires editing.

Notwithstanding the difficulties and complexities of static HTML based websites versus the easier updating power of dynamic websites, dynamic websites add further levels of complexity if they are to be installed and run from a user's hard drive or CD-ROM drive, because such dynamic systems are difficult to set up by the average computer user. Furthermore server technologies will not work on CD-ROM delivered media unless the user has a Web server installed. So despite the attraction to use server technology, if that route was chosen it might have meant that many users would not know how to access the content on the RAT CD-ROM, resulting in a diminished target audience of an already niche group and therefore reduced effectiveness of the project. The strength of ease of use for users and easy initial deployment of the RAT CD-ROM prompted the decision to use static HTML technology. However there still remained the problem of maintaining the

menu system and in this project I consider effective development processes being part of the evaluation. This being the case, then clearly a better method was required than updating multiple web pages each time a menu change is required. HTML enables sites to be developed using frames, which is what was used after considering the pros and cons of such a development choice. Further explanation about the frames and menu is provided in the visual design and layout section below.

5.5 High level technical design decisions

In this section I provide a high level view of the design of the RAT CD-ROM, including the visual design and layout, the textual content, and the media and software on the CD-ROM.

Visual design and layout

The colours, fonts and various other elements on the HTML pages of the RAT CD-ROM are controlled by *Cascading Style Sheets* (CSS). Style sheets are text documents that can link to an HTML page or be embedded on the page to control the appearance and position of various HTML elements. Style sheets allow developers to structure the HTML documents in basic code and then control the look and feel of the website without having to edit each individual HTML page. This impacts the design and update process in a positive way, as developers only have one file to create or edit and changes will be ‘cascaded’ throughout all pages in the website that link to the style sheet.

Developers can modularise the layout and functionality of an HTML website by using HTML frames. Frames are separate HTML pages loaded into a single main HTML page. By using frames developers can create a single menu file and load it into a frame (e.g., the left frame). When users click the links in the menu, pages can be loaded into another section of the page (e.g., the middle frame). The advantage of this approach is that only one menu file needs to be maintained. The RAT CD-ROM was designed with four framed areas: a top menu area for links to major sections of the resource (such as ‘history’, ‘ethics’, ‘aims’ etc.), a left menu for links to all the site syllabus resources, a centre content area for displaying the web pages, and a footer area displaying the last date of update and copyright information.

During development there were known issues with using frames in websites, but the benefits and the known target audience outweighed any of these issues. For example, indexing issues in search engines and bookmarking were not a concern, because the site was to be implemented on CD-ROM format. Furthermore, some issues were addressed with alternative arrangements. Printing issues were resolved by providing links to portable document format (PDF) alternatives to all syllabus content. It was envisaged that when Internet access improves for the user group, the RAT CD-ROM will be deployed on the Web using a Web 2.0 technology, where frames would not be required.

The RAT CD-ROM contains an assortment of media types, including HTML text, PDF files, video clips, instructional videos, Adobe Flash animations, images, mind maps, software and interactive slideshows. All the media files are bound by the system of (hyper)links, the menu, and the textual content. The textual content is described next.

Textual Content

One of the main aims of creating the RAT CD-ROM was to enhance the formerly text only content of the RAT syllabus. The RAT CD-ROM was a significant improvement over the formerly paper-based syllabus, because the textual content had the potential to be more meaningful with the complementary multimedia. But just because the syllabus would be enhanced with multimedia, it does not mean that we could do away with text altogether. RAT practitioners still need to use a common language to refer to ideas, principles, and techniques and we still need text to situate the syllabus activities within a structure that learners could follow and understand. The text binds the system together into a coherent format for learners and is in a sense their guide through the syllabus and reference material when no real life person is available to provide that guidance.

All text is produced in HTML and contains the links to other HTML pages, media, software, and other websites. In addition to the HTML text, users can also click a print icon on syllabus pages which would open equivalent PDF files if they wanted to produce print copies of the corresponding pages. While the purpose of the RAT CD-ROM is to provide a rich multimedia tool, some thought went into the design about other contexts (away from the computer) in which learners might like to use the content. PDF documents provide users with the choice to read on screen or on paper. So learners may be able to

extend their learning experience by taking the paper to read or practise principles and techniques when they are not sitting at the computer.

While the text guides the user through the website and explains syllabus content, the media and software contribute to the value of the learning and reference material by providing a rich medium more closely aligned with showing kinaesthetic skills than text alone can provide. The media and software tools included on the RAT CD-ROM are described next.

Media and software

The RAT CD-ROM is a media rich version of the RAT syllabus containing a wide variety of media and a large number of files. There are nearly 700 hundred video clips, several instructional videos, close to 2000 photos and other images and diagrams, as well as animations, and interactive slideshows. There is also a large mind map that represents the entire RAT syllabus and embedded martial arts principles. Minimal software has also been included on the CD-ROM; Freemind 0.7.1 and Java Runtime 1.4.1.04 so that learners can create their own mind maps during RAT Online courses, video codec software which enable video clips to be played, and the Macromedia/Adobe Flash Player 6 so that users can run the few Flash animations and slideshows.

The RAT CD-ROM was developed to run on a Microsoft Windows operating system as all the users run Windows platforms. However the CD-ROM also works on Apple Macintosh and Ubuntu Linux platforms. The video clips were recorded in various file formats (such as AVI, MPEG and MOV) depending on the technology available at the time of recording. These file formats resulted in file sizes that were too large for Web delivery or when compressed were unacceptable in quality. Compression is a process of reducing the information in images, sound, or video footage so that it reduces the size of the files. The movie clips on the RAT CD-ROM were compressed to Windows Media Video (WMV), as these produced the best quality to file size ratio, even when compared with the new Flash Video format (FLV) at that time. Apple users are able to download a WMV player to view the movie clips. Most of the movie clips are 320 pixels in width X 240 pixels in height. Movie clips are used extensively on the CD-ROM to represent techniques, principles and RAT training drills.

The movie clips were not originally designed to teach learners how to perform the techniques, nor were they meant to replace the face-to-face teaching and learning of RAT. Rather they were designed and used as visual reminders of RAT principles and techniques for practitioners. A good example of how RAT practitioners may use a movie clip is when they are practising at home: one of the requirements is to perform throwing sequences (i.e. throwing the opponent to the ground with a series of throwing techniques in a predetermined sequence). Practitioners may remember most of the respective techniques in a particular throwing sequence, but may forget some of the detail. Practitioners can then easily click the video link next to the text in the syllabus requirements and watch a video clip of the throwing sequence. The visual reference may clear up some of the uncertainty about the throwing sequence. So the video clips could provide a powerful mnemonic tool for learners.

A particular movie clip can be located in several places, which allows learners multiple access points to the clips. The movie clips and all other media on the RAT CD-ROM are placed in the context of the various syllabus sections. In other words, wherever there is a reference to a particular technique, sequence, or principle that has an associated movie clip, then a link to that movie clip is provided with an associated icon representing a movie clip. There is also a section of the CD-ROM (Resources) devoted to the various resources on the disk. The movie clips can be viewed under the folder heading 'Movies', where only the movie clips are listed under their categories. This means that learners can freely explore only the movie clips if they required. The video clips do not contain step by step instruction, which is necessary for highly complex sequences of RAT movements. This prompted a need for the instructional videos.

The few instructional videos were recorded and compressed in the same manner as the video clips, but were only experimental at that stage. The filming was of poor quality and the performers needed more rehearsing before the clips were filmed. Where the video clips are simply demonstrations of RAT activities with no explanations or step by step instructions, the instructional videos are intended to provide the learner with better instructions and guidance. The demonstrators in the instructional videos teach learners how to execute RAT techniques in a step by step manner. For example, in the first sequence of RAT throwing techniques (Throwing Part A) there are eight throws altogether. The fifth throw (the valley drop throw) is a complex technique that requires a great amount of

practise to acquire the skills to perform it effectively. To illustrate the complexity of this technique: the valley drop throw is a counter throw to a throw, so this means that the practitioner has to attack the opponent first instead of the other way around, the opponent then needs to defend with an attempted throw and the practitioner counters the opponent's throwing attempt with another throw (a counter throw). Secondly the counter throw itself is difficult, as it requires the thrower to fall to the ground while pulling the opponent down at a diagonal backwards angle. Some of this detail can easily be missed if an explanation does not accompany the video sequence. Learners could benefit from instructional videos for the individual techniques contained in sequences, such as Throwing Part A, especially in early stages of learning.

As with the movie clips, the instructional videos are placed in context within the syllabus pages, but also listed under the Resources section (Instructional Videos). While video clips and instructional videos are useful memory and teaching aids, they can take time to view, especially when they show longer sequences, as the viewer needs to play the file through until the point of interest is reached. There are times when practitioners may in fact know how to perform techniques, but may forget the names used to refer to the techniques. For this situation images were used as visual mnemonic aids.

For quick reference of techniques the RAT CD-ROM contains nearly 2000 photographs of individual techniques. The photographs provide quick visual mnemonic aids, as images do not have time-lines like movie clips that have to play through in a linear sequence, nor are they as abstract as text insofar as representing movement. The image combined with the text helps to remove uncertainty about technique names and the text helps to remove ambiguity about what the images represent. The abstractness of text may be complicated by the arbitrary nature of naming conventions for martial arts techniques. Different people use different terminology to denote techniques and some of these labels may be fairly descriptive and functional, such as 'low jab punch', while others may be more poetic, such as the Chinese Kung Fu technique 'needle on the sea bottom'. Even the seemingly more functional naming conventions can lead to confusion and also represent the creator's perspective at the time of naming the technique.

The functional label 'low jab punch' assumes that learners already know what a punch is, what a jab is, and how you can perform the jab punch technique at a 'low' height. Other

practitioners may have provided a very different label for the same technique. Furthermore there are many techniques that have subtle differences and blend into each other, like ‘high lead hook’, and ‘high reverse hook’. Simply reading the text for these two techniques may cause confusion, but at the same time these subtleties need to be recorded, adding to the richness of RAT knowledge. The photographs provide a visual representation of the meaning of techniques.

The biggest problem of course is that photographs do not capture the movement required to perform martial arts techniques effectively. The photographs on the RAT CD-ROM usually only represent a key step in the respective techniques so that it is just enough for the learner to identify the technique with the label attached to it. This means that the photos may not be effective learning resources for new RAT learners, but may be useful for more experienced learners. The photos are also placed in the context of the RAT syllabus and like the movie clips and instructional videos, have a section under Resources called ‘Photo Reference’.

Each photo representation consists of a small image of 100 X 75 pixels in size (a thumbnail image) which the user can click to open a larger and clearer copy of the same image (640 X 480 pixels). The larger image opens in a new browser window so that users do not lose their place in the flow of the CD-ROM. For some concepts neither a movie clip, instructional video, nor a photo can capture the meaning sufficiently and may require numerous representations to explain a concept.

To help explain principles and concepts the RAT CD-ROM contains diagrams and minimal animations. A RAT principle may be abstracted and applied to numerous techniques. A good example of this is the principle of ‘direction and path’. We use another useful principle, ‘the spindle’ (or ‘rotating 3D star’), to help explain direction and path. The spindle has large productive power, as RAT practitioners apply it in a wide array of techniques and categories of techniques. The spindle describes eight directions on a flat plane. The plane can be rotated to lie flat on the ground or stand vertically. The middle of the spindle also represents an up and down path if lying horizontally, or forward and backwards if standing vertically (see the black dot in the centre of Fig. 5.1). Furthermore the spindle also represents circular and changing directions along any of the paths in the spindle. The spindle is applied to categories of techniques ranging from throwing, to

ground grappling, to striking with the hands and feet, to the use of weapons. This powerful principle may be succinctly displayed in a simple diagram (Fig. 5.1).



Fig. 5.1: The spindle

Sometimes diagrams are used to represent individual techniques, simply because the textual descriptions may be too long and clumsy to use efficiently during training. In the Warrior's Eskrima syllabus on the RAT CD-ROM there are lists of combinations of techniques, most of which contain multiple techniques in one combination set. For example the text: backhand circular slash followed by forehand circular slash (Fig. 5.2) represents two techniques in diagrammatic form. These diagrams were provided courtesy of the Warrior's Eskrima head instructor (Africa).



Fig. 5.2: Eskrima technique

When practitioners are training and they become unsure about a particular technique in a combination set, it is much quicker to refer to the diagrams instead of having to read long names and descriptions. A good example is the tenth Eskrima combination in the set called the *single cane amarra* first represented as it appears on the RAT CD-ROM (Fig. 5.3).

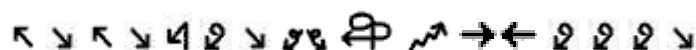


Fig. 5.3: Warrior's Eskrima single cane amarra

This combination in the Eskrima syllabus on the RAT CD-ROM requires an extensive textual description. Once practitioners know the meaning of the images, the diagrams are useful tools to work out the order of the techniques in the combinations without the time consuming activity of reading each description. The images function as mnemonics.

The added ability to represent movement in animation allows developers to combine the power of the diagrams and movement for conceptual types of knowledge. There are currently few animations on the RAT CD-ROM, but these will increase in number in later

versions of the RAT CD-ROM. Adobe Flash was used to create the animations. Flash or Adobe Director animations provide many opportunities to combine different media types into an integrated and meaningful environment.

An interactive slideshow was an experimental media type on the RAT CD-ROM, which is a Flash animation combining a slideshow metaphor with textual descriptions, images, animations, movie clips, and instructional videos of the steps involved in RAT self-defence techniques. Each step shows a photo or video clip and other information of the relevant part of the sequence. Interactive slideshows could also be used to illustrate RAT principles. At present there is only one interactive slideshow on the RAT CD-ROM, but this number may increase in future versions of the CD. These slideshows require extensive development time and are also high maintenance when changes are required, so this prompted the decision to initially focus on creating a large and useful set of movie clips as a first priority.

The RAT CD-ROM also contains mind maps (Buzan & Buzan, 1995, p. 179) for representing a knowledge about different aspects of RAT and self-defence. There is one main mind map representing the knowledge covered in the RAT syllabus (Fig. 5.4), as well as several other mind maps generated by learners during RAT Online courses. As more participants take part in RAT Online courses and successfully complete higher ranks in the face-to-face classes, more learner generated mind maps will be added to the RAT CD-ROM. The main RAT mind map (called the RAT framework) was created in Freemind, which is a freeware software programme. The software is included on the RAT CD-ROM so that users can view the RAT framework mind map, or create their own mind maps to represent their own learning and knowledge. The RAT Framework mind map is an alternative means of representing a large amount of knowledge about the structure of RAT as well as its principles. Many of the physical sequences in the syllabus are based on the structure of the mind map. Thus the practise of RAT is a physical representation of the structure of the mind map, and the mind map is a cognitive representation of RAT's physical structure. Through this purposeful integration of physical practice and mental representation it was intended that learners might develop a greater understanding of what they practise in RAT and why the syllabus is structured the way that it is.

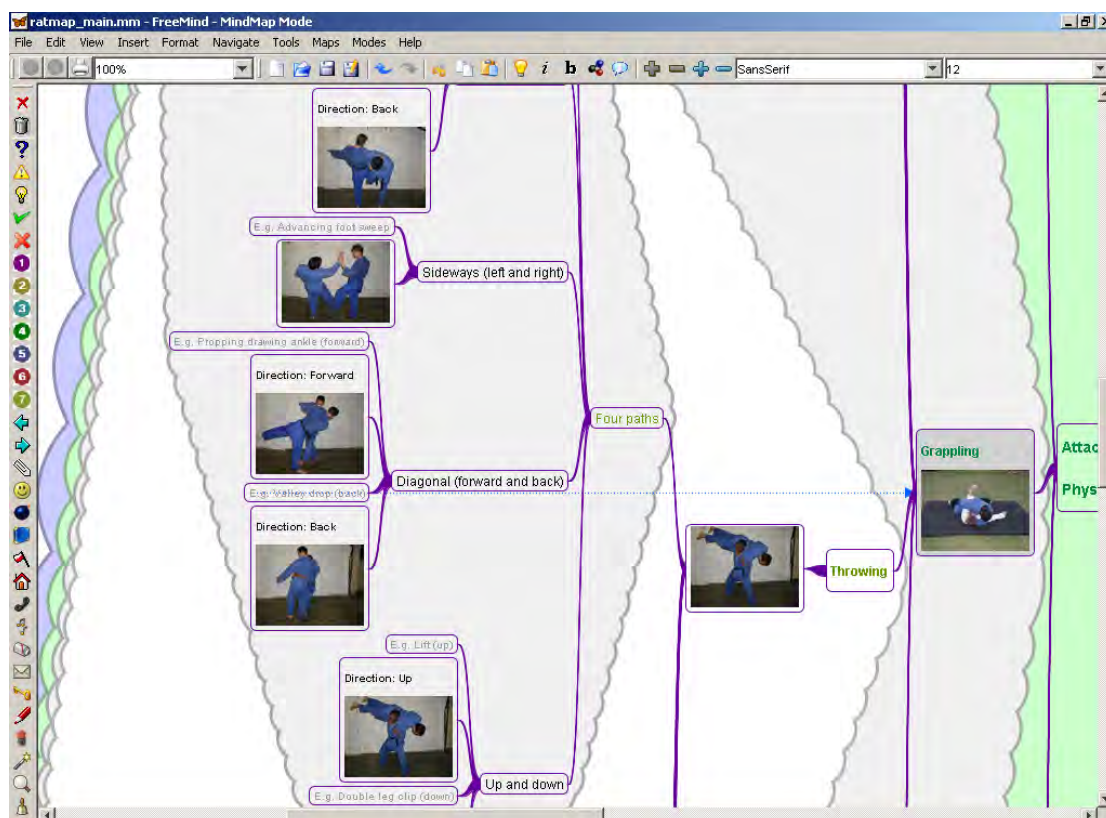


Fig. 5.4: Segment of RAT Framework mind map

The RAT framework is in no way a definitive representation of all the principles of martial arts. The intention is that the framework represents a starting point and an attempt to map out a ‘universal’ structure for RAT, but also realising that it is only one perception of a range of possible and different ‘truths’. For this reason, the RAT syllabus and RAT Online courses are designed in such a way that learners are required to develop their own knowledge representations, either by creating mind maps or by some other means (Fig. 5.5). These various options add to the diversity of the learning approaches taken in RAT, as well as to the multiple representations of knowledge. Learners are also required to constructively criticise the RAT framework and improve upon it.

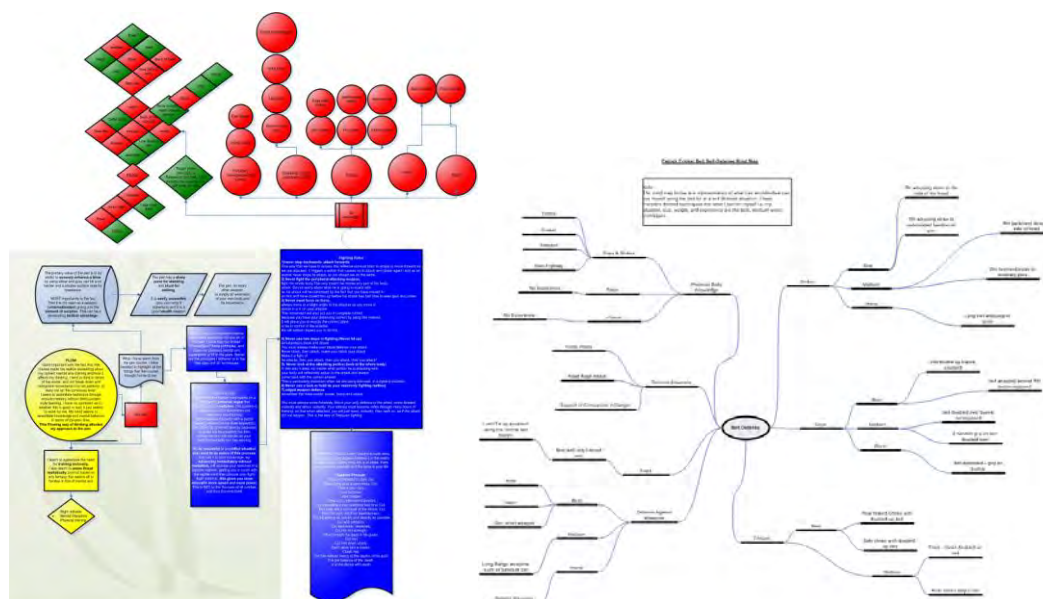


Fig. 5.5: Learner generated mind maps

One of the goals of the RAT CD-ROM is to promote it to grow and evolve into a more expansive knowledge resource as more learners add their own content.

With some of the multimedia software tools on the market, such as Adobe Flash and Adobe Director, a wide variety of learning resources can be created. For example, Director has a 3-D game engine built into it that allows developers to create multi-user 3-D game experiences. Interesting self-defence simulations can also be built in either Flash or Director. Other tools, such as Hot Potatoes and Adobe Captivate give developers the power to quickly and easily create quizzes and crosswords. These media types may be added to the RAT CD-ROM in later versions for learner self-review activities. But at these initial stages, a greater focus was placed on multimedia of more immediate need.

The next topic to be described is the content covered on the RAT CD-ROM.

5.6 The Content

The RAT CD-ROM contains four menu areas (Fig. 5.6): (1) a top menu containing links to information about RAT, (2) a left menu section called 'Syllabus Content', (3) a second left menu section called 'Resources', and (4) a third left menu section called 'Other Martial Arts'. There is also a footer section at the bottom displaying copyright information, the

date the site was created and last updated, as well as a contact email address. The site content is displayed in the largest section in the centre of the screen below the top menu.

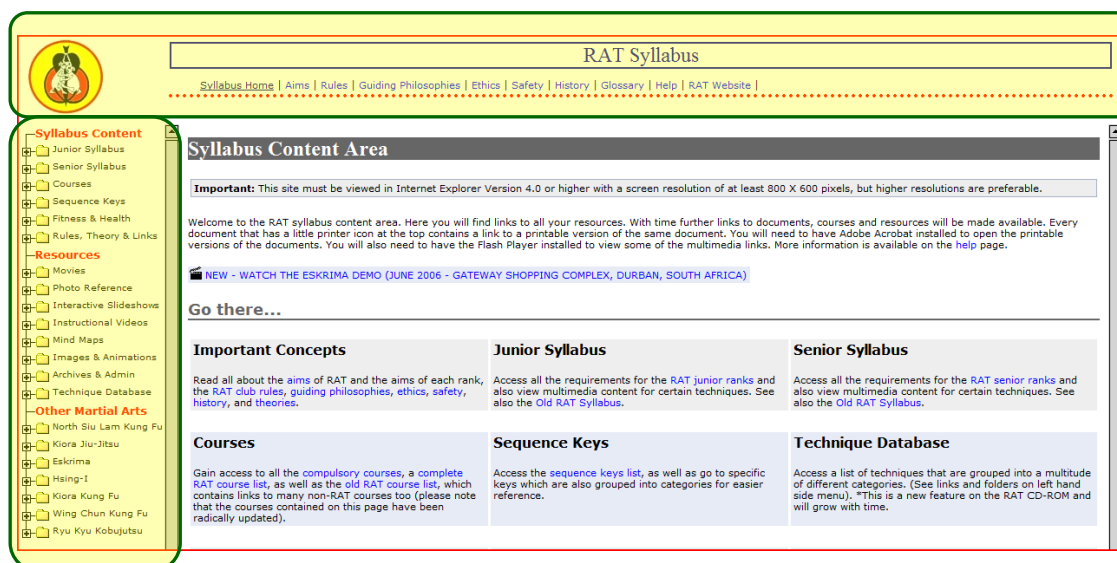


Fig. 5.6: RAT CD-ROM content areas

The top menu (Fig. 5.7) contains links to high level information about RAT, which are placed at the top for prominence and to provide easy access to the information. The menu contains links to the RAT CD-ROM home page, the aims of RAT, the rules, the guiding philosophies of RAT, ethics involved in learning RAT, safety, the history of RAT, a glossary, basic help on using the CD-ROM, and a link to the RAT website.

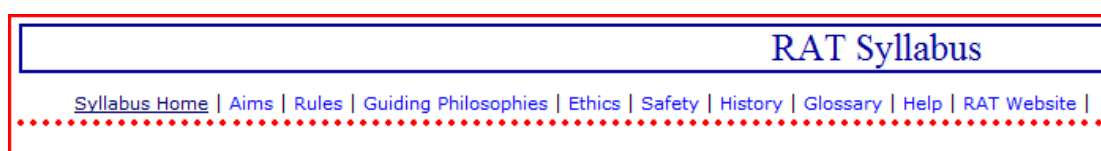


Fig. 5.7: RAT CD-ROM information menu

The 'Syllabus Content' topic area contains folders, sub-folders and links to web pages about the RAT syllabus (junior and senior ranks), compulsory and elective courses, sequence keys, fitness and health programs, and links to pages about the rules of RAT, underlying theory of RAT, as well as links to other websites (Fig. 5.8).

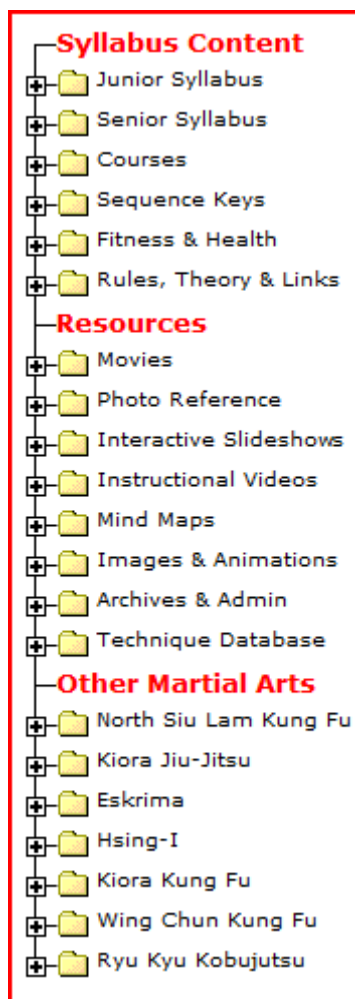


Fig. 5.8: Left menu area showing content areas

The 'Resources' area is a substantial part of the RAT CD-ROM which contains folders, sub-folders and links to movie clips, photos, the interactive slideshow, minimal instructional videos, mind maps, images and animations, archives containing older versions of the syllabus, as well as administrative documentation such as mark sheets for testing, and a growing technique database (Fig. 5.8).

The 'Other Martial Arts' area contains folders, sub-folders and links to syllabus material of a number of other martial arts practised by members in the club (Fig. 5.8). These include *North Siu-Lam Kung Fu*, *Jiu-Jitsu*, *Eskrima*, *Hsing-I*, *Kiara Kung Fu*, *Wing Chun Kun Fu*, and *Kobujutsu*.

The development of the RAT CD-ROM was a time-consuming and complex process and a number of software programs were used to develop it. A brief account of the development

of the RAT CD-ROM and the various software tools used during development are described next.

5.7 Development and tools

A detailed hand written development log was kept to track the evolution of the RAT CD-ROM. This log proved to be useful to keep track of technological solutions to problems encountered during development, as well as to document the settings required for optimal performance of multimedia items on the CD-ROM, such as video capture settings. The log also captured release dates of the RAT CD-ROM, the names of recipients of the CD-ROM, as well as the dates of filming of video clips, the list of clips produced and the circumstances of each filming event.

Once it was established that the RAT CD-ROM could be a worthwhile resource for learning RAT a basic framework was created. The conceptual framework consisted of the RAT syllabus in HTML format with placeholders for multimedia items. A list of multimedia items required could then be produced. Multimedia items may include photographs, diagrams, Flash animations, mind maps, or movie clips. The appropriate means of obtaining or creating the multimedia items was then determined. Usually this entailed coordinating filming dates and times with RAT learners who helped as ‘subjects/actors/models’ for the photos and movie clips.

A digital camera was used to capture over 2000 photographs and an analogue video camera was used to capture approximately 700 movie clips by the second round of evaluation. These movie clips then had to be digitised, edited, optimised for viewing on a computer, and compressed to a Web friendly format (i.e. by reducing the file size while maintaining a reasonable viewing quality). The photographs had to be resized and compressed to a smaller file size to increase download speed. The multimedia items were then assembled and linked at the various placeholder positions within the syllabus and course areas.

The technological framework consisted of four HTML framed areas (described above) which was created in Macromedia Dreamweaver MX 2004 (now Adobe Dreamweaver). Microsoft Word was used to write the syllabus and courses. This was a useful step as Word

is a good tool to perform editing tasks, such as spelling and grammar checking, as well as checking the logic of the content. Each Word document was then converted to a portable document format (PDF) file using PDF Writer in order to provide a print friendly alternative for learners. The Word document content was then copied and pasted into Dreamweaver. The Microsoft Word code was then removed to produce 'clean HTML' code in Dreamweaver for each of the hundreds of pages within the RAT CD-ROM. Each syllabus page was separated into more manageable 'chunks' using Dreamweaver and linked into cohesive syllabus units. For example, a typical rank might consist of four main task areas and each of these is comprised of its own page, all linked to the main page for that rank.

A tree menu structure was chosen for the left hand menu because of its capability to add folders, sub-folders, and links, which were required to list different categories and sub-categories useful for representing the RAT syllabus, as well as other categories representing various divisions/taxonomies of RAT techniques. The tree menu was created using a Javascript tool called Creatatree, which was a freeware tool at the time of development.

Adobe Photoshop was used to manipulate images and photos and Macromedia Fireworks (now Adobe) was used to generate thumbnail images of photos. This was useful to create album pages.

Adobe Premiere 5 was used to encode analogue footage into digital format. Windows Movie Maker was then used to produce movie clips in the Windows Media Video (WMV) format. The WMV format proved to provide the best quality file size ratio at that time.

A freeware software program called Freemind was used to create the RAT framework mind map.

The development process can become more complicated when large scale changes to the design are required. Thus to avoid making the development process more difficult, early evaluation was important before completing the development of the resource. The next section describes the first round of two rounds of evaluation.

5.8 RAT CD-ROM: Round 1 evaluation

A number of data collection instruments were used in the first round of evaluation (Table 5.1) to obtain a wide source of information from various perspectives to guide future development decisions. Each instrument is described in the methodology chapter. The rest of this section covers a description of the participant groups, the implementation of the instruments, the data elicited, the analysis and any decisions and changes made as a result of the evaluation, which is followed by the round 2 evaluation. This description approximates the order in which the evaluations were actually conducted and does not necessarily match the order listed in the evaluation matrix below (Table 5.1). The matrix shows the various evaluation methods used and which aspect each is intended to target.

Table 5.1: RAT CD-ROM round 1 evaluation matrix

Methods	Instruments	Functionality	Usability	Appeal	Effectiveness
Observation	Cognitive walk-through		X		
	Participant observation	X	X	X	X
Learner feedback	Semi-structured interview	X	X	X	X
	Focus group	X	X	X	X
	Post grading interview				X
Expert evaluation	User interface rating form	X	X	X	X
	Teaching evaluation form				X
	Content expert evaluation form			X	X
Records	Development log (and anecdotal records)	X	X	X	X

This section is described in the following order: (1) cognitive walk-through, (2) semi-structured interview, (3) focus group, (4) user interface rating, (5) teaching evaluation, (6) content expert evaluation, (7) post grading interview, (8) participant observation, and (9) development log (and anecdotal records).

The cognitive walk-through is discussed first.

5.8.1 Cognitive walk-through

The cognitive walk-through was carried out primarily to evaluate the navigation aspect (mainly the left hand menu system) of the RAT CD-ROM and to determine how user friendly the menu is for RAT practitioners. It was assumed that learners would require some knowledge of the structure of RAT techniques and categories of techniques to be able to use the menu efficiently. For example, learners would require enough background knowledge to know that under “strikes” one would find associated techniques, such as punches and kicks. A more detailed description of the cognitive walk-through instrument is provided in the methodology chapter.

The semi-structured interview, carried out directly after the cognitive walk-through was used as an opportunity to gather biographical and RAT CD-ROM usage information such as role in the club, martial arts and computer experience, frequency and place of use of the RAT CD-ROM, and the purpose of using the resource. Some information was used to merely understand the make-up of the participant group, while other data was used in conjunction with the cognitive walk-through results and tabulated in the SPSS software to compare results. This study makes use of small sample sizes. Therefore significant statistical conclusions cannot be made from the frequency data alone. Rather this information is used as a guide for further investigation triangulated by other methods of inquiry.

Next, the participant group in the round 1 evaluation is described.

Cognitive walk-through participants

16 participants took part in the cognitive walk-through tasks. All participants were male and ranged in age between 10 years and 39 years, with the majority being over 18 years of age (13 in total). 14 of the participants were members of the Senior RAT class, while the remaining two were members of the Junior RAT class. 11 of the participants were learners in the classes and five had the dual roles of both “learner and instructor” in the club. This means that they were learners in the Senior classes, but would also teach in the Junior classes, as well as perform a teaching role in the Senior classes. The “learner and instructor” participants were expected to have a greater understanding of the structure of the RAT syllabus than the other participants.

The participants' martial arts experience ranged from eight months of training to 10 years, while their RAT experience ranged from two weeks training to 8 years. 14 participants rated themselves as having excellent computer skills, while one rated himself as good, and the remaining one participant rated himself as a fair computer user. Most participants (12) rated themselves as excellent users of the World Wide Web (WWW) (referring to their experience in using Internet browsers and websites), while two rated themselves as good and the other two as having little exposure and experience with the WWW.

All participants had used the RAT CD-ROM at least once before the cognitive walk-through and they had been using the resource for a period ranging from one week to one year at intervals of once a week, twice a week, once a month, and a variety of ad hoc intervals.

Participants reported that the reason they used the RAT CD-ROM was for learning new knowledge and skills, for teaching, for reference and for other reasons such as for interest only. Interestingly the number of reported responses for using the RAT CD-ROM to learn (9) was almost as many as for reference purposes (10). The RAT CD-ROM was originally intended mainly as a reference resource. This observation adds to the perceived value of the RAT CD-ROM as a teaching and learning resource. It also supports a positive response to the question of whether RAT can be learnt in computer supported learning environments.

The places where the RAT CD-ROM was used included a majority at home and at the gym, while some used the resource during breaks at work, university and at school.

The tasks

Participants were given a set of five navigation related tasks to perform to find information or media and open or play them. The participants were encouraged to think out aloud in order for the observer to understand their decision making processes. The observer used a cognitive walk-through observation instructions sheet to observe whether the participants' actions matched the series of steps required to complete each task successfully. The observer then recorded each action performed by the participants on a cognitive walk-through record form, making note of any comments or unexpected actions.

The results for each of the walk-through tasks are presented next using the following four areas of interest which were considered as potentially playing a role in the outcome: status (Junior or Senior RAT), role in club (learner or “learner and instructor”), computer experience, and WWW experience. The ‘successfully with hesitation’ option has been excluded from the task results tables in round one, as participants either completed the tasks confidently or did not complete them successfully.

Task 1

Participants were given the following instruction for task 1:

“Go to the **Junior RAT Green Belt** syllabus.”

The observer used the following documented path for the task below so that it could be compared with how the user actually completed the task:

“Click the **Junior Syllabus** folder on the left-hand side tree menu > click the **Green Belt** link on the tree menu. (two steps).”

None of the participants experienced any difficulty with this simple task (Table 5.2). This suggests that the menu and navigation works effectively for simple tasks on the RAT CD-ROM. However the semi-structured interviews might uncover flaws not observed during the walk-through.

Table 5.2: Task 1 results

		Task 1 Completed	
		Successfully	Unsuccessfully
		Count	Count
Status	Junior	2	0
	Senior	14	0
	Total	16	0
Role in Club	Learner	11	0
	Learner and Instructor	5	0
	Instructor	0	0
Computer Experience	Excellent	14	0
	Good	1	0
	Fair	1	0
	Bad	0	0
WWW Experience	Excellent	12	0
	Good	2	0
	Fair	0	0
	Bad	2	0

Task 2

Participants were given the following instruction for task 2:

“Go to the **fitness programmes list** for the **Senior RAT Jack-Spades** rank.”

The documented path for completing the task is as follows:

“Click the **Senior Syllabus** folder on the left-hand side tree menu > click the **Jack-Spades** link in the tree menu > click the **Complete five fitness programmes** link under the **Tasks for this rank** heading on the **Jack-Spades** main page. (three steps).”

Four out of 16 participants did not complete task 2 successfully (Table 5.3), which was considered a fairly easy task. Interestingly one of the participants who could not complete the task successfully was from the ‘learner and instructor’ group (highlighted below),

which was an unexpected result. Two of the unsuccessful participants rated themselves as having bad/poor WWW experience, which could help to explain why they could not complete the task successfully, but then one would question why the other two participants who rated themselves as having excellent WWW skills also could not complete the task successfully. These findings pointed to a need for further investigation in the semi-structured interviews to follow.

Table 5.3: Task 2 results

		Task 2: Results	
		Task 2 Completed	
		Successfully	Unsuccessfully
		Count	Count
Status	Junior	1	1
	Senior	11	3
	Total	12	4
Role in Club	Learner	8	3
	Learner and Instructor	4	1
	Instructor	0	0
Computer Experience	Excellent	11	3
	Good	1	0
	Fair	0	1
	Bad	0	0
WWW Experience	Excellent	10	2
	Good	2	0
	Fair	0	0
	Bad	0	2

Task 3

Participants were given the following instruction for task 3:

“Find the first **list of sequences** for the **Joker-Spades** rank.”

The documented path for completing the task is as follows:

“Click the **Senior Syllabus** folder on the left-hand side tree menu > click the **Joker-Spades** link in the tree menu > click the **Complete a test on the syllabus**

content and create your own techniques link under the **Tasks for this rank** heading on the **Joker-Spades** main page > click the link in item (1a) **Junior RAT Red Belt - 1st Junior Rank** on the **Task D** page (Knowledge of previous ranks) > click **Syllabus work and test** under **Tasks for this rank** on the **Red Belt** page > scroll down to the **Sequence Keys** section (3). (5 steps).”

The path to completing task 3 is rather convoluted and the poor results for this task are a reflection of this (Table 5.4). Only four participants completed task 3 successfully, three of whom were from the ‘learner and instructor’ group. The one learner who completed the task successfully was near the level of becoming a ‘learner and instructor’ which may help to explain why he could complete the task due to his greater understanding of the syllabus. On the other hand one of the ‘learner and instructor’ participants had not trained in RAT for a long period and was not familiar with the structure of the new syllabus which could explain why his result was more like that of the learner group. Two of the participants were from the Junior RAT group and do not need to access the information in task 3, however it was felt that including these two participants might shed further light into ease of use for inexperienced practitioners. These findings indicate tentatively that participants who have a greater understanding of the RAT syllabus can find the information easier. The record forms show that most participants become hopelessly lost or did not have an idea where to go on the RAT CD-ROM. While the syllabus is designed in a way that learners should know what their grading requirements are, clearly finding this information on a computer resource (i.e. the RAT CD-ROM) is a usability problem for newer learners and effort should go into improving this issue.

Table 5.4: Task 3 results

		Task 3: Results	
		Task 3 Completed	
		Successfully	Unsuccessfully
		Count	Count
Status	Junior	0	2
	Senior	4	10
	Total	4	12
Role in Club	Learner	1	10
	Learner and Instructor	3	2
	Instructor	0	0
Computer Experience	Excellent	4	10
	Good	0	1
	Fair	0	1
	Bad	0	0
WWW Experience	Excellent	4	8
	Good	0	2
	Fair	0	0
	Bad	0	2

Task 4

Participants were given the following instruction for task 4:

“Find and play the Movie for the **Focus Pads Punching Drill**.”

The documented path for completing the task is as follows:

“Click on the **Movies** folder under the **Resources** heading on the left-hand side menu > click on the **Drills** link > click on the **Focus pads punching** link to play the movie (under the **Striking – Punches** headings). (3 steps).”

Participants performed well in task 4 (Table 5.5). Only one participant from the Junior RAT group did not complete the task successfully. The satisfactory results point to a well-constructed navigation structure for this task.

Table 5.5: Task 4 results

		Task 4: Results	
		Task 4 Completed	
		Successfully	Unsuccessfully
		Count	Count
Status	Junior	1	1
	Senior	14	0
	Total	15	1
Role in Club	Learner	10	1
	Learner and Instructor	5	0
	Instructor	0	0
Computer Experience	Excellent	13	1
	Good	1	0
	Fair	1	0
	Bad	0	0
WWW Experience	Excellent	12	0
	Good	1	1
	Fair	0	0
	Bad	2	0

Task 5

Participants were given the following instruction for task 5:

“Open the large **photo** of the **Hip Throw**.”

The documented path for completing the task is as follows:

“Click on the **Quick Pics** folder under the **Resources** heading on the left-hand side menu > click on the **Throws** folder (under the **Quick Pics** folder) > click the **Hip Throws** link on the left-hand side tree menu > locate the thumbnail (small) image named **Hip Throw** and click it to open the large photo. (4 steps).”

Task 5 was considered an easy task, so it was surprising to find that three participants did not complete it successfully (Table 5.6). The highlighted areas in the table show the random nature of the results. One of the Junior RAT participants managed to complete the

task successfully, two of the unsuccessful participants rated themselves as having excellent computer experience, while two of them also rated themselves as having bad/poor WWW skills. The observation record forms indicate that it might not have been the task itself that was difficult, but that there was a problem with the terminology used in the menu, as participants appeared to be processing the words before making a decision (even the successful participants). They also seemed to be unaware that there would be a throw named 'hip throw' on the hip throws page. Further interrogation of these issues would be required during the semi-structured interviews and the focus group discussion. Also given that task 4 required three steps to complete and task 5 required five steps, these two tasks would be swapped around in the second round of evaluation so that the easiest task is last.

Table 5.6: Task 5 results

		Task 5: Results	
		Task 5 Completed	
		Successfully	Unsuccessfully
		Count	Count
Status	Junior	1	1
	Senior	12	2
	Total	13	3
Role in Club	Learner	8	3
	Learner and Instructor	5	0
	Instructor	0	0
Computer Experience	Excellent	12	2
	Good	1	0
	Fair	0	1
	Bad	0	0
WWW Experience	Excellent	11	1
	Good	2	0
	Fair	0	0
	Bad	0	2

The semi-structured interview data discussed next was useful to uncover issues observed during the cognitive walk-through, as well to discuss more general topics about the CD-ROM.

5.8.2 Semi-structured interview

As mentioned previously the semi-structured interview was conducted directly after each cognitive walk-through. All participants who took part in the cognitive walk-through were interviewed.

The interviews were short in duration, lasting only a few minutes each, as they had to be conducted during face-to-face class training time so as not to inconvenience the participants. The interview forms contained targeted questions probing further information about the cognitive walk-through tasks, as well as about the usability, appeal, functionality, and effectiveness of the RAT CD-ROM. Each of these themes contained a few leading questions or hints if participants did not have anything to say and to ensure that all the areas of interest were covered. However, while these questions provided some structure in the interview, participants were free to talk about any aspect of the RAT CD-ROM and their use of it.

The interview data was gathered on a paper based form and then digitised and saved as Microsoft Word documents and then converted to Rich Text Format (RTF). These RTF documents were imported into the QSR NVivo qualitative analysis software and coded according to the themes mentioned above. Even though the information and comments were usually short and focused, several passes were made of this information, each time coding the information deeper and into a greater variety of themes, such as if any data relates to other areas of this evaluation.

The interview findings about each cognitive walk-through task will be covered next.

The tasks

None of the participants had anything to say about task 1, but participants have provided feedback on tasks 2 -5, each of which will be covered below.

Task 2

Much of the feedback about task 2 points to either a misreading of the task instructions, or the instructions were not clear. Participants seemed to have been expecting 'fitness

programmes list’ to be the exact wording in the link, whereas the word ‘list’ is a more generic method of referring to the fitness programmes of various ranks during face-to-face classes. This more generic method is used because each rank contains a different number of fitness programmes (i.e. lists) to complete and during each class there are practitioners of various ranks training at the same time. So the teacher might address all practitioners at the same time and ask them to refer to their specific fitness programmes list for their particular ranks. When the practitioner reads their syllabus a more active naming convention is used, e.g. for the second rank: “Complete two fitness programmes”. This task naming convention is used to provide specificity so that learners can read from the task name how many fitness programmes they are required to complete. The following comments illustrate some of the confusion expressed by participants:

- a. “Did fitness test.” – This participant clicked the test instead of the programmes.”
- b. “Maybe if I sat and did it properly. It wasn’t difficult.”
- c. “A bit confused. Had to work out what fitness programme list meant.”
- d. “Discrepancy in the name of the link.”
- e. “Discrepancy between the name of the link in task 2 and the name “fitness programmes list” in the observation tasks.”

Other participants had no problem with the task 2, but additional feedback was provided in the focus group about how to make the information easier to locate.

Task 3

As the cognitive walk-through data shows, task 3 was problematic for most participants. Even though the task was designed with the view that the participants would require some understanding of the structure of RAT, quite clearly the task was too difficult for beginner RAT practitioners. Several of the comments support the idea that the task was too difficult:

- f. “Too hard to find.”
- g. “It is too difficult to find.”
- h. “If I was following some information given to me it is hard to find.”
- i. “Wasn’t clearly marked.”

- j. “I didn’t know where to go.”

The task 3 comments below point to the notion that experienced RAT practitioners or practitioners who had read their syllabus grading requirements thoroughly would find the information. Alternatively, those who had not read their requirements would find the task difficult:

- k. “Didn’t understand that this rank means you must learn the first three junior ranks.”
- l. “Relying on knowledge that the person knows the ranks is Senior. Have a link called ‘Ranks’. You should have it there then.”
- m. “I distinguished the sequences from the syllabus. I knew I had to know the junior ranks, first rank in juniors. But I could have easily been confused, cos there were three junior belts. I had to read properly.”

Comment (l) is hinting at a solution, which is similarly supported by the following feedback:

- n. “It takes too long. You assume if it’s going to be under info for your belt, then it won’t be under another syllabus.”
- o. “You shouldn’t have to go to the Junior syllabus to see the sequences.”

Even though sequences are a syllabus requirement in the Junior RAT syllabus and not in the Senior RAT syllabus, Senior RAT practitioners are nevertheless implicitly required to learn the sequences because they are also required to learn the Junior RAT syllabus. For this reason it did not make design sense to duplicate the information and that is why the sequences were placed within the Junior RAT syllabus, as it was assumed that Senior RAT practitioners would look at the relevant Junior ranks in their entirety when required as they are part of the grading requirements anyway. As it turned out though, the sequences and the video clips for the sequences seemed to require a heavy learning load due to the complexity and were referred to often on the RAT CD-ROM and the long process involved to get to the sequences became an onerous task. A better balance between assumed knowledge and ease of use was required. The focus group provides further feedback about the task and a solution.

Task 4

The high success rate with task 4 would suggest that the task was easy enough for all users. However the following feedback suggests that there was some degree of uncertainty and thinking about the task (instruction) itself:

- p. “I had to think about it, but because I’ve used the CD I found it.”
- q. “Was wondering whether the movie was part of the previous question.”
- r. “Straight away I thought punching has a technique, but I knew it was in either one.” - This participant means that he could look in the techniques section or the drills section for punching.

Task 5

As mentioned above in the cognitive walk-through, task 5 was considered an easy task and yet three participants could not complete it successfully. The following feedback (provided both by the participants who could and could not complete the task successfully) points to the need for a better name for the photos folder, which seems to have caused the resulting difficulty with the task (i.e. ‘quick pic’ causes confusion):

- s. “Couldn’t find it. It wasn’t clearly marked.”
- t. “The Slideshows and Quick Pics seem to be similar. Maybe you should change the wording to ‘Photos’.”
- u. “Straight away I think that when I clicked on hip throw it would go straight there, cos I know a ‘pic’ is a ‘picture’. [He added the following after I prompted him to explain further] I’ve been working with computers for quite a while. I suppose it depends how computer literate you are.”
- v. “I couldn’t find the word for pictures.”

The following comments also hint that some level of knowledge RAT is required to complete the task, although this did not seem to influence whether participants completed the task successfully or not:

- w. “Minimal knowledge of hip throw and assumed the list of images was one

sequence...”

- x. “I didn’t know there were so many variations of hip throw.”

A number of comments were coded into themes. These comments are discussed next.

Themes

Each of the four main evaluation themes is discussed next, which includes the usability, appeal, functionality, and effectiveness of the RAT CD-ROM. Later in the chapter these themes are also evaluated from expert perspectives using a number of evaluation instruments and dimensions. These multiple perspectives, including learners, experts, and participant observer helps to provide a holistic picture making design decisions more well-thought out compared to a single evaluation perspective.

Usability

For the usability theme the participants were asked two leading questions: “Is there anything that frustrates you when using the RAT CD-ROM? Do you find the RAT CD-ROM easy to use? Explain.”

Generally participants found the RAT CD-ROM easy to use, but there were a number of frustrations including the difficulty experienced with task 3, a mismatch between the real rank names (as used in the tree menu) versus the way that the ranks are referred to in classes (i.e. first rank, second rank, etc.), becoming side-tracked due to the vastness of the resource, and incomplete areas of the CD-ROM. The following comments illustrate these frustrations:

- y. “Task 3 was frustrating, but the rest of the stuff is fine.”
- z. “It’s easy to use. You need to improve access to [the] sequence[s] for each rank.”
- aa. “Syllabi, each rank has a name, e.g. Joker-Spades. You always refer to first rank, second rank [in classes].”
- bb. “Sometimes I got side-tracked because of multiple links. The ‘coming soon’ messages can be frustrating.” – Referring to incomplete areas of the CD.

Overall the participants seem to be satisfied with the ease of use of the RAT CD-ROM and often volunteered information about the navigation and the way things are categorised. One of the comments supports the previous comment about the ranks being referred to differently in classes, because the learner counts the menu folders (rank names) to find the correct rank instead of identifying it by the folder name in the tree menu. Two of the comments support the design decision to use the Windows Explorer metaphor in the tree menu and this seems to have contributed to the usability. The following comments serve to illustrate these points:

- cc. “Usually easy to use. Usually you go through all the things that you have to do.”
- dd. “It is easy to use. The category names are useful.”
- ee. “Pretty easy to use. The syllabus content is easy to find. The first time I put the CD in I could find the syllabus. Even though I don’t know the name of the rank I just count from the top downwards.”
- ff. “I like the navigation. It is similar to Windows. I understand that from my experience.”
- gg. “Everything is pretty easy to find.”
- hh. “Easy to use. It relates to general computer ability.”

Appeal

The purpose of evaluating the appeal of the RAT CD-ROM was to elicit the kind of information mentioned in Reeves & Hedberg (2003, p. 179) such as the desirability or motivation of learners to use a learning resource. Reeves & Hedberg (2003, p. 179) claim that internal states derived from enjoying using a learning resource may support learning, because learners might be more alert or motivated which contributes to the effectiveness of the resource. It was decided to frame the leading question in simple terms with the view that further discussion or voluntary observations would lead to further information about the appeal of the RAT CD-ROM. The question asked was: “Is the CD-ROM website pleasant to look at, or does it look boring? Explain.”

The majority of responses reflect the feeling that the RAT CD-ROM has a pleasant appearance, or is satisfactory, but that the functionality is valued over its appearance and that its appeal becomes apparent once one explores the CD. Two participants felt that the

text makes the site look boring, but one of them felt that the RAT CD-ROM fulfilled its purpose excellently. The coherence that the RAT CD-ROM provides with its texts, menus and multimedia also seems to stimulate interest and motivate some learners to want to learn more. The following comments support these observations:

- ii. “To me there is nothing wrong with it whatsoever. If the background has too much on it, it becomes difficult to read. For example, some websites with dark backgrounds.”
- jj. “Pleasant.”
- kk. “It’s a bit of both. It says what it is. I don’t come to look at it for any other reason than it has something that I want; some information.”
- ll. “Considering what it’s about I don’t have a problem with it. You don’t need big pictures. Your main idea is to find information.”
- mm. “It’s okay. It has all the different kinds of media.”
- nn. “Very well laid out, easy. Well presented. I like listed look. Nice, clear.”
- oo. “Rather boring, but purpose wise, excellent. The text makes it look boring.”
- pp. “You need to explore before discovering its appeal. In the first look it seems to look like a basic text-based website.”
- qq. “Very pleasant. Interactive. For me, it caters for everyone. Everything is here on these things on the side here. [Referring to the tree menu] I love the way the RAT emblem (yellow) is incorporated into everything. The tree menu, etc.”
- rr. “When I’m bored I’ll go and look at it [the RAT CD-ROM] to learn something. When someone visits I’ll play the sparring videos. It is entertaining.”

Functionality

To address the overall functionality of the RAT CD-ROM participants were asked the following question: “Does the RAT CD-ROM work without errors? Explain.”

Although as participant observer I had noticed a few issues, such as typographic errors, incorrectly named links, a number of poor quality video clips, and missing information still to be developed, the participants found that overall the CD worked with very few errors. There were however a few problems identified and have been identified in other parts of

this study too. These included issues with the movie player, information and resources that have not been developed yet and one person reported that if he moved the play head on the movie player, it stalled his computer. The following comments illustrate these findings:

- ss. “It’s never given me any problems, except the time when I never had Windows Media Player 9.”
- tt. “On my machine if I move the play head on a movie it stalls.”
- uu. “Websites or texts that haven’t been developed yet [caused some degree of frustration].”

Before the second evaluation round work will need to be done to ensure that there are fewer typographic errors, fewer links that do not work, and that more of the missing information and media is included.

Effectiveness

This section of the interview was intended to elicit information about the effectiveness of the RAT CD-ROM for learning, but also to find out which of the resources are most useful and general information about the kinds of media used. Participants were asked the following set of questions to initiate discussion: “Have you learnt anything from using the RAT CD-ROM? Is it a useful resource? Which resources are most useful? Are the videos useful? Are the photos helpful? Are the texts helpful? Explain.”

Each of the questions will be discussed in turn, starting with “**Have you learnt anything from using the RAT CD-ROM?**”

A number of participants had only recently acquired the RAT CD-ROM, so said that they had not learnt anything from the CD yet, or that it was too soon to tell. The more experienced participants had already learnt much of the content before using the CD so could not claim that they had learnt the material from the CD. But the resource was useful for them to check if techniques were done correctly or to be used for teaching. There were a few participants who claimed that they had learnt a lot from the CD. Their comments suggest that it was physical skills they had learnt. This is useful evidence in favour of one of the key research questions of this study, i.e. Can RAT practitioners facilitate the learning of RAT martial arts knowledge, skills and attitudes (KSAs) in computer supported learning environments? It is the learning of the kinaesthetic skills that remained the most

pressing part of this question and is usually always the first concern people have when talking about learning martial arts online. The following are a few selected comments relating to this first question:

- vv. “I haven’t really learnt anything, but I have done it all before.”
- ww. “The movie clips have helped to check if drills and sequences are done correctly.”
- xx. “It helped me the most for the grading. It helped outline exactly what was required. Maybe I learned how to do different exercises.”
- yy. “Yes, better than having no training at all. It illustrates things better than a person, because you can go over and over something without frustrating the teacher. It can help demonstrations better than just spoken language.”
- zz. “Facilitates easier teaching, less stressful to teach.”
- aaa. “Starting to formulate how a syllabus for a martial art is structured.”
- bbb. “Yes I have learnt something, sequences, punching, kicking, knife numerado. Some things need explanation though.”
- ccc. “Yes, I learnt plenty of sequences for gradings.”

Even though the participants have claimed that they have learnt physical skills, such as sequences from the RAT CD-ROM, it does not necessarily imply that they have learnt the skills correctly or to an acceptable standard. This is useful feedback, but further evidence is required in the form grading assessments of the physical skills. The videos created by learners who took part in the RAT Online courses which were added after the first evaluation round provide this evidence. However in the context of the evaluation of the use of the RAT CD-ROM this evidence is discussed in the post grading interviews section.

Is the RAT CD-ROM a useful resource?

Given the unanimous positive response it might seem as though this question is somewhat contrived leading the interviewees too much. However useful feedback was provided beyond a simple ‘yes’ or ‘no’ answer, which indicates a value for the combination of media, but especially the video clips:

- ddd. “It is a valuable resource.”

- eee. “Yes, I learnt the syllabus.”
- fff. “I did the whole arm locking sequence by using video, by pause and play.”
- ggg. “Yes, it’s got everything that you need to know.”
- hhh. “Of course. The video and text combination is useful.”
- iii. “Yah, extremely useful, considering it has multimedia, movies and pictures.”
- jjj. “I’m lazy to read. It’s always better for me to see visual stuff than text. I prefer visualizing things. A picture paints a thousand words.”

Which resources are most useful?

The responses are mixed for the above question, but there is some evidence hinting that it is the combination of the media and resources built into the coherent structure of the RAT CD-ROM that is most useful rather than one medium on its own. However, as in elsewhere of this evaluation there seems to be a preference for the visual media, such as video clips and photos:

- kkk. “It is the combination of the media that is useful, e.g. movie and text. One is not more useful than the other.”
- lll. “The movies and the text are the most useful. It all mixes well together if you use every resource. I wouldn’t say one resource is better than another.”
- mmm. “The pictures and movies are most useful.”
- nnn. “The videos are the most useful. You actually see the technique in use.”
- ooo. “The movies are the most useful. Videos useful because when teaching to refresh your mind, quicker than reading.”
- ppp. “Pictures most useful and movies. Being able to see something physically demonstrated.”
- qqq. “The video clips are most useful. It’s easier to see something than to read it.”

The feedback for the final three questions is grouped together in one section below.

Are the videos useful? Are the photos helpful? Are the texts helpful?

A minimal number of interviewees had not viewed the photos or texts yet, but most interviewees thought that each of the media types were useful, except for one participant saying that the texts “Will be the last thing I look at.” He did not provide further information, but seemed to value the movie clips highly. He was also new to RAT and did not seem to understand that there is a syllabus with required learning tasks. He had only been exposed to the physical training up prior to the interview.

The participants provided additional information about the use and purpose of the three types of media. It has already been well-illustrated above that the video clips are useful by virtue of them being the ‘most useful’ media type on the RAT CD-ROM. Several examples were also provided about the uses of the video clips. For these reasons, the video clips will not be discussed further here.

Most people valued the videos over the photos, however some people prefer the clarity of the photos and one participant claimed that they help him to understand principles of the techniques of RAT.

The texts appear to fulfil their intended purpose of providing information about the syllabus for each rank, appropriate labelling of media, as well as a structure for the RAT CD-ROM binding all the information and media together into a usable format. The participant comments below support the points mentioned above:

- rrr. Photos: “Most useful, e.g. photos you can see exactly what a technique is.”
- sss. Photos: “Very useful, clearer than videos, e.g. hip throws. Helps to understand principles, especially exercise. It would help more if I had done the techniques before.”
- ttt. Photos: “Helpful. Not as good as the movies. There might be photos of something that there are no movies of.”
- uuu. Text: “The texts are helpful. They tell you your syllabus content.”
- vvv. Text: “You have to have them to know what photos, etc. are.”
- www. Text: “[Demonstrates his rank (2nd Rank)] “First thing I did was read the syllabus, so that you can know what to do. Don’t really look at it much

later on once I know what to do, unless it's something that needs confirmation later.”

xxx. Text: “Fairly useful, cos it tells me the names of the sequences.”

yyy. Text: “Helpful. The site would be disorganized without texts. We would be naming everything ourselves.”

zzz. Text: “Helpful. Otherwise you won't know what you're doing.”

Semi-structured interview conclusion

The participant feedback shed light on the difficulties experienced with the cognitive walk-through tasks which helped to formulate solutions for further development of the RAT CD-ROM. Although design decisions were only made after carrying out further evaluation, the feedback suggests possible changes to terminology for greater clarity and restructuring of information and links for improved navigation which should reduce the difficulty of the walk-through tasks.

The feedback provided about each of the themes showed that there were several usability frustrations, even though for the most part interviewees felt the CD-ROM was easy to use. Concurring with the above paragraph, work would be required to restructure information and links in order to improve navigation and usability. Furthermore, incomplete sections of the RAT CD-ROM need to be reduced to avoid frustration of users clicking links to find a ‘coming soon’ message.

There seems to be a general interest in using the RAT CD-ROM even outside of class times indicating that the resource is appealing and potentially even intrinsically motivating, however the visual design of the site was not considered to be particularly aesthetically pleasing, but functional and fulfils its purpose. It is this alignment with its purpose that seems to make the RAT CD-ROM an appealing resource to the RAT learners interviewed.

Participant feedback reflects the extensive measures taken to avoid errors in the system, however given the vastness of the resource and the minimal human resources available to develop the resource (i.e. one person) some errors are unavoidable. Work would be required to reduce these errors.

The evaluation of effectiveness showed that the RAT CD-ROM is fulfilling its intended design aims. The understanding gained from feedback about the main kinds of media used on the CD helps to know which areas to target for further development. Clearly the movie clips were highly valued and seemed to promote both the desire to learn more, as well as increase the range of learners' physical skills.

The feedback was also useful as an indicator that as a result of using the RAT CD-ROM participants gained in knowledge, skills and attitudes. Participants reported increased understanding of categories, learnt new knowledge and physical skills by using the movie clips, and seemed to value the RAT CD-ROM and demonstrate self-motivation and interest in RAT.

The focus group feedback, which is discussed next, provided additional useful information contributing to design changes.

5.8.3 Focus group

A focus group discussion was conducted with 10 RAT learners between 0-2 days after the cognitive walk-throughs and semi-structured interviews were completed while these tasks and the memory of the RAT CD-ROM would still be fresh in the participants' minds. The purpose of the focus group was to encourage discussion and elicit further information and suggestions regarding issues encountered during the cognitive walk-through tasks and the semi-structured interviews. The purpose was also to obtain further feedback on the RAT CD-ROM in general. The face-to-face focus group was followed up by an online focus group discussion, but only one participant provided feedback already covered in the face-to-face focus group, so the online focus group is not discussed in this evaluation.

The 10 participants were all Senior RAT members with a range of experience levels from beginner, to intermediate, to one advanced. A video camera was set up to record the session and everyone provided consent to use the material discussed for this research. Hand-written notes were also taken during the session, which was fortunate, as the video tape was damaged and got stuck inside the video recorder rendering the tape unusable. No further focus groups of this nature were conducted in the RAT Online project.

Even though the tape was damaged, some of the written feedback was useful to help make design decisions for the next development round.

Firstly, the cognitive walk-through task 2 (Go to the **fitness programmes list** for the **Senior RAT Jack-Spades** rank) was probed as it was considered a reasonably easy task, but even so four (25%) out of the 16 participants did not complete the task successfully. Participants in the focus group recommended that the link to the fitness programmes should be moved under the resources sections under fitness programmes, as this would be a logical location to find the resource. This is a valid suggestion, but the fitness programme in question was specific to a particular rank and is not one of the generic fitness programmes which are normally located in the resources section. Furthermore, if the link had to be moved, then part of the logical flow when reading the syllabus rank would be lost. **Design decision:** A combination of the suggestion made by participants, as well as keeping the original flow of the syllabus was implemented as a solution. The link to the fitness programme was kept within the context of the syllabus and the fitness programmes page was updated to include links to each of the fitness programmes specific to each of the ranks (e.g. sections were added to the Fitness Programmes page with the headings ‘Junior RAT’ and ‘Senior RAT’ and under each further headings and/or links to fitness programmes specific to each rank were added). This way, learners would be able to access the fitness programmes from various parts of the RAT CD-ROM instead of only through their rank main page.

Secondly, task 3 (Find the first **list of sequences** for the **Joker-Spades** rank) was discussed as a relatively large number of participants (12 out of 16) (75%) did not complete this task successfully. Clearly, given the poor cognitive walk-through results and the feedback provided in the semi-structured interview improvements were required. Participants suggested direct links from within the senior syllabus to the relevant sequences with the possibility of providing ‘bread crumb’ links for easier navigation. However, it was also discerned that some Senior RAT participants had never read their syllabus grading requirements which could be a partial explanation why they struggled to complete task 3 successfully. In order to know where the list of sequences is located for this task, participants needed to know that in the Senior RAT syllabus practitioners are required to learn the Junior RAT ranks as well, which is where the list of sequences is located. Only

Junior RAT practitioners are required to know sequences for their gradings. This issue may also beg the question of just how intrinsically motivating a resource such as the RAT CD-ROM is if some participants had not even read their syllabus requirements. It was evident through the discussion that there was appreciation of the video clips, so perhaps certain parts of such a resource are more motivating than others.

Design decision: While the Senior RAT practitioners are not really required to learn sequences, they are required to know the Junior RAT syllabus, where knowledge of sequences is a requirement. For this reason, it was decided that providing direct links would make it easier for practitioners to locate required information, as well as making it quicker to arrive at the target pages due to the reduced number of clicks.

Thirdly, task 5 (Open the large **photo** of the **Hip Throw**) was also considered an easy task and yet three out of 16 participants (18.8%) did not complete the task successfully. The feedback provided in the semi-structured interviews highlighted that there might be issues with the name of the “Quick Pics” folder in the tree menu. The discussion during the focus group confirmed this concern and a suggestion was made by participants to change the name to “Photos”. The idea behind the “Quick Pics” name was to signify that the photos are intended as a quick visual reference for categories of RAT techniques. The name “Photos” would lose this meaning and connotes a more generic meaning covering all types of photos on the RAT CD-ROM. This view was supported by the one online focus group discussion participant. However, “Quick Pics” was evidently not an easy to understand name for inexperienced computer users and represented the one-sided opinion of me as the developer of the RAT CD-ROM. One of the participants also suggested making the text labels under each image into links to open the larger images. Each small image (thumbnail) when clicked opens the larger version of the same image. There are already instructions at the top of the page explaining how to open the larger images, so this did not seem like a necessary suggestion to carry out.

Design decision: The name “Photo Reference” was chosen for the next development round, as it has the word ‘photo’ in the name and the word ‘reference’ carries the original intended meaning. The thumbnail link structure was left intact and text links were not added under each image because there are instructions in a visible location about how to open the large images. Furthermore, to make thousands of text links under each image was not deemed to provide a good benefit return versus the amount of work and time required to implement such a change.

Lastly, participants made a few suggestions for resources that would enhance the RAT CD-ROM. These include a glossary, the history of RAT, a search feature, including the Adobe Acrobat Reader software and techniques for resuscitating injured participants.

Design decision: Glossary and history pages were added before the next evaluation round, as well as a number of other resources, such as a link to the RAT website. A search feature was not implemented, as this requires a high level of manual coding to work effectively. However an effective search tool would be considered a necessity when the RAT CD-ROM is moved onto a live website using Web 2.0 technology. Adobe Acrobat was not added, as many computers already have the software installed and it is also easily obtainable.

The next section covers the three expert rating forms, starting with the user interface rating form, which provides expert insights into the functionality, usability, appeal, and effectiveness of the RAT CD-ROM.

5.8.4 User interface rating

Three user interface experts participated in this evaluation round. All three returned completed forms with two of the experts providing minimal written feedback in addition to the ratings. One of the experts did not provide a rating for the anticipation of user needs dimension, because she felt that she could not respond to this dimension as she was not a martial arts person. While this dimension can be legitimately evaluated by a user interface expert as indeed it was by the other two experts, it was decided that it might be more appropriate for martial arts experts to evaluate this dimension instead, as they might know better what kinds of resources would benefit a martial arts learner. Thus this dimension was moved to the content expert evaluation form in the second evaluation round. Overall the result was satisfactory with most of the ratings falling on or near to the development goals or the expected ratings (Fig. 5.9).

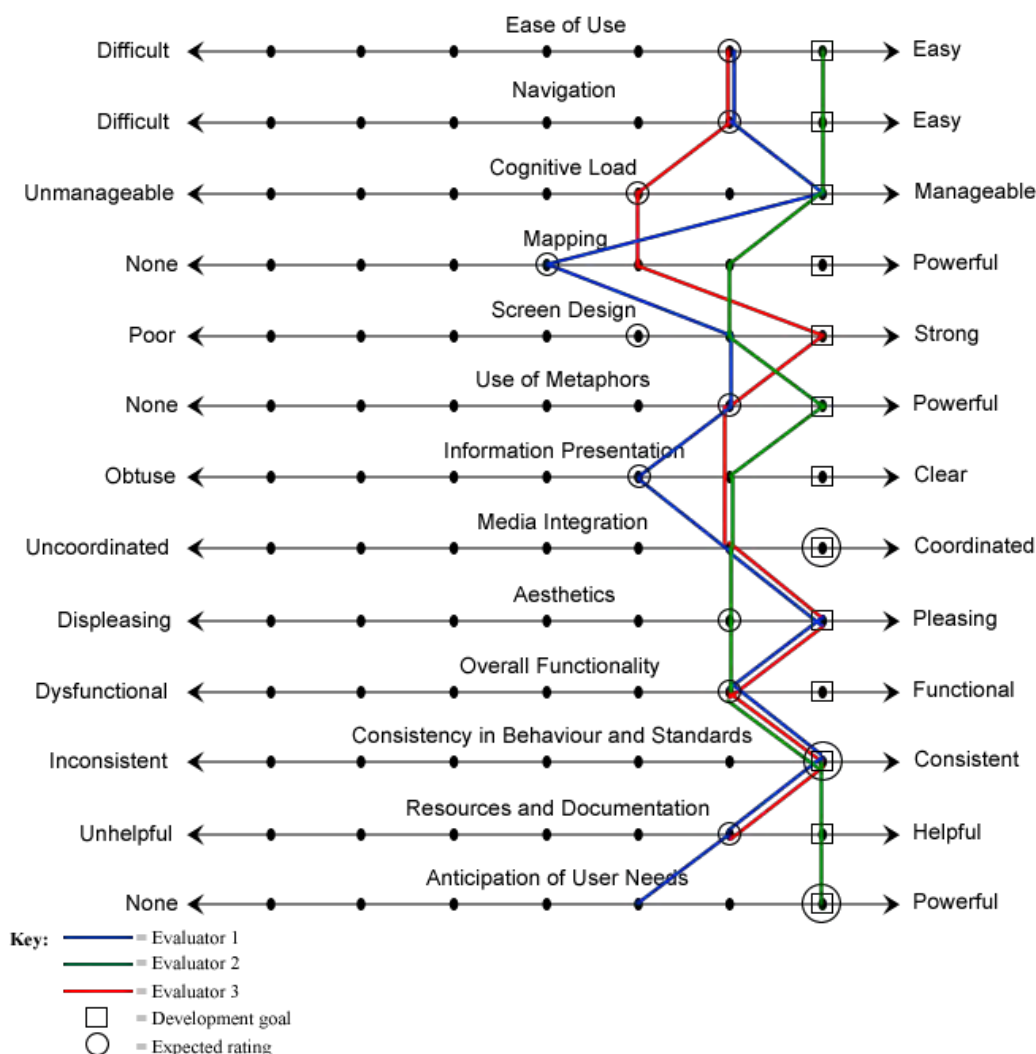


Fig. 5.9: User interface rating form – round 1

The expert user interface form used in conjunction with an evaluation involving the users of the RAT CD-ROM is useful because it sheds light on issues identified by experts, as well as issues experienced by learners, such as problems finding resources within the RAT CD-ROM. For example, during the cognitive walk-through conducted with learners, specific navigation issues were identified. This might have also been pointing to more general ease of use and navigation problems, which could be revealed during the expert review. As such the following dimensions were primary areas of interest in the user interface expert evaluation: (1) ease of use, and (2) navigation. Other evaluation dimensions that were on or close to the expected ratings, but could improve with closer ratings to the development goals include: (3) cognitive load, (4) mapping, (5) information presentation and (6) media integration.

Ease of use

As the user interface rating form shows, the ease of use dimension was rated highly, indicating that generally the RAT CD-ROM is intuitive (Fig. 5.9). However, the high level review conducted by the experts is in conflict with the highly specific tasks required of learners during the cognitive walk-through. Furthermore, ease of use in the RAT CD-ROM is deeply interconnected with the navigation of the resource, as illustrated by one of the reviewer's comments:

aaaa. "Nice menu structure on left – easy to operate."

All dimensions on the rating form contribute to overall ease of use, but information presentation and consistency in behaviour and standards are of significant importance, as instructions and wording should not be misleading and media and signifiers such as icons should work and be presented consistently so that users know what to expect when using them. For example, when learners see a link and icon representing a movie clip, they should be able to safely assume that every time they click such a link a movie clip will open. And the link should open in the same way each time, e.g. in a new window. The expert rating for ease of use is satisfactory and no direct design decisions were executed. However, there would be changes made relating to other dimensions such as navigation and information presentation and it would be interesting to see if these changes might have some effect on the ratings for ease of use shifting closer to the development goals in the next evaluation round.

Navigation

The navigation system of the RAT CD-ROM is an integral part of its usability, in particular the left hand tree menu. The tree menu contains the high level links to areas of the syllabus, such as each of the ranks and the numerous resources. The tree menu is complemented by a network of hyperlinks on the web pages, as well as a top menu area. In order for the RAT CD-ROM to be easy enough for learners to use and find relevant information the navigation system must be clear and intuitive. The expert rating was high for navigation, the same as ease of use, indicating that at a high level the navigation system works well. One of the expert's comments further supports this satisfactory rating:

- bbbb. “Menu structure on the left is clearly visible – tells user exactly where in the site they are.”

The high overall rating indicates that the problems with certain navigation tasks in the cognitive walk-through tasks might exist at a more specific task level.

Design decision: Implement changes suggested by learners during the semi-structured interviews and focus group discussion to address specific issues.

Cognitive load

The RAT CD-ROM contains a significant amount of resources and information. The resources and information on the RAT CD-ROM, if not appropriately structured, has the potential to cause the learner to become lost within the system or lose focus on tasks, therefore adding to the cognitive load of the learner and making the resource difficult to use. Thus it was important to ensure that the resources and information were integrated with an efficient navigation system and that content was grouped into relevant and manageable logical sections. For example, each rank on the syllabus has its own section. Within each rank, the various main tasks were further divided into separate pages. The learner would be able to ‘drill down’ to this information in a logical manner through the explicit display of links on the pages and focus on each main task or related groups of tasks. Two of the experts rated cognitive load at the ‘manageable’ extreme and on the development goal, however the other expert rated this dimension on the expected rating, which is three rating positions away from the development goal. While the rating is satisfactory, there is room for an improved rating as is demonstrated by one of the expert’s ratings.

Design decision: Implement content structure and navigation changes suggested during semi-structured interviews and the focus group with learners.

Mapping

On the mapping dimension the RAT CD-ROM is designed as an open content learning resource. Rather than forcing the learner through a particular path, the learner should be able to navigate to the resources that they need from any point in the system. This openness is an important feature of the CD-ROM, as there are learners of various ranks who need to use different resources and therefore should not be forced through a certain path each time they need to access a specific rank or resource. However, as mentioned

above, due to the openness and vastness of the RAT CD-ROM there is the potential for users to become lost within the system. A number of visual cues were used to provide guidance to users about their current 'location' within the RAT CD-ROM. Firstly, hyperlinks are coloured in blue to show that they are clickable items. When users hover their mouse cursors over a link, the link turns red and becomes underlined, showing that the link is selected. Importantly, once a link to another page has been clicked it turns purple indicating that the page or resource associated with the link has been viewed. When learners select a task from one of the main pages of a rank a sub-menu is activated at the top of the page showing links to each of the other tasks within that rank. This allows navigation from within a rank to each of the tasks. The main menu on the left-hand side is a Javascript tree menu and looks much like the folder structure in Microsoft Windows Explorer. The tree menu contains images of folders, sub-folders and links. A plus sign next to a folder indicates that the item is not currently selected. A minus sign indicates that the item is currently selected and the folder is open. When users hover their mouse cursors over the links within folders, the links are underlined. If users click the links they remain underlined indicating that the item has been viewed.

A considerable effort went into developing powerful mapping capability on the RAT CD-ROM, which is reflected in a better than average rating, albeit closer to the expected rating rather than to the development goal. The following two expert comments support the above average results of this effort.

cccc. "The design is clear and clean so I think [it] keeps a good spatial sense."

dddd. "Once again, good use of menu structure and appropriate use of link display, shows links as underlined when they have been viewed."

Even though significant work went into developing useful visual cues for users, the expected rating was placed around the middle of the scale, because it was felt the RAT CD-ROM mapping capability could have been improved by using *bread crumbs*. *Bread crumbs* in website design refers to a group of links at the top of a web page showing the hierarchical structure of a specific link within a website. In other words, it shows the category that a link belongs to. For example, a bread crumb structure on the RAT CD-ROM for the 'punches' technique section might look something like this: Home > Resources > Technique Database > Strikes > Punches.

Design decision: The use of bread crumbs was considered for the next iteration of development, but it was felt that the number of visual cues and the tree menu was sufficient to provide satisfactory mapping. Furthermore the tree menu already shows the hierarchical structure of links and pages and their parent categories. Due to the static nature of the HTML pages, it was decided that the work invested in manually coding links for each of the hundreds of pages within the site would not be worth the minimal additional value to learners. This could be considered for a future incarnation of the CD-ROM, a time when it can run on a more dynamic platform, such as a database driven website where the bread crumbs can be automatically generated by the system.

Information presentation

The information presentation dimension was rated in between the expected rating and the development goal by two of the reviewers and on the expected rating by the other reviewer. While every effort went into providing a clear and easy to read resource, the resource is large containing numerous references to martial arts techniques and principles. For these, minimal text was used and more emphasis was placed on the media, such as movie clips and images to provide the clarity about the texts. If full textual explanations were used the resource has the potential to become unwieldy. For this reason, full textual explanations were avoided where appropriate in favour of the combined use of media for greater effectiveness. Given this decision, it was considered that the information might not be as clear to all users as it could be with better textual explanations. Therefore the expected rating was placed three points away from the development goal. It was also expected that changes to other parts of the RAT CD-ROM, such as improved navigation, cognitive load and including additional information about RAT suggested by learners in the focus group and semi-structured interviews might enhance the information presentation dimension. This link between navigation, cognitive load and information presentation is supported by one of the reviewer's comments.

eeee. "The course material is always laid out in a very logical, easy-to-follow flow. There is a lot of information to be shown, but it is appropriately chunked and logically displayed, making it more accessible to users."

Design decision: Implement navigation and content structure changes, include additional information and work on reducing typing errors and improve language where possible for better readability.

Media integration

The media integration dimension is a fundamental component of the RAT CD-ROM, as the use of media such as movie clips, animations and images was thought to have the potential to improve the effectiveness of the standard text based syllabus. The use of media is one of the main reasons why this part of the RAT Online project was undertaken in the first place. For these reasons, a significant amount of development time was invested in providing appropriate media types at appropriate locations. In other words, when a technique or martial arts principle was referred to, a link to a media resource was provided below the reference with an associated icon to signify the type of media used. Media opens in a new window so that the learner does not become lost in the system. For example, when clicking a link to a movie clip, the movie opens in a new movie player window. When the learner closes the movie clip, the page they were originally looking at will still be open. This idea was extended to images too, but slightly modified by providing smaller images (thumbnails) on the pages. Learners can click the images to view larger alternatives in a new window. In addition to embedding links to media within the syllabus and course pages, a resources section was created, which was further categorised into sections such as ‘movies’, ‘quick pics’, ‘mind maps’, etc. Within each main category further sub-categories were created. Each of the sub-categories contained links to pages containing links to media items. The most work was done on movie clips and photos (quick pics). The resources section was created so that learners could have an alternative means of accessing the media items, rather than only through the syllabus content and course pages. For example, if the resources section was not created and when reference was made to a front kick in the third rank and never again, then when a learner wants to view how to perform the front kick they would need to know which rank contains that reference, which would be an unreasonable expectation. The resources section contained links to techniques and principles without reference to where they are placed within the syllabus and courses. This was expected to increase the usefulness of the RAT CD-ROM, as learners might want to refer to techniques out of the context of the syllabus and courses.

One of the expert comments reflects that the development effort was headed in the right direction.

ffff. “Media is integrated into information and links to appropriate videos are placed in the text. I also like the way that the videos which are referred to are kept together in an archive repository.”

Given the effort involved in setting up the many hundreds of links to media, the expected rating and the development goal were placed at the extreme end of the dimension, that is, at the ‘coordinated’ pole. Despite the effort and the positive expert comment all experts rated media integration one rating point away from the development goal. This is a good result, probably not worth further investigation, but noted that there is still room for improvement.

Design decision: Implement content structure and navigation changes suggested during the focus group and semi-structured interviews, as well as increase the number of useful media items, especially video clips. This would include providing more links to media items in line with texts in the syllabus and courses, as well as increase the number of categories and links within the resources section.

In the next section, the teaching evaluation form results are explored, which provides insights into the effectiveness of the RAT CD-ROM.

5.8.5 Teaching evaluation

The same three experts who rated the user interface returned completed teaching evaluation rating forms with minimal written feedback in this round. More feedback is provided after the second evaluation round.

Overall the patterns produced on the visual rating scale (Fig. 5.10) are irregular and many of the dimensions are rated away from the development goals with a number of them closer to the expected ratings. In this section the following areas of interest are discussed: (1) pedagogical philosophy, (2) learning theory, (3) goal orientation, (4) source of

motivation, (5) teacher role, (6) metacognitive support, (7) collaborative learning, and (8) cultural sensitivity.

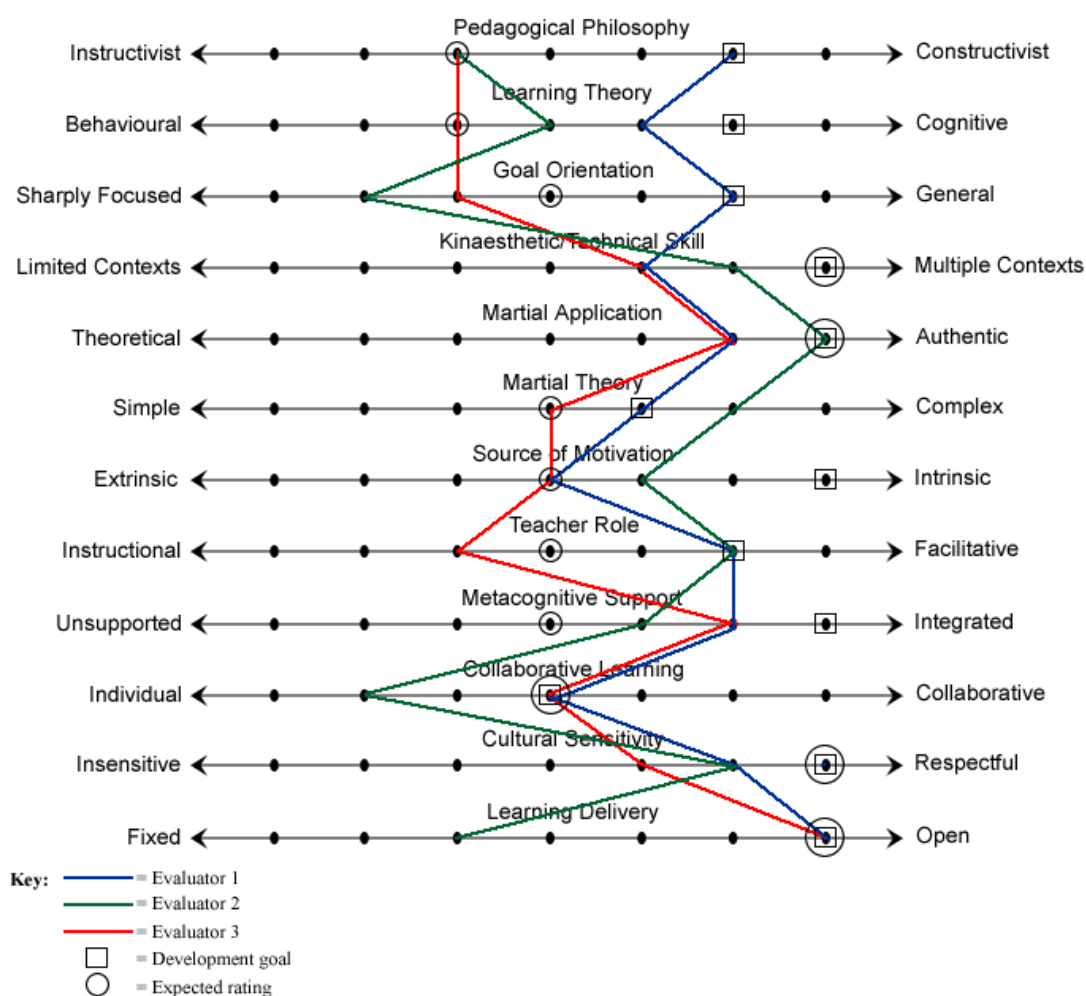


Fig. 5.10: Teaching evaluation form – round 1

Pedagogical philosophy

The RAT CD-ROM was designed as an information resource providing a digital record of the learners' syllabus and tasks for learning in real life face-to-face RAT classes or for self-practise. Collaborative learning activities take place in the RAT face-to-face classes and in the RAT Online courses. On this basis it was expected that the expert ratings on the pedagogical philosophy dimension might be closer towards the 'instructivist' end of the scale, as the syllabus texts prescribe for learners what they need to complete for each rank. This expected rating is reflected by two of the expert reviews which both 'sit' closer to the instructivist end of the scale than the constructivist end. There is a blend of instructivist and constructivist learning tasks on the RAT CD-ROM, but it was envisaged that over time

the RAT CD-ROM would become more constructivist in nature with the addition of learner generated material.

Design decision: Increase the amount of learner generated feedback resulting from RAT Online courses and add the content to the RAT CD-ROM.

Learning theory

The moderately behavioural expert rating on the learning theory dimension is aligned with the moderately instructivist rating on the pedagogical dimension. This is also close to the expected rating for learning theory, because the road to mastery of many martial arts techniques and principles is through repeated practise and drills typical of instruction. However, the development of cognitive skills in the learning theory dimension is just as important, as this pole is what facilitates the deep learning, understanding, and development of RAT techniques, principles, and strategies. While it is preferred to have a rating closer to the ‘cognitive’ pole, the review is satisfactory because all the experts observed that the RAT CD-ROM contains elements from both poles. One of the reviewers commented that: “All the drills and instructions suggest more behavioural and cognitive.” This feedback supports the rating for this dimension. This rating also supports in part the underlying cognitive flexibility theory approach taken when developing the RAT syllabus, in that some learning is better suited to structured tasks and others are more suited to ill-structured tasks.

Design decision: The same changes were implemented as for pedagogical philosophy, as well toning the language down to be less ‘commanding’, as a result of the rating for cultural sensitivity.

Goal orientation

The development goal for the goal orientation dimension was more towards the ‘multiple contexts’ extreme, however there is a balance between sharply focused and general types of tasks on the RAT CD-ROM. At the beginner ranks there is greater reliance on focused tasks, while in later ranks more emphasis is placed on general tasks. This is once again in line with cognitive flexibility theory where structured learning is thought to be better in early learning, while more ill-structured learning tasks are better suited to expert learning. Due to the balance between sharply focused and general tasks the expected rating was placed in the centre of the scale. Two of the experts rated the dimension closer to the ‘sharply focused’ pole, while the third expert rated the dimension on the development goal.

Design decision: There was no intention to change the syllabus at this stage of development, but it is hoped that the addition of learner generated material from the RAT Online courses would highlight the general nature of tasks on the RAT CD-ROM and shift the rating towards the development goal.

Source of motivation

The expert rating for source of motivation was far off the development goal with two ratings being on the expected rating and the third rating one point away from the expected rating and closer to the development goal. While there are ambitious development goals for this dimension, it was known from the outset that they will be difficult to achieve, as intrinsic motivation is very much a personal attribute developed in each learner. However, the intention was to make the RAT CD-ROM as useful as possible so that it can support those learners who were motivated in their training, as well as promote motivation to those learners who were less motivated. The difficulty in measuring this dimension is substantiated by one of the reviewer's comments: "Both. But by extrinsic motivators? E.g. media" She means that even the media on the CD-ROM can be viewed as being an external motivator and does not necessarily make the resource intrinsically motivating. If this is indeed the case, then it would still be beneficial for learners if there was a sufficient amount of media of an acceptable quality and usefulness on the RAT CD-ROM to motivate learners to use the resource.

Design decision: Include a greater variety of resources and media, especially video clips.

Teacher role

Teacher role is another of the difficult dimensions to rate, as the RAT CD-ROM is a resource and contains no teacher/facilitator interactions with learners for the experts to observe. However, the purpose of requesting experts to rate this dimension was to ascertain how the teacher role in the learning tasks are represented and perceived (i.e., in the texts). A desirable development goal would be to advance towards the 'facilitative' pole, but it was more realistically expected that the rating might be more towards the centre of the scale. The rating was better than satisfactory, as two of the experts provided a rating on the development goal, while the third was one point away from the expected rating, closer to the 'instructional' pole.

Design decision: No design actions were taken, but it was expected that including the learner generated content from the RAT Online courses, as well as the increase in the

media and more complete resources might improve the rating in the second evaluation round. The facilitative teacher role was expected to become more evident if experts could actually see material produced by learners.

Metacognitive support

Metacognitive support was another of the dimensions that came out better than expected in the evaluation. It was not clear at this early stage whether the names and category structure of the tree menu items and the various tasks embedded in the syllabus requiring learners to use various learning methods would be prominent enough to experts conducting an overall evaluation of the RAT CD-ROM. There was the risk that metacognitive support might only become more obvious through close and detailed evaluation of every rank and course, so it was encouraging to find that all the experts rated this dimension between the expected rating and the development goal. One expert provided a rating three points away from the development goal of ‘integrated’ and the other two experts rated this dimension one point away from the development goal.

Design decision: It was expected that changes to the navigation and naming of folder categories, as well as the inclusion of more learner generated content from the RAT Online courses might improve the rating.

Collaborative learning

Another of the dimensions that received a favourable rating was the collaborative learning dimension. No collaborative learning can actually take place on the RAT CD-ROM, as there are no software tools available on the CD to engage in communication for collaboration. However, the tasks in the syllabus require learners to collaborate with each other and it was hoped that the representation of these tasks would reflect the collaborative nature of the RAT CD-ROM. For the above reasons, the development goal for this dimension could not be placed at the fully ‘collaborative’ extreme of the dimension and was placed in the middle instead. This is the same location as the expected rating. Two experts rated the dimension right on the development goal, while the remaining third expert rated the dimension two points from the development goal towards the ‘individual’ extreme. It would be an ideal goal to aim for a rating of fully ‘collaborative’, however it is not a realistic expectation given the static nature of the technology used on the RAT CD-ROM.

Design decision: Although the rating for collaborative learning is already satisfactory, it was expected that the addition of learner generated content from the RAT Online courses might improve the rating slightly.

Cultural sensitivity

The cultural sensitivity dimension was rated slightly poorer than expected. The expected rating and the development goal for this dimension were both on the ‘respectful’ end of the scale. Two experts rated this dimension one point away from the development goal and the third expert three points away from the development goal. One of the experts commented that: “The ‘shoulds’ concern me – alien to my understanding of my own learning.” This comment provides an insight to the problem and a possible solution and design decision.

Design decision: Change the language of instructions on the RAT CD-ROM to be less direct.

The evaluation also revealed two issues with the rating form itself.

A comment by one of the experts indicating that she did not feel suitably qualified to rate one of the dimensions on the user interface form because she was not a martial arts expert prompted more thought around the appropriateness of the evaluation dimensions on the teaching evaluation form too. The dimensions of concern include: kinaesthetic/technical skill, martial application, and martial theory. It was felt that these three dimensions might also be better evaluated by a martial arts expert and were therefore moved to the content evaluation rating form in round 2.

Two of the experts felt that some of the dimensions were difficult to rate on the evaluation form, as the dimensions had elements from both opposing poles. For example, on pedagogical philosophy there was a presence of both instruction and construction. One reviewer proposed that a dual axis (i.e. x and y axes) rating form with four quadrants be used, similar to that used by Cronjé (2006). This idea was considered for its potential to provide a richer and more varied data source; however each dimension would then require its own graph and visual representation. This would mean that one would lose the powerful visual patterns produced that include all teaching evaluation dimensions in one diagram. The rating scale diagrams offer practical potential in the real world for time poor e-learning project managers and developers, as they can gain a quick and rich sense of a learning

environment or resource at a glance, rather than reading conventional and lengthy reports. The power and potential of the tool as used in this project was valued too highly to lose. Therefore, it was decided to continue using the rating forms, but to modify them to support ratings for dimensions that might include elements of both poles. For these dimensions, the term ‘integrated’ (or some other word appropriate to the dimension in question) was added in the centre of the scales, implying that a rating in the middle would contain equal proportions from both the poles. This change was implemented in the second evaluation round.

The content expert evaluation is discussed next, adding to an understanding of the appeal and the effectiveness of the RAT CD-ROM.

5.8.6 Content expert evaluation

The content expert evaluation form was given to five martial arts experts. Three experts returned completed evaluation forms; one did not complete the form, while the remaining expert felt uncomfortable completing the form with so little experience using the RAT CD-ROM and submitted written feedback instead. He said that he required more time to use the CD-ROM in this evaluation round, however he completed an evaluation form in the second evaluation round. He also provided a voluntary overall evaluation of the content, saying that: “Your RAT syllabus seems very comprehensive, as it complies with the criteria for a ‘system’ of martial [art] (as it covers both empty hand and weapons).”

The overall written feedback provided indicates that the RAT syllabus is effectively constructed and meets the quality criteria required of a martial art. Furthermore, the rating scale below shows that the development goals, the expected ratings and the evaluators’ ratings of many of the content evaluation dimensions are fairly close (Fig. 5.11).

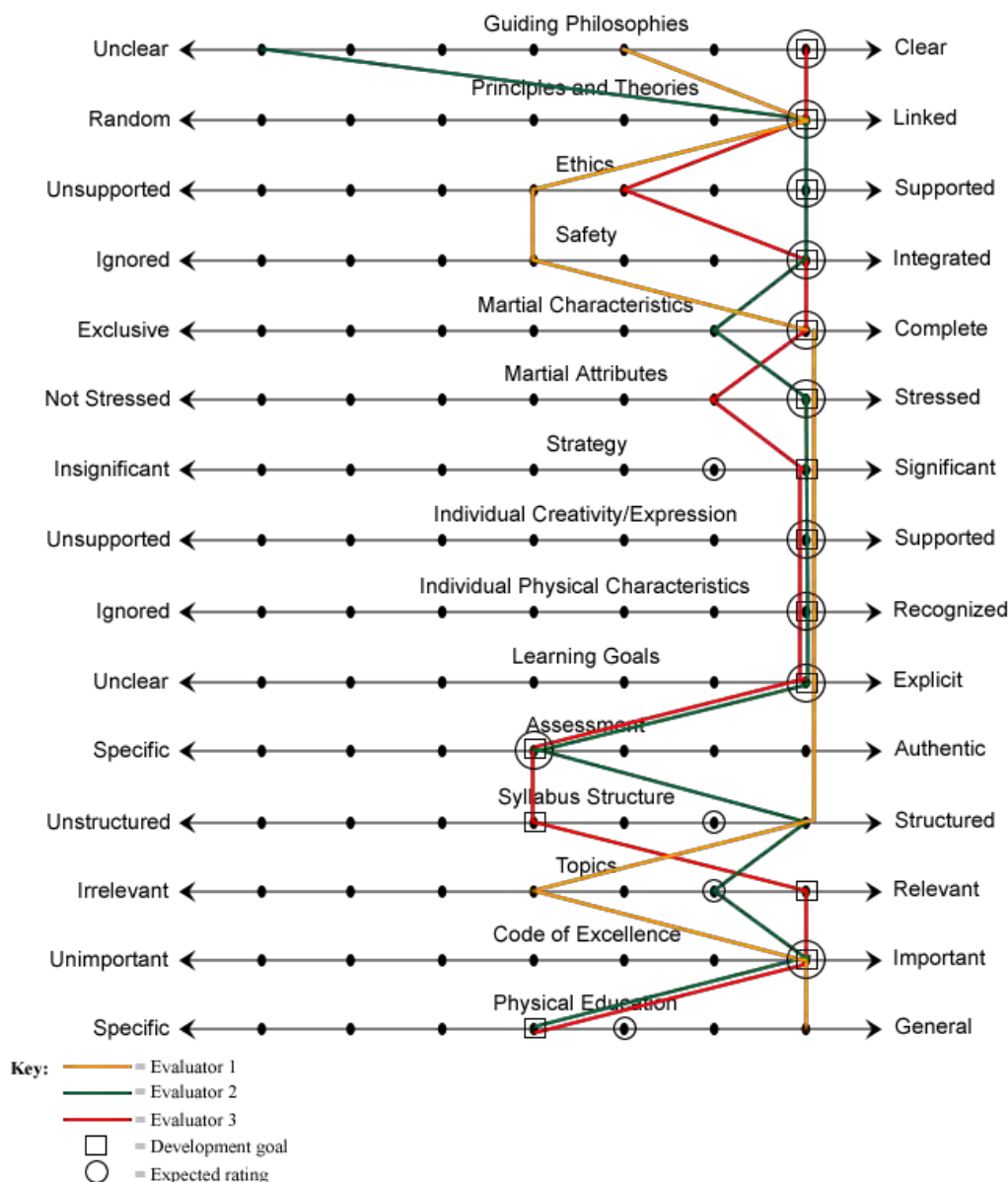


Fig. 5.11: Content expert evaluation form – round 1

For the most part the close proximity of the expert evaluations to the development goals shows that the content on the RAT CD-ROM meets its intended quality criteria along most dimensions of the evaluation. There are however areas for improvement, which include: (1) guiding principles, (2) ethics, (3) safety, (4) syllabus structure, and (5) topics.

Guiding principles

Only one of the reviewers rated the guiding principles dimension the same as the development goal for this dimension. It was expected that all the reviewers would rate the guiding principles dimension at the extreme end of the 'clear' pole, as the syllabus texts and activities contain broad learning aims such as gaining an understanding of the theory

of RAT and developing persistence and determination. There are a number of learning activities based on the guiding principles, for example the compulsory course devoted entirely to the development of persistence and determination. These are key guiding principles of RAT amongst a number of others and a significant portion of the RAT syllabus is devoted to developing these attributes. The reviewer who provided the written feedback without a rating commented that: “From the content alone, it is difficult to evaluate this, since students need a living example!” This is a valuable comment in the context of traditional martial arts teaching and learning, as the journey from beginner to mastery takes many years and is associated with much more than physical skills alone. Additionally, perhaps that just because the guiding principles are written in the syllabus it does not imply that people will value the content as much as is intended. Furthermore, because the RAT CD-ROM is such a vast resource with content relating to the guiding principles existing in disparate areas of the syllabus, it was perhaps an unreasonable expectation for evaluators to be able to rate this dimension accurately given the time frame to complete the evaluation. Perhaps a longer evaluation period was required to provide enough time to read the entire syllabus.

Design decision: It was decided that access to the guiding principles information needed to be made more explicit on the RAT CD-ROM. A page devoted to the guiding principles of RAT was created and a link to the page was created in the main top menu for maximum prominence for the second round of evaluation.

Ethics

The development goal and expected rating for ethics was on the ‘supported’ extreme of the dimension, however two of the evaluators’ ratings were closer to the middle of the scale indicating that ethics is partially unsupported or not supported quite as much as was intended in the design. The lower rating might also be because the information about ethics is not clear or prominent enough. In addition two of the evaluators suggested that this dimension is taught by example only:

gggg. “Again, this can only be taught by a competent instructor, leading by example!”

hhhh. “Ethics are taught by the instructor in interaction with the student and by example.”

Even though the RAT syllabus is designed in such a way that learners are made aware of ethics for their training and use of martial arts, the comments show that martial artists may value a living example more than merely having information about it available in the syllabus. However the purpose of the evaluation was to evaluate whether the information and activities relating to ethics were explicit enough on the RAT CD-ROM indicating a value for this dimension, not whether it requires an instructor who can lead by example. Despite the purpose of the evaluation being what it was, the high value placed on living examples points to the possibility that some of these dimensions might be better rated within a learning environment involving the actual collaboration of groups of people such as in the RAT Online courses, rather than from CD-ROM resource alone.

Design decision: A page was created about ethics and a link in the top menu was also created to make information about RAT and ethics more explicit.

Safety

Although two of the reviewers rated the RAT syllabus as integrating safety into the training, one of them provided a rating that was closer to the middle. Given the inherent risks involved in training RAT, safety is a crucial element of the learning and therefore it was worth making changes to make the information about safety more explicit as a result of the one expert's unsatisfactory rating.

Design decision: A page about safety in training and outside training was created and a link in the top menu was created so that users have easy and more direct access to the information.

Syllabus structure

The RAT syllabus is both structured and unstructured. It is structured in the sense that every rank has a number of requirements clearly listed which gives the syllabus a structured appearance. However when examining the nature of the tasks in the syllabus, it follows the suggestions provided in cognitive flexibility theory (Spiro et al., 1992a). That is, that structured learning tasks at earlier levels of learning are effective, but as the learner becomes more expert or knowledgeable the learning tasks are more beneficial when more unstructured. The syllabus follows this approach by making tasks progressively more unstructured as learners advance in rank. For example, in the earlier ranks learners might be provided with specific techniques to practise, whereas in the final rank, learners are required to design a new syllabus. The development goal for this dimension would be

placed around the middle to reflect the structure of the earlier ranks and the lack of structure of later ranks. However, one needs to appreciate the time given to experts to review the RAT CD-ROM. It would be very difficult to work carefully through each rank in such a short time and deduce that the syllabus is mostly unstructured given the inherent ‘structure’ of the menu and comprehensively documented syllabus making it seem highly structured. For this reason the expected rating was in between the ‘structured’ pole and the development goal, but closer to the ‘structured’ pole. The rating shows that experts were divided in their opinions with two of them giving a rating of fully structured and one sitting nearer the middle right on the development goal. This dimension might have been better evaluated along a graph depicting each rank and its level of structure. However this would detract from the visual appeal and power of the rating scale diagram showing all dimensions at once and it would have been too much to expect the experts to evaluate each rank. In these types of evaluations one needs to keep in mind that people are busy and if one asks too much of them, then one can easily end up with no evaluation at all.

Design decision: No direct change was made to the syllabus to highlight how structured or unstructured the syllabus is, however changes to how the syllabus is laid out on the RAT CD-ROM were made as a result of findings in the cognitive walk-through, which could potentially have an effect on the result in the next evaluation round.

Topics

The development goal for the topics dimension was at the relevant extreme and the expected rating was close with only one rating point away from the relevant extreme, supporting a few of the learner comments made earlier. However the ratings reveal that the experts differ in their opinions about the relevance of the learning topics on the RAT CD-ROM. One of the experts rated the topics the same as the development goals. Another gave a rating the same as the expected rating, while the third reviewer gave a rating closer to the middle of the scale and thus further away from the development goal. RAT training is intended to be adaptable to different situations and contexts and the syllabus tasks are designed to promote this kind of adaptability. The varying ratings for this dimension reflect that this development goal is not explicit enough. It could also be that this dimension is open to greater interpretation than anticipated as is reflected in the comment below:

- iiii. “Topic relevance I think is related to what an individual wants out of a

martial art, someone primarily interested in self defense or entering an NHB [no holds barred] tournament would probably be wasting their time learning nunchakus [ancient and traditional Okinawan weapon] and elaborate forms, whereas someone else who wants a unique form of exercise and the satisfaction of mastering a “martial” art learning the above would be relevant to them.”

Design decision: No direct change was made to the RAT CD-ROM along the topics dimension, but it was decided that the reviewers’ perceptions of this dimension might change in the second evaluation round as a result of greater familiarity with the resource.

The post grading interview is discussed next.

5.8.7 Post grading interview

An informal post grading interview was conducted when the opportunity arose. The post grading interview is an interview conducted with a RAT practitioner directly after the practitioner has completed an assessment grading. The purpose of the post grading interview was to determine whether the RAT CD-ROM was an effective learning resource for the RAT learners while preparing for their gradings (assessments). Grading assessments occur rather infrequently in RAT and only one interview was conducted during the first round of evaluation. Three Senior RAT practitioners were interviewed directly after two of them had completed their grading assessment. The third participant was available as an observer-instructor.

The interview was semi-structured and consisted of five broad questions around the usefulness of the RAT CD-ROM, suggestions how it can be improved, suggestions about additions to the content and media, and about the usefulness of the syllabus.

The responses to question 1 (“Has the RAT CD-ROM helped you at all in your preparation for your grading?”) and 2 (“If yes to above, explain how.”) provided the most useful information and served to corroborate findings in the earlier semi-structured interviews and expert evaluations that the RAT CD-ROM is a useful learning resource, but through the

participants' suggestions there is room for it to improve on the effectiveness dimension. The participants' responses also highlighted a value for the video clips. This supports the decision to include more video clips, as well as a greater variety of clips. Both participants answered affirmatively to question 1. They then went on to provide the following comments for question 2 where they had to explain how the RAT CD-ROM helped them:

- jjjj. "Moving into fighting stance movie – used to correct problems. In fact you had to refer to the CD. Helped with throws. The rules were useful. You actually really get into the CD when you grade. You refer to it more."
- kkkk. "At first it helped a lot. Yes. And I used it a lot closer to the time [of the grading]. It helped with footwork. Cos in class there are so many people, sometimes it is better than an instructor, because you can pause and fast forward."

The responses to question 3 and 4: "How could the CD-ROM have been improved to help you?" and "What could be useful additions (e.g. media, texts, etc.)?" both referred to movie clips again:

- llll. "For critical techniques, the camera angle needs to be different."
- mmmm. "Maybe a little bit of voice could help. For critical techniques, anything important."

In the last comment above the interviewee was referring to the idea of adding spoken explanations for techniques in the video clips, especially for important techniques or principles. These clips (instructional videos) are distinguished from normal movie clips which contain no spoken explanations.

The one response to question 5: "Is the syllabus useful in your training?" confirmed that the RAT syllabus is useful in training and in life more generally, but when questioned further, the participants were not able to add any further explanation for this comment.

The observer-instructor also suggested that folders should be added in the left hand tree menu for each rank and should be renamed to be more closely aligned with how they are

referred to in the face-to-face classes (e.g. 1st rank, 2nd rank instead of the rank names).

This comment was similar to others made during the semi-structured interviews.

The next section is a brief account of my own observations of how the RAT CD-ROM was used.

5.8.8 Participant observation

I observed that before the first round of evaluation some newer learners did not seem to be reading their syllabus requirements and may not have been as serious about their training as some of the members who had been training longer. This observation was confirmed in the focus group discussion described earlier. At this time there had been an influx of new learners, some of whom joined because their friends had joined rather than joining out of a genuine interest in RAT. This might explain some of their lack of motivation.

As the RAT CD-ROM grew with its number of resources learners seemed to use the CD more frequently in the face-to-face class time, especially when the dates for grading assessments got closer. This highlights a value for the resource as a learning aid and supports what the learners said about the CD being a useful and effective resource during the post grading interview and in the semi-structured interviews.

The resource became a valuable resource for me as instructor, as I could check syllabus requirements with much greater ease and speed compared to previously when there was only paper-based documentation. For this purpose alone, the RAT CD-ROM is a significant value-add, as classes consist of members at various levels and when class time requires learners to practise their syllabus, the range of questions are broad and sometimes numerous taking up valuable time. I am required to provide quick and effective answers so that there is time during the class to help others with their questions. Moreover, I could use the RAT CD-ROM to double-check new additions to the syllabus. Often the photos and videos were mnemonic devices only and enabled a quick ‘jog’ of the memory. This was so much quicker than having to read textual explanations.

The last section discussed for the first evaluation round is the development log.

5.8.9 Development log

As described earlier a lengthy handwritten development log was maintained during development and anecdotal notes were made. A handwritten log was used for practical purposes, as it could be carried to the training venue during filming and photo shoots and used onsite. Nobody had access to a laptop computer at that time, which made the handwritten document even more appealing as a practical log due to its portability. However, there would certainly have been benefits to creating a digital equivalent, as it could have been searchable and categorised more effectively.

Development was prolonged, technically difficult and was dependant on people and technology often causing delays. Very often videoing of the movie clips was postponed because of bad weather and because participants were absent. With 444 movie clips and 1651 images (mostly photos) the task of creating the RAT CD-ROM was a task requiring tenacity.

The findings and decision-making in the first round of evaluation was guided by a number of data sources, some of which served to provide additional or new information and others to substantiate previous findings. This multi-pronged approach is undoubtedly an onerous task, but with such small participant numbers it serves to provide richness to the evaluation. Furthermore, a resource of this nature is complex with a number of angles of evaluation. Thus without an evaluation of this type, useful decision-making would be difficult.

The next part of this chapter describes the second round of evaluation and how well the changes made after round one measure up.

5.9 RAT CD-ROM: Round 2 evaluation

In the second evaluation round nearly all the evaluation instruments were used as in the first round (Table 5.7). The purpose of using the same instruments was an attempt at consistency, making it easier to observe changes and evaluation results due to design decisions and further development after round 1. There were a few minor changes to the

evaluation instruments, but these are considered part of the evaluation too with the aim of improving the evaluation itself. The focus group was excluded in the second round, as it was felt that the semi-structured interviews and post grading interviews provided enough learner qualitative information.

Table 5.7: RAT CD-ROM round 2 evaluation matrix

Methods	Instruments	Functionality	Usability	Appeal	Effectiveness
Observation	Cognitive walk-through		X		
	Participant observation	X	X	X	X
Learner feedback	Semi-structured interview	X	X	X	X
	Post grading interview				X
Expert evaluation	User interface rating form	X	X	X	X
	Teaching evaluation form				X
	Content expert evaluation form			X	X
Records	Development log	X	X	X	X

This section follows a similar format to the round 1 evaluation with brief descriptions of the participant groups, the implementation of the instruments, presentation of data with observations, and the findings and discussion within the natural flow of the text.

This section is described in the following order: (1) cognitive walk-through, (2) semi-structured interview, (3) user interface rating, (4) teaching evaluation, (5) content expert evaluation, (6) post grading interview, (7) participant observation, and (8) development log (and anecdotal records).

The second cognitive walk-through is described next.

5.9.1 Cognitive walk-through

The second cognitive walk-through was again used to evaluate the navigation of the RAT CD-ROM and to see if changes to the resource had made any impact on its usability.

The semi-structured interview following the walk-through was once again used to gather biographical information and to gather further qualitative feedback about the tasks and the RAT CD-ROM more generally. This qualitative information is essential, because as you will read in the next section the participant sample size is even smaller than the round 1 evaluation, making statistical data useful only as a guide.

Cognitive walk-through participants

Although most of the participants in this evaluation round also took part in the round 1 evaluation, the make-up of the group in this round is different.

Seven all-male, all Senior RAT participants took part in this cognitive walk-through. They ranged in age from 21 to 25, so a much more homogenous group than in round 1. This homogeneity was unintentional, as these were the only participants training at the time. A much larger group would have been preferred, but the practical application of such evaluations seems to dictate the direction of the research and one makes do with what is available for practical outcomes. This of course makes a multi-pronged approach essential. With a framework allowing a combination of approaches one can still achieve an effective outcome.

The groups' martial arts experience ranged from one year of on and off training to 15 years and their RAT experience ranged from four months to eight years. One of the participants seems to have overrated his martial arts experience, or he underrated it in round 1. Five of the seven participants were from the 'learner and instructor' group and only two were learners.

Six participants gave themselves an excellent computer experience rating, while the other gave himself a good rating. Similarly for WWW experience 6 participants rated themselves as having excellent experience and the remaining participant gave himself a rating of bad.

All participants had used the RAT CD-ROM prior to the cognitive walk-through and once again the RAT CD-ROM was used in a variety of locations, including the gym, home, school, work, or university and was used for a variety of purposes including for learning, for reference and for teaching. They had used the RAT CD-ROM for between two months and two years at intervals of once a week, twice a week, once a month and several times a

week outside of class times. During class times some participants used the CD at least once in every session, some in one session per week, and others several times each session.

Five participants learn RAT in the face-to-face classes, one was a distance learner who had previously trained in the face-to-face class, and one took part in a combination of face-to-face and RAT Online learning.

So as you can see the mix of variables is quite extensive even within this small group, which illustrates how complex evaluation of these kinds of learning environments can become.

Each of the task results will be presented next.

The tasks

In this evaluation round participants were once again given a sheet of paper listing five tasks to perform with the RAT CD-ROM, ranging in complexity from easy, to an intermediate level of difficulty, to difficult, to intermediate, to easier. Tasks 4 and 5 were swapped around in this round, as task 4 in round 1 was considered an easier task than task 5 in round 1. Each of the chosen tasks were almost exactly the same as round 1, except the specific content participants were required to find was different.

Participants were once again encouraged to think out aloud so that the observer could note down the thought processes behind decisions made. However, thinking aloud was not required if participants did not feel comfortable doing so. The observer recorded the path participants took during each task on the cognitive walk-through record form.

As with the round 1 evaluation, the following variables will be considered when presenting the results: status, role in club, computer experience, and WWW experience.

Task 1

Participants were given the following instruction for task 1:

“Go to the **Junior RAT Yellow Belt** syllabus.”

The documented path for completing the task is as follows:

“Click the **Junior Syllabus** folder on the left-hand side tree menu > click the **Yellow Belt** link on the tree menu. (2 steps).”

As you can see (Table 5.8) all participants managed to complete the task successfully. No changes were made to increase the ease of use for completing this task. The benefit of this data is that it may serve to support the results in round 1.

Table 5.8: Task 1 results

		Task 1 Completed		
		Successfully	Unsuccessfully	Successfully with hesitation
		Count	Count	Count
Status	Junior	0	0	0
	Senior	7	0	0
	Total	7	0	0
Role in Club	Learner	2	0	0
	Learner and Instructor	5	0	0
	Instructor	0	0	0
Computer Experience	Excellent	6	0	0
	Good	1	0	0
	Fair	0	0	0
	Bad	0	0	0
WWW Experience	Excellent	6	0	0
	Good	0	0	0
	Fair	0	0	0
	Bad	1	0	0

Task 2

Participants were given the following instruction for task 2:

“Go to the **fitness programmes list** for the **Senior RAT 5th** rank.”

The documented path for completing the task is as follows:

“Click the **Senior Syllabus** folder on the left-hand side tree menu > click the **5th Rank** link in the tree menu > click the **Queen-Spades** link > click the **Complete two fitness programmes** link under the **Tasks for this rank** heading on the **5th Rank - Queen-Spades** main page. (4 steps).”

All of the participants completed task 2 in this evaluation round (Table 5.9), even though one of them completed the task with hesitation. These results might be indicating an improvement based on the changes made, however it is difficult to judge based on the small sample size. Another indicator that the changes have made the navigation for this task easier is that one of the participants completed the task following a completely different path to the rest of the participants. The path that he took was one resulting from the implemented changes, i.e. to provide an alternative method to reach the specific fitness programmes for each rank by including direct links to each rank on the fitness programmes page. So not only can learners access the information from within the context of their rank, but they can also access the information from the more general fitness programmes page.

Table 5.9: Task 2 results

		Task 2 Completed		
		Successfully	Unsuccessfully	Successfully with hesitation
		Count	Count	Count
Status	Junior	0	0	0
	Senior	6	0	1
	Total	6	0	1
Role in Club	Learner	1	0	1
	Learner and Instructor	5	0	0
	Instructor	0	0	0
Computer Experience	Excellent	5	0	1
	Good	1	0	0
	Fair	0	0	0
	Bad	0	0	0
WWW Experience	Excellent	5	0	1
	Good	0	0	0
	Fair	0	0	0
	Bad	1	0	0

Task 3

Participants were given the following instruction for task 3:

“Find the **list of sequences** for the **Senior RAT 3rd** rank.”

The documented path for completing the task is as follows:

“Click the **Senior Syllabus** folder on the left-hand side tree menu > click the **3rd Rank** folder in the tree menu > click the **Jack-Spades** link > click the **Complete a test on the syllabus content and create your own techniques** link under the **Tasks for this rank** heading on the **3rd Rank - Jack-Spades** main page > see the sequences list under **Task E: Syllabus**. (4 steps).”

The number of steps for this task was reduced from five to four. If the main folder structure was left intact as per round 1, the number of steps would have been reduced to three, however the changed folder names were intended to provide additional clarity for the Senior RAT syllabus (i.e., change the main folder names so that they match the way they are referred to during classes, such as first rank, second rank and so on - then the folder includes a link to the pages with the actual names of each rank).

Even after the considerable changes the results for task 3 are disappointing (Table 5.10). Again, the small sample size makes it difficult to judge the effectiveness of the changes on the cognitive walk-through results alone even though a greater percentage of participants completed the task successfully. It would have been more encouraging to observe that learners could also complete the task successfully and not only the ‘learner and instructor’ group. One of the learners did actually hover over the correct link and then moved on. There is a slight improvement for the ‘learner and instructor’ group with four completing the task successfully. The participant who was unsuccessful with this task completed it with ease in the first evaluation round (when the task was perceived as being more difficult). This participant had been out the country for a year and had not been training in RAT during this time nor using the RAT CD-ROM. It should also be noted that this participant was in an unusual mood on the night of the evaluation, as he even said that he never uses the RAT CD-ROM and yet he was observed using it regularly during class

times upon his return from abroad. Usually this participant is a motivated leader in the classes.

These findings seem to be pointing to the notion that one needs to have a good grasp of the RAT syllabus to be able to complete task 3 successfully. Even the computer and WWW experience does not provide meaningful information, as excellent WWW users also experienced difficulty with the task.

In this instance, as participant observer and founder of RAT I would at least consider it a reasonable expectation that all learners would benefit by finding out that their syllabus testing material is located in the **Complete a test on the syllabus content and create your own techniques** section of each rank as a logical location for this information. A possible enhancement for future iterations of the RAT CD-ROM might be to use a similar approach to that which was used in task 2, that is, to provide an alternate entry point to the list of sequences. This could be achieved by updating the ‘all sequences’ page and adding sections for the ranks with the respective sequences that belong to each rank.

5.10: Task 3 results

		Task 3 Completed		
		Successfully	Unsuccessfully	Successfully with hesitation
		Count	Count	Count
Status	Junior	0	0	0
	Senior	3	3	1
	Total	3	3	1
Role in Club	Learner	0	2	0
	Learner and Instructor	3	1	1
	Instructor	0	0	0
Computer Experience	Excellent	3	2	1
	Good	0	1	0
	Fair	0	0	0
	Bad	0	0	0
WWW Experience	Excellent	3	2	1
	Good	0	0	0
	Fair	0	0	0
	Bad	0	1	0

Task 4

Participants were given the following instruction for task 4:

“Open the large **photo** of the **Front Kick**.”

The documented path for completing the task is as follows:

“Click on the **Photo Reference** folder under the **Resources** heading on the left-hand side menu > click on the **Strikes** folder (under the **Photo Reference** folder) > click the **Kicks** link on the left-hand side tree menu > locate the thumbnail (small) image named **Front Kick** and click it to open the large photo. (4 steps).”

The results indicate an improvement in the navigation for task 4 (Table 5.11). The folder “Quick Pics” was renamed to ‘Photo Reference’ and was intended to provide more clarity as to the contents of the folder (i.e. that the folder contains photos referencing RAT techniques).

The one learner who did not complete the task successfully almost found the photo, as he clicked the strikes folder (which is where the link is located), but then clicked elsewhere. The table data does not present a completely accurate representation of events, as one of the ‘learner and instructor’ participants first clicked the home page and scrolled down the page in search of a link, but then seemed to apply his knowledge of RAT and clicked the tree menu and found the information quite easily. So it was not a smooth process, but fairly rapid. The learner who completed the task successfully first clicked the photo reference folder and then repeated aloud “front kick” as if to be thinking how this technique would be categorised. He then easily followed the correct path “Strikes > Kicks > Front Kick”. There was no hesitation apparent, but rather careful consideration before acting. He had performed other tasks in a similar way.

Although the table has bad WWW experience highlighted, it is more to point out that I suspect that this is not the reason for this participant being unsuccessful at this task. Similar to task 3, I think task 4 requires an understanding of how RAT techniques are categorised in order to complete the task successfully. Therefore this might indicate that problems with

this task are not so much computer usability issues, but rather knowledge of RAT issues. Possible improvements in the task could take the form of greater effort being invested in helping learners understand the structure of RAT better.

Table 5.11: Task 4 results

		Task 4 Completed		
		Successfully	Unsuccessfully	Successfully with hesitation
		Count	Count	Count
Status	Junior	0	0	0
	Senior	6	1	0
	Total	6	1	0
Role in Club	Learner	1	1	0
	Learner and Instructor	5	0	0
	Instructor	0	0	0
Computer Experience	Excellent	6	0	0
	Good	0	1	0
	Fair	0	0	0
	Bad	0	0	0
WWW Experience	Excellent	6	0	0
	Good	0	0	0
	Fair	0	0	0
	Bad	0	1	0

Task 5

Participants were given the following instruction for task 5:

“Find and play the **Movie** for the **Power Pads Kicking Drill**.”

The documented path for completing the task is as follows:

“Click on the **Movies** folder under the **Resources** heading on the left-hand side menu > click on the **Drills** link > click on the **Power pads kicking** link to play the movie (under the **Striking – Kicks** headings). (3 steps).”

The results remain unchanged for this task compared to the first evaluation round (Table 5.12). The learner who could not complete the task appeared to be having difficulty using the folders, which might be a result of his poor experience at using the WWW. However folder structures are more commonly used in the Windows environment and less so on the WWW, so this seems an unlikely reason. He also seemed to be having difficulty finding the correct category, although he did actually click on the drills link twice. All he needed to do to complete the task successfully was to look on the page and locate the movie clip link, but he seemed to be confusing the tree menu link with the page and had expected the tree menu link to open the movie. In my opinion this indicated either a more general computer use issue, not reading the task correctly, or perhaps the task wording was not clear, or a combination of these factors.

Table 5.12: Task 5 results

		Task 5 Completed		
		Successfully	Unsuccessfully	Successfully with hesitation
		Count	Count	Count
Status	Junior	0	0	0
	Senior	6	1	0
	Total	6	1	0
Role in Club	Learner	1	1	0
	Learner and Instructor	5	0	0
	Instructor	0	0	0
Computer Experience	Excellent	6	0	0
	Good	0	1	0
	Fair	0	0	0
	Bad	0	0	0
WWW Experience	Excellent	6	0	0
	Good	0	0	0
	Fair	0	0	0
	Bad	0	1	0

Further data and comments about the above tasks follow in the next section covering the semi-structured interview conducted directly after each cognitive walk-through.

5.9.2 Semi-structured interview

The same procedure and data collection instrument was used for the round 2 semi-structured interview as round 1, with the exception that minimal additional biographical information was collected in round 2. The data was collected using a cognitive walk-through record form and an interview form. The information was first hand-written on the forms and then later digitised and coded in the QSR NVivo software. All participants who took part in the round 2 cognitive walk-through were interviewed. Participants were also encouraged to compare the first version of the RAT CD-ROM with the second.

First the cognitive walk-through tasks are covered below followed by a description of the feedback themes discussed.

The tasks

Similar to round 1, none of the participants provided any feedback about task 1, but provided minimal feedback about tasks 2 to 5 which are discussed below.

Task 2

Participants provided the most feedback about the tasks that caused the most problems for them. All participants completed task 2 successfully, one of whom hesitated slightly during the task. His feedback indicates that the reason that he hesitated was not because he found the task to be difficult, but rather that he was just being careful.

nnnn. “Would like to be cautious and not open the wrong page.”

The good results for this task seem to suggest that the changes resulting from round 1 have been successful. However, one cannot discount the fact that perhaps learners have become more accustomed to using the RAT CD-ROM making the information easier to find for them. Care was taken to choose a task that participants do not ordinarily need to look at, but there is no guarantee that they had never accessed the information before given the open access nature of the RAT CD-ROM. The task results taken together with my own participant observations and use of the CD are a pragmatic affirmation that the information and navigation for this task are satisfactory.

Task 3

As discussed in the cognitive walk-through for task 3 the results were slightly disappointing as none of the learners completed the task successfully. Even though there is a small sample size, this data seems to be indicating that once again it was the more experienced learners who could complete the task because of their more developed understanding of the RAT syllabus. The comments below suggest something similar but nuanced slightly differently. It seems that participants were expecting the links to the sequences to be placed in a more prominent position or level rather than on the syllabus page for the rank.

- oooo. “When I looked at this I thought you would have broken it down like the other ranks, e.g. I thought that if fitness is important it would be on the same level, but ‘sequences’ is under the syllabus. So I thought duh. But usually all the stuff for gradings is under syllabus.”
- pppp. “I didn’t realise the sequence keys list was right here in the syllabus.”
- qqqq. “I was thinking I would see a link to sequences, but then I had to apply my knowledge, ... where would you find it?”

While the above expectations are reasonable from a usability point of view, they do not make sense from the RAT syllabus point of view, as all learning material is always logically placed in the syllabus section. The sequences page needs to be updated as suggested in the cognitive walk-through section to include links to the sequences for each rank. Also the name of the syllabus page could be shortened to ‘syllabus’, the way it is used during training rather than the more clumsy “Complete a test on the syllabus content and create your own techniques”. The following comment supports the idea that perhaps participants found the task difficult because the word ‘syllabus’ is not prominent enough:

- rrrr. “It didn’t stand out. The word syllabus didn’t stand out.”

Again, this feedback is reasonable, but the purpose of the longer name is because each section on a RAT rank is written as a task, supposedly to indicate more clearly what the learner can expect for that task. However if this serves to confuse rather than help, then shortening the name will be implemented in future iterations of the RAT CD-ROM. Also further consideration will be given to shorten the names of each syllabus task.

The following comparison made with the previous version supports my own observation that finding the information for task 3 is much easier in the second version of the RAT CD-ROM:

ssss. “[Previous version] Frustrating to find the sequence links. [This version] Easy to use. Easier than the previous version.”

Task 4

Task 4 in round 2 (previously task 5 in round 1) resulted in one unsuccessful attempt. The feedback by the participant suggests that his poor experience using the WWW might be partially to blame for his unsuccessful attempt at task 4. The following interchange demonstrates his confusion between folders and links.

tttt. Interviewer: “You clicked on exercise.”
Participant: “I clicked on strikes as well.”

It is correct that he did click on the strikes folder, so he seemed to have an idea how the techniques were categorised in RAT, but he seemed to be confusing folders and links, expecting that the page would be displayed by clicking the folder. This is probably not so much a WWW issue as it could be a more general computer experience issue.

The following comment seems to hint that success in this task relies on the participants’ knowledge of the structure of RAT techniques:

uuuu. “I was looking that you didn’t have punches and kicks separately. I read through and saw the other options and obviously I could see that it would be in that link (strikes).”

The results and feedback are satisfactory and require no further development changes for the next iteration of the RAT CD-ROM.

Task 5

The implemented changes for task 5 appear to have resulted in an improved navigation. The one participant who did not complete the task successfully seems to have been confused for similar reasons as in task 4, i.e. a confusion between folders and links. Although, his reason why he did not complete the task successfully was that he simply needed to read the task more clearly:

vvvv. “I didn’t look at it properly. I think I went too quickly.”

This could be suggesting that the actual cognitive walk-through task was not written clearly enough. The results for this task are satisfactory and no further changes to the navigation structure for task 5 will be made in the next iteration of the RAT CD-ROM.

The themes from the round 1 evaluation are revisited next, which will include where possible, comparisons between the two versions of the RAT CD-ROM.

Themes

The same data collection protocol was carried out as in the round 1 evaluation. Also the same four main evaluation themes were discussed. These include the usability, appeal, functionality, and effectiveness of the RAT CD-ROM. Each will be discussed in turn, starting with usability.

Usability

The same questions were asked of interviewees as in the previous round, with the exception that they were also asked to compare to the previous version of the RAT CD-ROM: “Is there anything that frustrates you when using the RAT CD-ROM? Do you find the RAT CD-ROM easy to use? Explain. Remember to compare to previous versions of the CD-ROM.”

Although some participants experienced problems in task 3 of the cognitive walk-through the feedback in round 2 suggests that the RAT CD-ROM is easy to use and some say that it is an improvement upon the previous version. Some of the problems with the Windows Media Player still seem to occur with a minimal number of participants. There is concern that several of the movie clips are too dark or poor in quality to view properly and there

seems to be a value placed on the additional martial arts resources placed on the CD. In later versions of the RAT CD-ROM much more work will be required to improve the movie clips and also increase the number of clips. This is what some of the participants had to say:

- www. “Now, no not really. The media player jams when trying to move the playhead. I think it is just my computer. [Previous version] Frustrating to find the sequence links. [Current version] Easy to use. Easier than the previous version.”
- xxxx. “I haven’t come across anything. Yes, the one thing I did find a bit frustrating was the movie quality and sometimes the techniques were hard to see or hidden. Maybe you can put voice clips for the pronunciation.” [Referring especially to the terminology for the other martial arts that may use foreign languages.]”
- yyyy. “It’s not frustrating at all. I like the way it is set out. It is set up like my resources at work. It is straightforward. What I really do like is the other martial arts, all on one CD. I can use this for the rest of my life.”
- zzzz. “The only thing I struggled with was finding the sequences in ‘all sequences’. I confused ‘combinations’ with ‘sequences’. It is pretty straight-forward to use. I can’t say anything about the old disk.”

Appeal

For the appeal theme the interview was preceded with the following questions: “Is the RAT CD-ROM website pleasant to look at? Does it look boring? Explain. Remember to compare to previous versions of the CD-ROM.”

Similar to the round 1 part of this evaluation, interviewees are satisfied with the look and usefulness of the RAT CD-ROM and seem to understand that it is a ‘fit for purpose’ resource with the aim of making it easy for RAT practitioners to find the resources they need for their learning. The following comments illustrate these observations:

- aaaaa. “The content of it makes it interesting, the photos and everything are there. You find what you want. [I asked a question about what could be

added.] I don't think having anything else would make any difference. I think if you change too much, the whole layout, you will have to go through this whole process again. This over here [pointing to the tree menu] is what it is all about."

bbbbbb. "Yeah, because um... in terms of usability the set out is brilliant because for a new user it is easy to get started. No offence, but from a graphical point of view it is a bit bland, but it is functional. I would give it a 10 out of 10 for functionality, but a 6 out of 10 for looks. But it is to present data and a pretty site might confuse the user, especially a new user. The links guide the user (different colours)."

cccccc. "If it is going to be used as an instruction CD it is not meant to be all colourful. It could be distracting. The movies could be motivating."

dddddd. "It's not boring. It's interesting and it's useful."

eeeeee. "Appeal. Leave it. It is alright as it is. Nice colours, badge."

Functionality

Participants were asked the following questions for the functionality theme: "Does the RAT CD-ROM work without errors? Explain. Remember to compare to previous versions of the CD-ROM."

As participant observer, I have noticed that there are still a few errors encountered when using the RAT CD-ROM, especially given that there is a vast amount of additional information and media incorporated into this version of the CD. However, every measure was taken to reduce these errors. One interviewee reported that some video clips seem too dark, another said that some clips do not work, and another saying that some links do not work. While interviewees seem satisfied with the functionality, more work is required to aim for a completely error-free resource. Here are a few of the relevant comments:

fffff. "[The interviewee was happy with the functionality of the CD, so the following question was asked to prompt discussion: Are there any links that don't work, etc.?] No, I've never had that."

ggggg. "Not that I've experienced." – meaning he has not experienced any problems with the CD.

- hhhhh. “Certain movies, it’s a bit dark.”
- iiii. “Most of the time [it works without errors]. Sometimes videos don’t work, but it could be computer related. My computer is slow and gets jammed.”
- jjjj. “The only problem was with links not working.”

I believe the last comment about the links not working is related to an issue experienced in the first evaluation round when some users tried to play the movies in the bottom of the Internet browser, which causes the links on the site to crash. I had not experienced any further links that did not work and neither did any of the other interviewees. Further error-checking would be required and a bug report system set up.

Effectiveness

All of the above evaluation themes contribute to an understanding of the effectiveness of the RAT CD-ROM, but as in round 1 the effectiveness section is focused more on the learning effectiveness and usefulness of the CD and the resources contained therein. Interviewees were asked the following questions: “Have you learnt anything from using the RAT CD-ROM? Is the RAT CD-ROM a useful resource? Which resources are most useful? Are the movie clips useful? Are the instructional videos useful? Are the photos helpful? Are the texts helpful? Explain. Remember to compare to previous versions of the CD-ROM.” Note there is an additional question about the instructional videos.

Each question will be discussed individually except the last three which are grouped together into one section.

Have you learnt anything from using the RAT CD-ROM?

All interviewees except one claimed that they had learnt from the RAT CD-ROM. The interviewee who said he did not learn anything was an advanced practitioner and does already know a lot of the learning material, however he was in an unusual mood on the night of this interview and had provided less than useful feedback elsewhere in this round of the evaluation. Furthermore he had just recently returned from spending time abroad and had not been using the RAT CD-ROM at all while away. However he was observed using the CD for teaching purposes and relearning difficult material to demonstrate to others in the weeks preceding this interview. The types of learning uncovered in the comments

relates mostly to psychomotor skills (RAT techniques and sequences), which require cognitive processing and often involve discussion amongst the learners before they can become skills due to the complex nature of some of them.

The mind maps seemed to be valued to provide the categories and structure of RAT techniques. Many of the learning tasks require learners to evaluate the RAT framework mind map and apply it in different individual ways. This can be viewed as encouraging the construction of learners' own individual cognitive structure of RAT through the scaffolding provided by the RAT framework.

Interviewees also attested once again to the appeal of the CD-ROM, and one interviewee expressed a value attitude in which he said he could extend some of the RAT principles to the rest of his life. This practitioner later succeeded in becoming a general medical practitioner. Others have commented similarly, but not necessarily as part of this evaluation. He also expressed a value for RAT members socially constructing knowledge and contributing to the RAT CD-ROM, which is characteristic of a social constructivist learning environment.

The contextual relevance of the RAT syllabus content is also supported by one of the interviewees (a dimension also evaluated in the expert reviews). A number of comments are provided below, as I believe it is the learning aspect of the RAT CD-ROM which will make the resource grow in usefulness:

- kkkkk. "I use it to learn for the gradings, e.g. I learnt the 7 Defense Principles in class a long time ago and forgot the sequence and re-learned it from the movie clip and text. It's also a reference for the gradings."
- lllll. "Sequences. Anything I need to look at, it's all there. It helps for everything with the gradings."
- mmmmm. "If you count those mind maps as well those are very useful to know which class everything belongs, e.g. deflective blocking, reflective blocking, the strikes as well."
- nnnnn. "Definitely yes. I have learnt new techniques from it. It's even refined old techniques."

- ooooo. “It has taken a lot of work on your behalf to get this far. I have never seen anything like it. I’ve always been interested in martial arts. This appeals to me. It is very streetwise. It teaches you to defend yourself in the society we live in.”
- ppppp. “This could take a person a long time to go through. There is definitely a lot of useful information here that people could find useful.”
- qqqqq. “Ja, my throws, certain sequences, the baton as well. It’s helped me. It’s better because of more stuff. Some of the things that weren’t on the disk we actually get to see now.” – ‘Ja’ is the equivalent of “yes” or “yeah” in South African English and Afrikaans.
- rrrrr. “Yes, I learnt. What intrigued me was the fact that you could use Freemind for other things, like school work [referring to university]. I was thinking that Rough & Tumble you could apply its principles to life and nothing will be too difficult.”
- sssss. “The latest edition impression - there is a lot in it. Now is the time when we can start training. Maybe let others [add to the CD], like me for my grading. I will be doing the kicking part. Others need to develop. [Referring to others adding and developing material and multimedia for the CD].”
- ttttt. “It’s been good for me to see the wide range of techniques, particularly the combinations.”

Is the RAT CD-ROM a useful resource?

As in the first evaluation round, all the interviewees felt that the RAT CD-ROM is a useful resource. Most provided short statements of affirmation, however there were a few interviewees who volunteered more information. The feedback suggests a value for the usefulness of the RAT CD-ROM as a reference and for teaching purposes. The first comment also suggests that the underlying social constructivist learning approach in designing the learning activities in RAT is starting to become more explicit to learners than it was in the earlier version of the CD. The first comment also implies the high affective value of the RAT CD-ROM (i.e., “inspirational”) and that it keeps the learner motivated.

- uuuuu. “The whole CD effectively illustrates your whole point to RAT and student input. When I see how many people are getting involved reinforces the whole concept behind RAT. It is inspirational, because when you see all that it is on [the CD] [it] keeps you involved. And if you are not able to get to a training session you at least have the knowledge at your finger tips.”
- vvvvv. “Definitely, for those who’re training at home. For reference when you go home.”
- wwwww. “Yes, when I forget something. If I was teaching. I prefer hands-on. I would rather see it performed in person.” – This interviewee is an advanced level practitioner of RAT and has learnt much of the content already. It is good to see the CD-ROM being used for teaching purposes by practitioners other than me.

Which resources are most useful?

Once again, as in round 1, the responses reflected a value for the combination of media as being useful, however with a greater observed interest in the movie clips as being the most valued useful resource.

- xxxxx. “Video clips, alongside with the writing, e.g. the sequences.”
- yyyyy. “I can’t say. I’ve only looked at the movies. Just looking at the headings I would say they’re all relevant.”
- zzzzz. “Movie clips.”
- aaaaaa. “Movie clips for me.”
- bbbbbb. “Videos. [Interviewer: “Why?”]. Quick and straight to the point. Also the photos, but I don’t use the photos very much cos they are too self-explanatory. They are more for the junior people. At my level I know what is there already. Also for personal reasons if you want to do some fitness, you have the fitness courses (texts).”
- cccccc. “The videos. You get to see it. You can become confused with text.”

Are the movie clips useful? Are the instructional videos useful? Are the photos helpful? Are the texts helpful?

In this evaluation round the usefulness of the movie clips as a useful resource was once again established.

There were only a minimal number of instructional videos (which were poor in quality) added to the RAT CD-ROM by the time of the second evaluation. These were placed in the “Other Martial Arts” section as an experiment, so might not have been easily noticed. As a result few interviewees actually had the opportunity to view these experimental clips. When the idea of the clips was discussed with one of the interviewees he thought that it was a good idea to include them, especially for times when the instructor was away. Another thought they were very useful.

There seemed to be a growing value for the photos in this evaluation round, probably because more participants had a chance to view them compared to previously. Still, the photos do not seem to be used as much as the movie clips. The photos are valued because of their clarity, but also for their intended design purpose; that is, as a mnemonic, a quick reminder of a technique or principle.

While the texts are not necessarily what makes the RAT CD-ROM an appealing resource, the feedback from both the evaluation rounds suggests that one cannot do without the texts, as they provide the basis for all the learning and the structure of the content into a coherent resource. One learner thought that the textual descriptions provide the opportunity for learners to visualise techniques, which is an approach to learning used in RAT to help increase physical skills and practise of self-defence scenarios. His comment also suggests that the texts are useful to analyse techniques. Analysis is considered one of the higher order thinking processes in Bloom’s Taxonomy (Bloom et al., 1956).

The feedback below illustrates some of the above ideas:

dddddd. Instructional videos: “Haven’t seen instructional videos yet, but yes will be a good idea.” [I showed him an example] “Those will be brilliant, especially nights when you not are here, or to save time

- with really simple things.”
- eeeeee. Instructional videos: “Very useful.”
- fffff. Photos: “Used it to check back on exercises, stomach course.”
- gggggg. Photos: “Yes, definitely. Because being a still picture you can hone in on a technique.”
- hhhhh. Photos: “Ja. Well, in terms of exercises, fitness programmes and stuff, I looked at the pictures and it was what we were doing. I was doing some of the exercises wrong.”
- iiiiii. Photos: “I mostly looked at techniques, e.g. kicks, throws, etc. It will be difficult to tell the difference between them, e.g. half hip throw and full hip throw. For me it helps to click [and see the full sized picture]. These are more for someone who knows it. For someone who doesn’t know maybe it wouldn’t be useful.” – This comment contradicts an earlier comment about the photos being more useful for less experienced practitioners. Perhaps this demonstrates that further use of the photos might expose a wider range of uses.
- jjjjj. Text: “Ja, cos most of the video clips it goes by so quickly or if it is a different angle the texts help. And of course for the grading material you have to read it to know what to do.”
- kkkkkk. Text: “I think they’re necessary. It is like a definitive breakdown and it forces you to think about it and analyse it. To act it out. To visualise something you’ve never seen before and get it right helps you to remember it.”
- lllll. Text: “Of course. You have to have text with video otherwise people won’t know what to do.”
- mmmmmm. Text: “No, not at the moment, because I’ve got no need to look at them.”

Semi-structured interview conclusion

The feedback in this evaluation round suggests once again that the RAT CD-ROM is valued as a learning and reference resource as was the finding in the first round.

Furthermore, there seems to be a growing recognition of the resource as being a socially constructed resource and a greater appreciation of the vastness and usefulness of the content and the RAT syllabus was shown. The appeal of the RAT CD-ROM seems to

make learners motivated to learn more in their own time and the syllabus and the CD were recognised as being life-long learning resources stimulating positive affective ideals, such as persistence and positive thinking. Persistence and determination are key guiding principles of the RAT syllabus.

Interviewee feedback on the cognitive walk-through tasks illustrate a general level of satisfaction with each of the tasks, however the less than ideal results on task 3 combined with the feedback indicates that practitioners use their cognitive understanding of RAT to find the information. This is not necessarily a bad thing, however, the purpose of the design is to make the resource easier to use for all users. Minor problems with other tasks might be attributed to ambiguous wording in the cognitive walk-through tasks as well as lack of computer and WWW experience with the confusion displayed between folders and links in the tree menu by a participant.

While it could be argued that there is a small sample size in this interview group, potentially providing little useful statistical data, the almost unanimous feeling that this version of the RAT CD-ROM is easier to use than the previous version, coupled with the range of comments attesting to this improved ease of use across the various interview questions is in my view at least partial evidence that the resource is fulfilling its intended design purpose and improving as a result of changes made after the previous evaluation. After all, the interviewees are the target audience and their opinions are valued.

Further work would be required to reduce errors, as well as increase the number and quality of movie clips and instructional videos. Once the resource has expanded further an improved visual design might make the RAT CD-ROM at least in part more appealing.

The interview comments provided about the effectiveness of the RAT CD-ROM showing the resource as facilitating psychomotor, affective, and cognitive learning as having taken place is encouraging and justifies the two evaluations as being worthwhile efforts.

The next section covers the three expert rating forms, starting with the second round review of the user interface.

5.9.3 User interface rating

The same three experts who provided completed user interface rating forms in round 1 provided completed forms in the second round. It was intended that by using the same experts it might add to the reliability of the expert rating activity. Also, it was hoped that previous exposure to the rating form and the RAT CD-ROM would imply some familiarity with the instrument and enable the reviewers to take note of the changes to the CD-ROM. Most dimensions were rated, except that one of the reviewers omitted to rate one of the dimensions.

A comparison between the round 1 and round 2 user interface rating forms shows an overall improvement in round 2 with most dimensions being closer to the development goals. Furthermore, the patterns generated by joining the dots of the rating points show a more regular pattern than the round 1 pattern (Fig. 5.12). The feedback provided by one of the reviewers indicates an overall value for the RAT CD-ROM as a useful resource for students and that the second version is an improvement upon the first: “Firstly, I was hugely impressed by the amount of time and effort that has clearly gone into the making of these resources. I know what a mission video capture and filming can be and I think the sheer number of these resources available to students is phenomenal...”

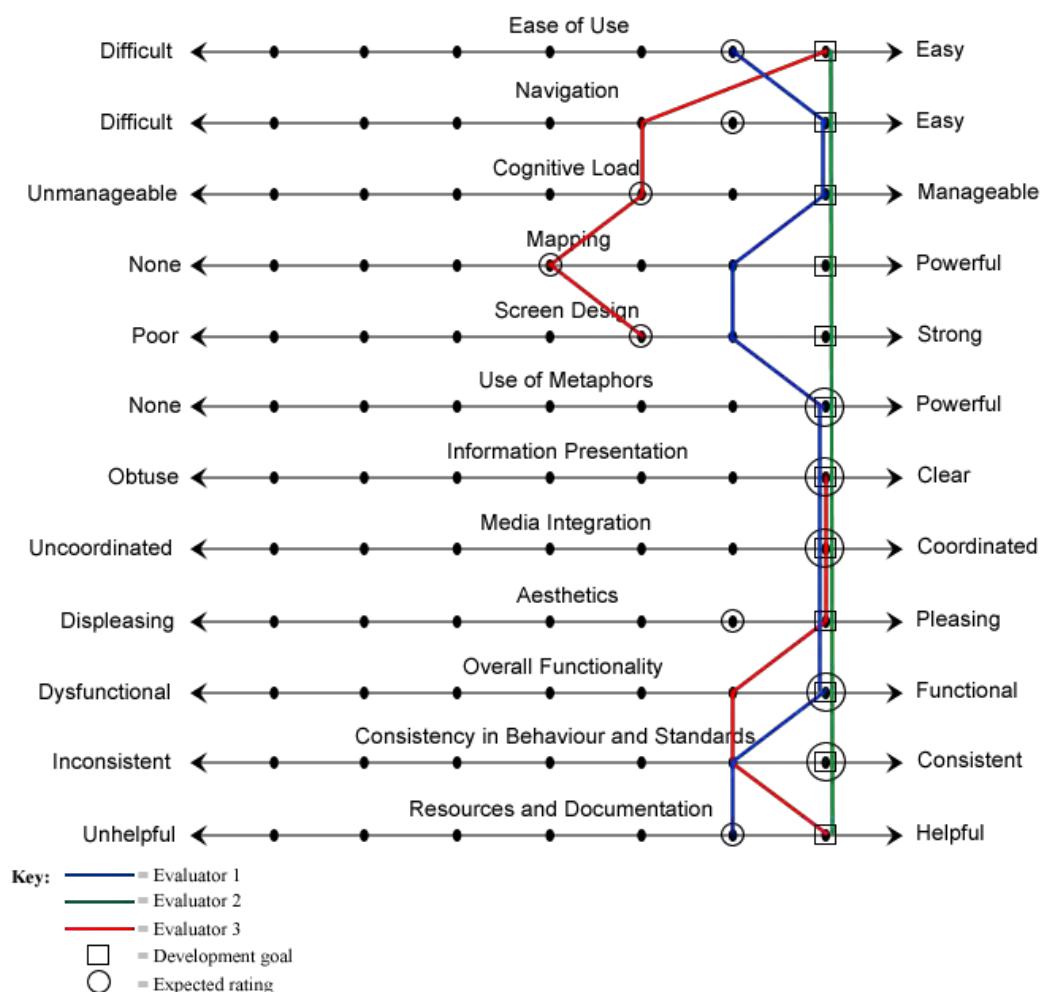


Fig. 5.12: User interface rating form – round 2

Each of the areas of concern in the round 1 evaluation will be discussed below noting any changes. These include: (1) ease of use, (2) navigation, (3) cognitive load, (4) mapping, (5) information presentation and (6) media integration.

Ease of use

Two of the experts rated the ease of use dimension the same as the development goal and one the same as the expected rating, which was one point away from the development goal (a marginal improvement). The expected rating remained unchanged as no overt changes were made to affect ease of use specifically, but it was hoped that changes in other dimensions, such as navigation might improve the rating. There is still room for improvement, but the result is satisfactory and is supported by the following expert comments, though suggesting that ease of use may rely on the learner having to understand navigation menus and Microsoft Windows:

- nnnnnn. “Better navigation system than previous version. Links seem more consolidated and easier to use.”
- oooooo. “Though assuming familiarity with menus and Windows + ‘web’ based design.”
- pppppp. “I also like the outlay of the site, finding it easy to navigate through the appropriate use of the Windows file structure metaphor. In addition, I think the opening of additional windows to show content areas is clever because it allows the learner to keep track of the original linking content without having to hit the 'back' button to get back to where they started from prior to viewing the new content.”

Navigation

It is difficult to determine at first glance whether the rating for navigation is in fact an improvement or not, or whether it is about equal to round 1. This difficulty arises because two of the experts rated navigation on the development goal which is an improvement upon round 1, whereas the third expert rated the dimension three points away from the development goal, which is a regression. The ratings and the feedback together suggest an improvement.

- qqqqqq. “Good navigation – menu system appears more condensed and easier to follow.”
- rrrrrr. “I also felt that the navigation was superior and media was more seamlessly integrated into the course material in the latest CD. Somehow, the navigation tabs for the latest CD seem to be more coherent and more easily navigable.”

Even though the navigation system seems to have improved there still exists specific navigation issues, due to either wording of menu items or the known issues with the Internet browser itself. The learners experienced similar issues. The first expert comment below illustrates the former issue and the second the latter:

- ssssss. “I had one problem when it indicated I must go to ‘Fitness Programme’ but I could not find it on the menu – then saw ‘Fitness + Health’ +

opened that and found it. Is this intuitive?”

ttttt. “An odd bug: If I view a movie and then select a syllabus page the page does not load.”

Cognitive load

The ratings for cognitive load did not change in the second round evaluation, indicating that there is still room for improvement. Even though the experts did not observe an improvement, the rating is nonetheless satisfactory with two experts rating the dimension on the development goal and the third expert rating the dimension three points away from the development goal. Two of the comments demonstrate these two divergent views:

uuuuuu. “Well chunked info.”

vvvvvv. “Well this is a great deal of info. I had forgotten that the left menu was different from the horizontal one so I think I was approaching some sort of overload.”

In my view including a breadcrumb link function might address the concern highlighted in the second comment as it would show the relationship of links to their categories. However this would only be implemented when the RAT CD-ROM is moved to a Web 2.0 platform and the breadcrumb structure can be generated automatically through the site’s programming. This proposed solution is interrelated with mapping.

Mapping

The mapping scale shows an improvement upon the last evaluation round. One of the experts rated the dimension on the development goal and another rated the dimension one point away from the development goal, whereas the third expert rated mapping on the expected rating, the same as it was before. While this is largely an improvement, the expected rating is three points away from the development goal and thus could potentially improve in later iterations of the RAT CD-ROM. One of the expert comments highlighted a point for improvement:

wwwww. “The LH [left hand] menu does not give cues but for a session the page cues for visited etc were subtle but once I noticed them they

were useful.”

This comment means that the tree menu does not indicate the current page the user is visiting, even though visited links become underlined. It also means that the links on pages provide useful cues. The comment about the tree menu is of interest and if modified to show the current page that a user is visiting could add significantly to an improved rating for mapping. This issue will be considered for future versions of the RAT CD-ROM navigation system.

Information presentation

The information presentation rating demonstrates a marked improvement compared to the round 1 evaluation and that the changes to navigation, content structure and wording seem to have paid off. All of the experts provided a full rating of ‘clear’. However, this improved rating could be attributed in part to the increased number of pages and resources which provide the intended logical linkages between parts of the RAT CD-ROM that might have been absent in an earlier more incomplete version. The expert comments support the changes made to the RAT CD-ROM as reasons for the improved rating:

xxxxxx. “Though I’m not a martial arts buff I found it all easy to read/grasp.”

yyyyyy. “Better grouping of menu structure - makes interface clearer and facilitates better presentation of information.”

Media integration

The work carried out to improve the structure of the content, the navigation and category changes, increasing the number of media items (especially video clips), and creating many more links to media items within the flow of texts in the syllabus and courses appears to have had a positive influence on the rating for media integration with all three experts rating this dimension on the development goal. The expert comments support the effectiveness of the changes:

zzzzzz. “Good integration of media files - more direct linking.”

aaaaaa. “This works very well. Seems to be something useful wherever it is needed.”

Several of the other dimensions that improved include: use of metaphors, aesthetics, overall functionality, and resources and documentation. Screen design and consistency in behaviour and standards appear to have regressed. The regression is minimal, but it is not clear why this round produced a poorer rating for these two dimensions. There were no significant changes to screen design. Possibly the different rating for screen design can be attributed to different subjective feelings towards the design at the two different times that the evaluation was conducted. The increased volume of media, pages, and resources could well have produced a greater number of errors on the RAT CD-ROM, which could be the reason why the rating was slightly worse for consistency in behaviour and standards than the previous rating.

Summary: user interface evaluation

The user interface rating form was a useful tool providing insights to improve elements of functionality, usability, appeal, and effectiveness of the RAT CD-ROM. Performing two rounds of evaluation was very useful to guide development decisions and make improvements after the first round and then proceed to create a more fully developed learning resource, and then observing the results after the second evaluation. The visual representation of the scale diagrams helps to gain an overview of all dimensions in order to guide future design decisions. The formative nature of the evaluation also helped to identify that the anticipation of user needs dimension is better placed on the content expert evaluation form. The expert ratings taken together with the cognitive walk-throughs, learner feedback and observation data helps to provide a more complete picture than would be possible if using any of the instruments in isolation. For example, the navigation ratings are satisfactory according to the experts and yet navigation problems were experienced by users. Using the various instruments helps to identify the source of issues with greater ease, as well as identifying which design decisions are working as intended.

The next section describes the second round of the teaching evaluation.

5.9.4 Teaching evaluation

The three experts involved in evaluating the user interface rating form and teaching evaluation form in round 1 reviewed the RAT CD-ROM against the teaching evaluation

form in round 2. All dimensions were rated with the exception of collaborative learning which one expert omitted to rate. The intention was for experts to observe changes made to the RAT CD-ROM after the first evaluation round, potentially influencing improved ratings for the respective dimensions in the second evaluation round.

The second evaluation round shows an overall improvement in the ratings with expert ratings producing similar patterns to each other on the scale diagrams as well as being more regular in shape (Fig. 5.13). It must however be taken into account that the more regular overall pattern could be a result of three of the evaluation dimensions being moved to the content expert evaluation form, which if still part of this evaluation form might have produced a very different shape. The expert comment below supports the improved overall rating of this version of the RAT CD-ROM:

bbbbbbb. “Overall, I was very impressed by the CDs, especially the latest version which I felt was superior to its predecessor. I felt the overall concept behind the latest version had become more constructivist in its approach and I think the delivery of [...] material benefitted greatly from this.”

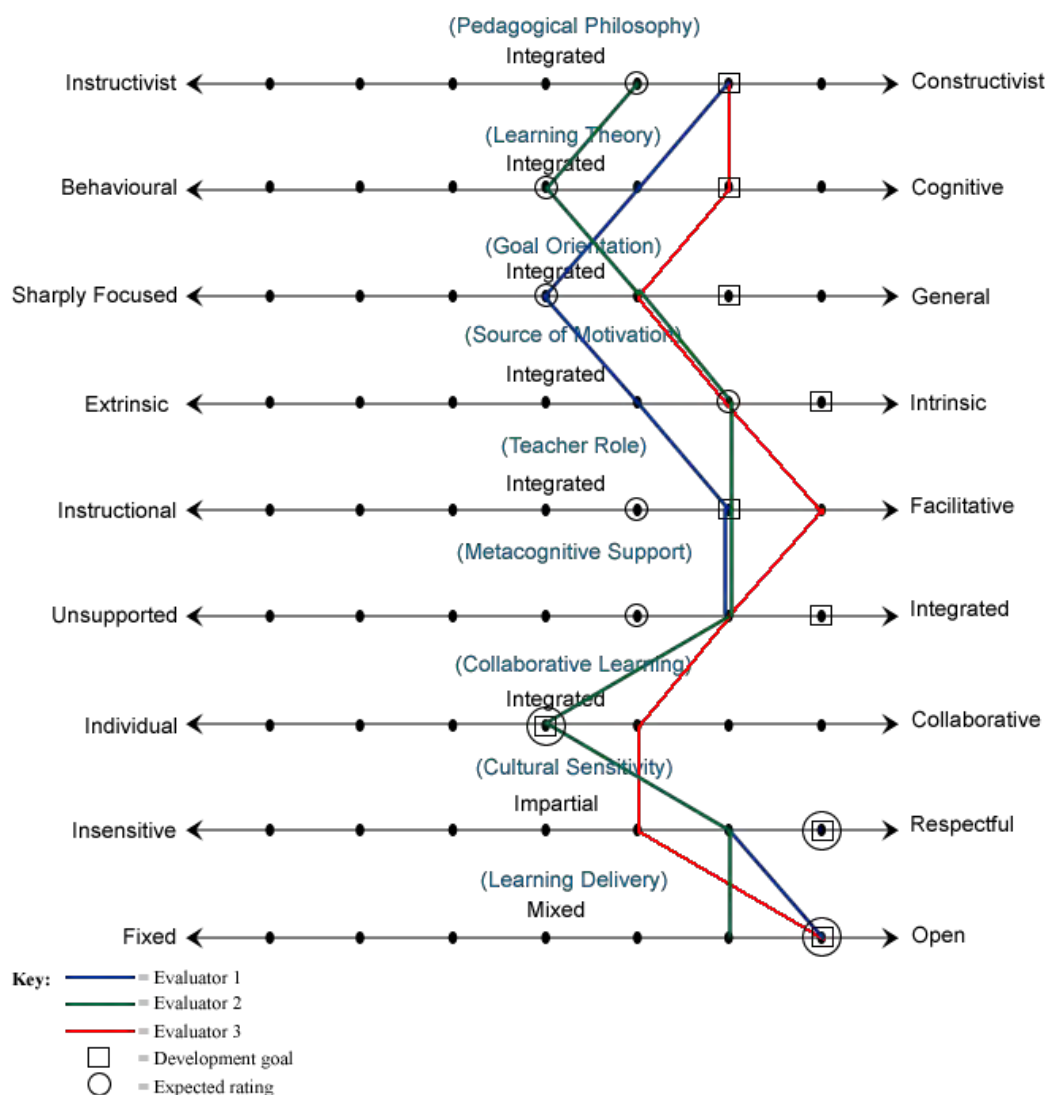


Fig. 5.13: Teaching evaluation form – round 2

Each of the dimensions discussed in round 1 will be discussed here to determine how they compare to evaluation round 1. These include: (1) pedagogical philosophy, (2) learning theory, (3) goal orientation, (4) source of motivation, (5) teacher role, (6) metacognitive support, (7) collaborative learning, and (8) cultural sensitivity.

Pedagogical philosophy

The pedagogical philosophy dimension showed a marked improvement and performed better than the expected rating. Two reviewers rated the dimension on the development goal (which is only one point away from the extreme 'constructivist' pole). The third reviewer rated the dimension on the expected rating, which was one point away from the development goal (towards the 'instructivist' pole). This review is of significant importance to the RAT Online project and supports the constructivist learning approach

grounding this project. The following three expert comments support the improved rating and provide an insight to why they felt the RAT CD-ROM had improved on the pedagogical dimension:

- ccccccc. “As I said earlier I saw the CD-ROMs more as a content delivery tool when compared to the [RAT] online course component which draws its strength from the strong interaction and collaborative work undertaken by the students. This may be due to my unfamiliarity with the subject matter and the way in which this kind of course is normally taught. In particular, I felt the first version of the CD was more instructivist than the second, with the addition of mind maps from the students and different degrees of scaffolding being provided at different levels of learner progression greatly contributing to the more constructivist feel of the second CD-ROM.”
- ddddddd. “Better integration of Freemind software links - more like a learning tool than just instruction.”
- eeeeeee. “I based my evaluation decisions on an overview of selected syllabuses and also saw how some work is applied in the evaluation videos and I see it is more facilitative/constructivist etc than I thought after viewing it previously.”

This rating is satisfactory. However, over time, it is intended that an even greater amount of learner created content will be added to the RAT CD-ROM compared to instructor added content. Thus the RAT CD-ROM might become more of a constructivist learning resource in later reviews.

Learning theory

The expected rating for the learning theory dimension was placed one rating point closer to the ‘cognitive’ side in round 2 compared to round 1, as the addition of learner generated content was expected to improve the rating. As expected the expert reviews did improve with their ratings being closer to the ‘cognitive’ side of the scale making the results of this part of the evaluation satisfactory. One expert rating was on the development goal for this dimension; one was on the expected rating, and the third between the expected rating and development goal. This improved rating seems in some way linked to the improved rating

on the pedagogical dimension. The constructivist learning approach requires learners to create their own artefacts. The addition of learner generated content from the RAT Online courses, such as video clips and mind maps demonstrates that learners are not only required to drill and practise techniques in the behaviourist learning tradition, but that there is also a strong emphasis on learners representing their own knowledge.

Goal orientation

Overall the rating for the goal orientation dimension improved and is satisfactory. One of the experts rated the dimension on the expected rating and the other two rated it one point away from the development goal. While this evaluation represents an overall improvement, the highest rating had decreased by one rating point, as one of the experts in round 1 had rated the dimension on the development goal. So one of the expert ratings had dropped by one point, however the ratings combined are much more closely grouped than they were before. Like the previous two dimensions the improved overall rating for this dimension was thought to be attributed to the addition of the learner generated content. This idea is supported by one of the expert comments:

ffffff. “Better integration of mind maps - more student feedback/mind maps.”

Source of motivation

A significant amount of media was added to the RAT CD-ROM before the second round of evaluation, especially video clips. The addition of this material was expected to improve the rating for source of motivation with an overall move closer to the ‘intrinsic’ extreme of the scale (one rating point away from the development goal). The reason for this higher expectation was because of the high value placed on video clips by learners. Thus it was anticipated that learners might find the RAT CD-ROM more useful and be intrinsically motivated to use the resource. One expert rated the dimension one point away from the expected rating and the other two experts rated it on the expected rating. The changes made to the RAT CD-ROM (possibly attributed to the addition of the media) have had a positive impact and the rating for this dimension is now satisfactory.

Teacher role

No explicit changes specifically directed at the teacher role dimension were made. However due to the good rating in the first round, the expected rating was moved one point

closer towards the development goal. As expected the addition of the learner generated content and media seems to have had a positive effect on the rating, making the evaluation for this dimension satisfactory and reflecting the facilitative approach taken in RAT learning. Two of the experts rated the dimension on the development goal, which is one point away from the 'facilitative' extreme of the dimension. The third expert rated the dimension on the 'facilitative' extreme, which is better than both the expected rating and the development goal.

Metacognitive support

The evaluation of metacognitive support in round 1 was better than expected. This together with a number of changes made after round 1, such as changes to folder names and categories representing the structural relationships between different techniques, as well as the addition of learner generated content prompted an improved expected rating in round 2, which was one point closer to the development goal than it was previously. While not on the development goal all of the expert ratings are one point away from the development goal, which is better than the expected rating. This rating is satisfactory, but in future evaluations the expected rating should perhaps be placed on the development goal and more work done to improve menu item and folder names, as well as adding more learner generated content and software that can be used by learners as tools to represent and record their knowledge.

Collaborative learning

Only two experts rated the collaborative learning dimension and overall their evaluation represents an improvement, with one rating on the development goal and the other expert rating one point past the development goal towards the 'collaborative' pole. However given that one of the experts omitted to rate this dimension, it is perhaps somewhat contrived to opt for an overall positive rating without considering that had the other expert rated the dimension, it might have swung the overall rating to a much less collaborative one. Nonetheless given the static nature of the RAT CD-ROM, this rating is satisfactory in reflecting the collaborative nature of RAT learning.

Cultural sensitivity

The efforts to tone down the language on the RAT CD-ROM to be less authoritarian seem to have had little effect on the ratings. There are still two expert ratings one point away

from the development goal and expected rating (which are both placed on the ‘respectful’ extreme of the scale) and one expert rating two points away. This is the same as the round 1 evaluation. This is by no means a bad rating and is satisfactory, but more could be done to improve the rating in future iterations of the RAT CD-ROM. Perhaps increasing the changes to the language will help.

The learning delivery dimension was not a topic of concern in the first round, but it is worth mentioning its much improved rating in round 2. Two experts rated the dimension on the development goal and the expected rating (which were both placed on the ‘open’ extreme) and the third expert rated it only one point away. The following expert comment supports the rating, as well as the intended ‘learn anytime’ nature of the RAT CD-ROM: “Learners regulate their own learning timetable completely - no online synchronous interaction required for this CD.”

Summary: teaching evaluation

The teaching evaluation form was a useful tool to determine the effectiveness of the RAT CD-ROM from a teaching and learning perspective. This is a crucial component of the evaluation given that the purpose of the RAT CD-ROM is as a learning resource.

While a challenging development task for a static resource such as the RAT CD-ROM, the changes and additions to the resource have prompted a more constructivist rating in the second evaluation round. This result is satisfactory and is supported by an underlying constructivist learning approach taken in this study. The greater emphasis on cognitive learning theory over behaviourism in the RAT syllabus is also reflected by an improved rating on the learning theory dimension. A general move towards the general side of goal orientation demonstrates the high regard for ill-structured and complex learning situations in the RAT syllabus, which is in line with the thinking behind cognitive flexibility theory. Furthermore, the higher order thinking and learning of Bloom’s Taxonomy is reflected in many of the complex RAT syllabus tasks requiring synthesis and evaluation. The higher ratings on pedagogical philosophy, learning theory, and goal orientation help to support the value for higher order thinking and learning tasks in RAT. The improved facilitative teacher role rating, the improved collaborative learning rating, and the satisfactory cultural sensitivity rating help to illustrate the effort expended to develop a learning resource that is guided by a social constructivist learning approach was well invested. It is anticipated that

the improved ratings for source of motivation, metacognitive support and the open learning delivery will help to make the RAT CD-ROM more appealing for learners and contribute to helping learners complete their learning tasks more effectively.

The second round of the content expert evaluation is discussed next.

5.9.5 Content expert evaluation

Six experts were contacted to take part in the second content evaluation round. Five experts returned forms with their ratings; however one of the experts completed the round 1 evaluation form, which contained fewer evaluation dimensions than the round 2 form. As a result, some of the data are missing for this reviewer's evaluation.

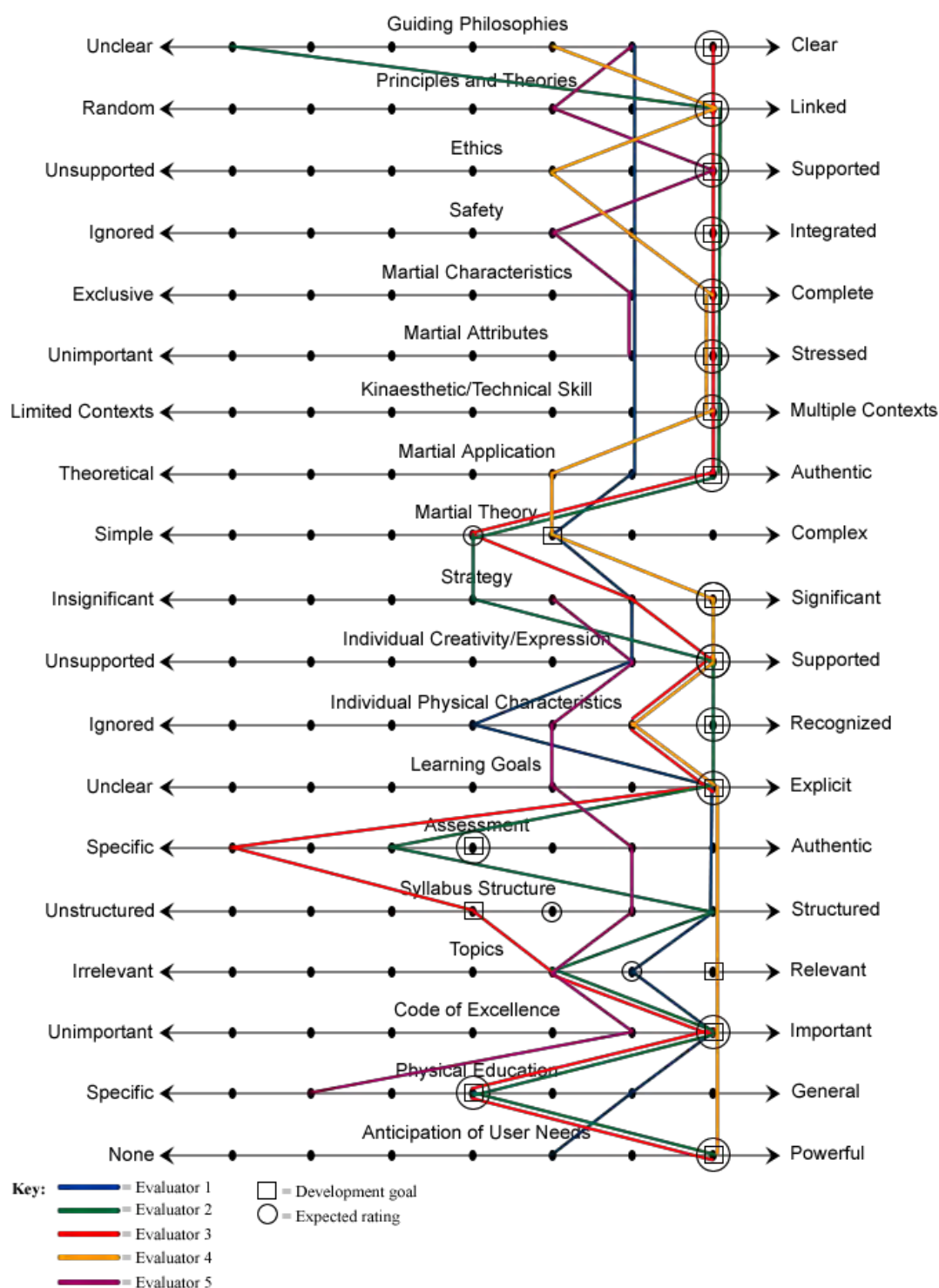


Fig. 5.14: Content expert evaluation form – round 2

Overall the pattern generated on the rating form is satisfactory with the ratings being close to the development goals, even though there are a greater number of reviewers with some of them appearing more conservative about their ratings (Fig. 5.14). The pattern also indicates slightly improved ratings along some dimensions, minimal changes to others,

while others have moved further away from the development goals (Fig. 5.14). One of the reviewers' comments for this part of the evaluation supports changes made after round 1, but also supports changes made to improve usability and effectiveness of the RAT CD-ROM:

ggggggg. "This version of the RAT CD is much more user friendly than the previous one. The amount of information is also growing considerably and there is a vast amount of information available."

As mentioned previously, three of the evaluation dimensions were removed from the teaching evaluation form (kinaesthetic/technical skill, martial application, and martial theory) and one dimension was removed from the user interface rating form (anticipation of user needs). These four evaluation dimensions were then included as part of the content evaluation form as they were deemed more appropriately evaluated by martial arts experts.

Each of the areas of concern from the first evaluation round will be reconsidered to determine if the changes made any difference in this round of evaluation. These include: (1) guiding principles, (2) ethics, (3) safety, (4) syllabus structure, and (5) topics. Then the four new evaluation dimensions will be reviewed, which include: (1) kinaesthetic/technical skill, (2) martial application, (3) martial theory, and (4) anticipation of user needs. Only four of the reviewers provided feedback for these four dimensions. As already mentioned one of the reviewers completed the evaluation form for round 1, which was missing these dimensions. Finally, any new areas of concern will be highlighted.

Guiding principles

The changes made on the guiding principles dimension made no observable difference for two of the expert ratings, which is a disappointing result. However, counting in favour of the changes are the ratings given by the additional reviewers. One expert's rating was on the extreme end of the 'clear' pole and the remaining two reviewers' ratings were only one point away from the 'clear' pole. There was minimal written feedback provided for this evaluation form, but one of the reviewer's comments presents an interesting argument, which suggests a high value for the student/teacher relationship (similar to observations made in round 1):

hhhhhhh. “The guiding philosophy of the student/teacher relationship is missing. You are not getting to know the student over the Internet. I see someone learning martial arts over the Internet as learning ‘parrot fashion’.”

This is a valid point; however the purpose of the RAT CD-ROM is to complement the face-to-face RAT classes and collaborative RAT online courses, not as a stand-alone learning web page for anonymous learners. Furthermore the tasks for mid to high level ranks require increasing levels of learner creativity, going against the idea of ‘parrot learning’. This version of the RAT CD-ROM contained more examples of learner contributed work which resulted in the greater ‘constructivist learning’ rating on the teaching evaluation form. Thus, the RAT CD-ROM was rated much less of a ‘parrot fashion’ learning resource as it might have been in the first evaluation round.

Ethics

The ethics dimension was much improved in this evaluation round with three of the reviewers providing a fully ‘supported’ rating, while one reviewer provided a rating only one point away from the ‘supported’ pole and the remaining reviewer, two points away from the ‘supported’ pole. This is a satisfactory result.

Safety

The rating for safety was also satisfactory showing improvement. Two reviewers rated the RAT CD-ROM as having safety as fully integrated. Two ratings were one point away from the ‘integrated’ pole, while the remaining rating was three points away from the ‘integrated’ pole.

Syllabus structure

The syllabus structure overall rating was disappointing. Even though there is a slight improvement with one of the reviewer’s ratings being right on the development goal and another rating moving one point closer to the development goal, the other three ratings were at the extreme end of ‘structured’. I had expected that the ratings might be placed more towards the ‘structured’ end of the dimension, but had also expected that they might at least move off the fully ‘structured’ pole. As mentioned at the end of the first round of evaluation, this dimension might be better evaluated along each rank and their individual

levels of ‘structuredness’. Additionally, more work might be required on improving the evaluation instrument. Perhaps the wording requires more clarity, or perhaps the words chosen for each of the poles are misleading. For example ‘unstructured’ might be deemed a negative word in the context of a syllabus and with the inherent (structured) presentation structure of the RAT CD-ROM menu it might well seem that the syllabus is fully structured.

Topics

As expected the overall rating of the topics dimension improved slightly even with the additional experts who had not seen the RAT CD-ROM in the first evaluation round. Since there is no written feedback it is not clear whether the reason for the improved rating is because of greater familiarity with using the RAT CD-ROM as suggested might be the case after the first round of evaluation.

Kinaesthetic/technical skill

The decision to move the kinaesthetic/technical skill dimension to the content expert evaluation form has resulted in an improved overall rating with three of the reviewers rating this dimension on the ‘multiple contexts’ pole, which is the development goal as well as the expected rating. The remaining reviewer rated this dimension only one point away from the development goal. The move of this dimension from one instrument to another suggests that more accurate ratings might result from more careful consideration of matching evaluation dimensions more appropriately to experts’ areas of expertise.

Martial application

The martial application dimension is improved by two reviewers providing a rating of ‘authentic’, which is both the development goal and expected rating. One of the other ratings was unchanged and one point away from the development goal. However the fourth rating was two points away from the development goal, which implies a slightly worsened rating. However, overall the rating for this dimension is satisfactory.

Martial theory

The martial theory dimension shows improvement with two of the reviewers rating this dimension on the development goal and the other two on the expected rating.

Anticipation of user needs

The anticipation of user needs rating dimension is satisfactory with three of the ratings being at the ‘powerful’ end of the dimension, which is also the development goal and expected rating. The fourth rating is two points away from the development goal. This is not a bad result, but written feedback on the reason/s why this dimension did not receive a fully ‘powerful’ rating would have been helpful. Again one has to exercise caution and not expect too much when asking reviewers to use their valuable time for these kinds of reviews.

The following evaluation dimensions: principles and theories, strategy, individual creativity/expression, individual physical characteristics, and assessment seemed to have gone down slightly in their ratings, although not so much that they became problem areas. The principles and theories and individual creativity/expression dimensions seem to have changed due to the additional ratings provided by the two new reviewers. Other dimensions, such as strategy, individual physical characteristics, and assessment, have been rated differently to evaluation round 1 by most of the reviewers. Although it is preferred that strategy and individual creativity/expression achieve their full development goals, having different ratings by different experts for assessment does seem to suggest that the syllabus achieves specific and authentic assessment, hence the development goal in the centre of the dimension. This change in rating could be a result of the reviewers reading different parts of the syllabus, which make use of varying learning activities which can fall on different parts of the dimension. This in part might suggest that the syllabus is fulfilling its development goal by including aspects of both dimensions.

Summary: content expert evaluation

The content evaluation form served as a useful tool to determine the quality of the content on the RAT CD-ROM, as well as its overall appeal and effectiveness for RAT learners as rated by experts. The formative evaluation process was useful to enhance the quality of the evaluation instrument itself by moving evaluation dimensions from other evaluation forms which were then more appropriately matched to the content expert’s knowledge and experience. The tool was useful as a visual guide to potential problem areas and guided design decisions to improve the resource’s appeal and effectiveness. The introduction of additional experts might be useful if statistical data was required, but the value of the tool is the qualitative ratings and insights provided by a few experts. In future evaluations of

this nature, three experts would be sufficient to provide a balanced view, as too many add to the complexity of the evaluation and might require additional cross-checking with follow up interviews. I would also ensure that a part of the evaluation is to provide constructive feedback for each rating. This is a tough requirement though for time-poor experts. Overall the results of this part of the evaluation are satisfactory and most design changes improved the result.

The post grading interviews are discussed next.

5.9.6 Post grading interview

The post grading interviews conducted for the second evaluation round were found to provide a richer source of information compared with the previous post grading interview.

Three interviews were conducted with four Senior RAT interviewees in total. First one interview was conducted with one interviewee. A few days later another interview was conducted with two interviewees who had both recently completed their grading assessment together. The third interview was conducted with one interviewee a few days after the second interview.

The same question set was repeated from the first evaluation round in order to elicit feedback about the effectiveness of the RAT CD-ROM. These questions included:

1. Has the RAT CD-ROM helped you at all in your preparation for your grading?
2. If yes to above, explain how.
3. How could the CD-ROM have been improved to help you?
4. What could be useful additions (e.g. media, texts, etc.)?
5. Is the syllabus useful in your training?

All interviewees responded affirmatively to question (1) and went on to provide useful explanations for question (2). Their feedback will be presented first followed by observations resulting from the feedback.

Interview 1:

“When I was working out the techniques the mind map, the RAT framework for the principles [was useful]. Because it was easier for me to know that I was not repeating the same things. For example, moving in different directions. Sometimes the techniques were similar, for example face to face, side to face, position of hands – it helped me do the same techniques with different configurations. It was good guidance, even though I knew what to do. It guided me to actually go about planning for the grading. The higher your grade is the more of use the CD is, because earlier on in terms of doing the earlier gradings you can just practise the techniques. The higher you go the more techniques there are so you need to create order.”

Interview 2:

Interviewee 1: “Well everything is on there.”

Interviewee 2: “Going over techniques.”

Interviewee 1: “I need the videos. I go over the videos a hundred times.”

Interviewee 2: “Refreshing your mind on the techniques learnt in class.”

Interviewee 1: “I need the mind map for mine. I had all the different types of punches, so I could see all the different types of blocks for those things. I need the syllabus. All the syllabus and requirements are on the disk.”

Interviewee 2: “Everything that you need is on the RAT CD. The videos were the biggest source of knowledge, as there are a lot of sequences in RAT. It is much quicker to go through videos than reading through text. It illustrates things much better than text.”

Interview 3:

“When it came to techniques, it showed the correct way of doing them. I used it to review stuff that was learnt, for example, the sequences. The written stuff helped as well [referring to the syllabus].”

Interview 1 places a value on the RAT framework mind map as a means to create new techniques and seems to be suggesting that by placing the learning within the broader context and framework it helps to see where techniques and principles fit and helps to avoid repetition of the same techniques during syllabus construction. The framework also

seems to provide an example or template upon which to encourage further learning, creativity, planning, and structuring content according to individual understandings. To create the RAT framework mind map Chomsky's Universal Grammar (Cook, 1988) was used as an underlying approach by way of analogy and is the basis for the entire RAT syllabus. The interview 2 feedback places a value on the completeness of the syllabus on the RAT CD-ROM, and a value for video clips as a resource for review. Furthermore, the video clips seem to be valued more highly than text for illustrating how to perform techniques, which further supports the design decision to include more video clips. There was once again a value placed on the mind map (the RAT framework) as a useful resource for planning for the grading. Interview 3 maintains that the RAT CD-ROM provides useful guidance to the correct method of performing techniques, as well as being an effective resource for reviewing learning material covered for the grading. The interviewee was referring to the video clips, but suggests that the text was also useful.

The responses to question (3) revolved exclusively around the video clips:

Interview 1:

"No improvement."

Interview 2:

Interviewee 1: "I think it is the media player more than anything, cos you can't slow down the videos. You can't start in the middle of the video either. It would be nice to be able to play it in slow motion."

Interviewee 2: "The video clips need audio. You need step by step audio instructions while the video clip is playing." [Instructional videos]

Interviewee 1: "We need to be careful with one or two video clips with the text not matching the video."

Interviewee 2: "More techniques added."

Interviewee 1: "More videos. We need videos for everything."

Interview 3

"You could have different angles for the sequences in the video clips, as well as slow motion. No, now it is excellent."

The feedback highlighted that the media player's functionality was not optimum, however a solution to this issue is outside the scope of the RAT Online project. Additionally, it was noted that there are a few video clips with the incorrect names, which would require correction. However the most useful guide to further development of the RAT CD-ROM was the high value for the video clips to support RAT learning and the need to include more of them, as well as the potential to include instructional videos with accompanying audio explanations of techniques. These opinions are expressed elsewhere in this evaluation too.

The responses to question (4) support several themes in this project:

Interview 1:

Interviewee: "I don't think there is more you can add at the level of grade we are in."

Interviewer: "Why?"

Interviewee: "I think we should be... [pause]. We are at a phase where we have gone past the complaining stages, we either do it or we don't do it. Everything is up to us now, because if someone complains I don't know what they want. If anyone wants something we should add it."

Interview 2:

Interviewer: Explained the concept of the interactive slideshows. Interactive slideshows are a series of images depicting the steps in a martial arts technique. Each image is accompanied by explanatory texts and/or other resources, such as other images, video clips, or animations.

Interviewee 1: "It would be very helpful to have all the different angles of things [techniques]. Update the links to other websites."

Interviewee 2: "Instructional videos on all techniques."

Interview 3:

Interviewer: Mentioned the idea of including more instructional videos.

Interviewee: Agrees with adding more instructional videos. "I can't think of anything [else that we can add]."

The need to include more instructional videos (demonstrating how to perform RAT techniques with audio explanations) is once again highlighted. In interview 3 the interviewee was asked a leading question about the instructional videos to elicit some feedback, as he never had much to say before that. Even though the interviewees were asked a leading question about interactive slideshows in interview 2 the discussion quickly returned to the topic of video clips with the interviewees suggesting that video clips could be improved by filming techniques from different angles so that key movements would be easier to see. The interview 1 discussion revolved around learners becoming responsible for adding new material themselves. This practitioner is an advanced learner of RAT and his response reflects an affective value judgement that is consistent with the ethos of social constructivist learning and the synthesis objective of Bloom's Taxonomy (Bloom et al., 1956) and is furthermore aligned with the expert ratings on the teaching evaluation form which were more on the constructivist side of the pedagogical dimension compared to the first evaluation round.

The responses to question (5) revolved around the usefulness and effectiveness of the RAT syllabus and the RAT CD-ROM:

Interview 1:

Interviewee: "Ja." (Colloquial South African English derived from Afrikaans "*Ja*" is "Yes" in English)

Interviewer: "Why?"

Interviewee: "Because it gives you the basics, the framework and it encourages productivity. Like a platform where you can get to know yourself more. Because by doing everything you get exposed to everything and then you get to develop and get a chance to explore what you like more. Also it is not a rigid martial art. It is flexible."

Interview 2:

Interviewee 1: "Yes, it gives us ... we start off learning techniques that are simpler and builds us up to the more difficult techniques."

Interviewee 2: "Yes, in a way, the sequences are harder to learn, but once you know them it is easy to use the techniques in a flowing way."

Interviewee 1: “The new syllabus makes us think a lot more about the techniques that we are doing. It makes us think. It is a lot more difficult.”

Interviewee 2: “It is a creative way of learning techniques, allowing you to think and develop techniques while training.”

Interviewee 1: “We can all add our own piece to the CD.”

Interview 3:

“Yes, it is. When you need to reference certain techniques, it is useful.”

Interview 1 supports the idea that the RAT CD-ROM encourages the construction of knowledge, the cornerstone of the constructivist learning approach. Importantly it is also aligned with discovery learning (Bruner, 1986) where learners are free to explore what they are interested in learning more about and may do so more effectively with communal learning activities. This learner is an advanced learner of RAT and his rank learning requirements are less structured than earlier ranks, following the general guidelines of cognitive flexibility theory (Spiro et al., 1992a). This flexibility in learning seems to facilitate the production of new knowledge and contributes to the effectiveness of the RAT CD-ROM as a learning resource for RAT. Interview 2 supports several of the underlying theories used as part of the theoretical framework. The comment that one starts by learning simple techniques which help to build up to more difficult techniques illustrates that the sequencing of learning is effective. The difficulty of learning the more complex sequences, but then being able to apply them with greater ease suggests that the use of cognitive flexibility theory has been implemented satisfactorily. One of the goals of the RAT syllabus is to encourage learners to think and the ill-structuredness of advanced learning activities suggested in cognitive flexibility theory appear to have facilitated thinking to occur. Furthermore, prototype theory (Taylor, 1989) and multiple contextual training provided the basis for many of the creative learning activities in the syllabus which seem to have facilitated the creation of new techniques by learners. In addition to encouraging thought, an important aim is to promote higher order thinking skills, such as the creation of new knowledge (synthesis) which is what learners have reported occurred in their training. Bloom’s Taxonomy (Bloom et al., 1956) provides a useful approach to design such learning outcomes. The feedback also suggests that learners are aware that they can add to the RAT CD-ROM and do not have to rely on a teacher to add the content. Another of the aims for the future development of the RAT CD-ROM is to make it more of a learner

generated resource, so hopefully their awareness will facilitate the expansion of the CD-ROM in this way. Interview 3 supported the RAT CD-ROM as a useful learning reference resource.

This section will conclude with a summary of the post grading interview findings and how the findings link with key project questions and underlying theoretical underpinnings.

Summary: post grading interviews

There is an apparent shift from the post grading interviews conducted in the first evaluation round from minimal feedback revolving around the need for more video clips to a greater amount of feedback with richer insights in the second evaluation round. Besides the need for more video clips and instructional videos, there seems to be a value placed on the RAT syllabus itself, the RAT framework, and the learning activities to support a meaningful learning experience. These findings correspond to similar findings observed in semi-structured interviews and expert reviews.

As participant observer in the first round of evaluation I noted that the RAT CD-ROM not only became an increasingly useful resource for RAT practitioners, but it also became a useful teaching tool for me as instructor. The next section describes any observations made during the second round of evaluation.

5.9.7 Participant observation

Over time the RAT CD-ROM became a standard training resource in the same way that a punching bag and padded floor mats are standard training resources for RAT. The RAT CD-ROM is used by most of the learners and at least by someone in every training session to refer to their syllabus requirements and to learn new techniques. It was also used by the instructors and learner/instructors to use for teaching purposes.

The resource had become a convenient extension to the face-to-face classes and its original intended use as a resource for RAT learning was extended to become a resource for other martial arts taught in the club. For example the Eskrima syllabus (a weapons based Filipino martial art) was also included on the RAT CD-ROM under the section 'Other Martial Arts'.

This syllabus was referred to often by instructors and learners alike. It was also used by the master (the teacher of the instructors) to evaluate the techniques in the video clips. The high value for the video clips was once again demonstrated by one of the learners when he transferred all the Eskrima video clips for his rank onto a personal digital assistant (PDA) so that he could refer to them in order to prepare for his grading assessment. He had moved to another city to work as a hospital doctor, so had become time-poor with the long shifts he had to work and he no longer could take part in the face-to-face classes. He was attempting an advanced rank (brown belt) and managed to pass with an above average result. He attributes his success with the grading to the video clips which he could carry around with him. I think there is great potential with current mobile device technology to extend the RAT syllabus for use on mobile devices.

Summary: participant observation

The increased reliance on the RAT CD-ROM for teaching purposes, as well as for reviewing techniques by learners shows that the RAT CD-ROM has become an effective resource for supporting the learning of RAT and indeed of other martial arts practised in the RAT club.

The last section discussed is the development log of changes made after the first round of evaluation.

5.9.8 Development log

The handwritten development log increased significantly after the first round of evaluation with 19 pages in total of notes. Before the first evaluation round the development log had largely been about media recording and conversion settings, such as the optimum settings for the video clips. However, due to the feedback from the evaluation several large and sweeping changes had to be made and a record maintained of the recorded and converted video clips so that they do not become mixed up. The development log was a useful tool for reference purposes, especially when there were any delays between development activities. Quite often development could be delayed and only continued days later. Without the development log it would have been easy to forget at what point the work was left previously or what settings were required.

In hindsight a typed computerised development log would have potentially avoided the difficulty of reading the log at times, as the hand writing was sometimes poor especially when the log was taken on site during filming. It is difficult to interpret some people's hand writing. However, without a laptop computer available, a computer generated document was not a practical approach.

A brief summary of the development log activity is provided next.

Summary: development log

While a development log can become a tedious task, it provided me as developer with a powerful tool to reflect on suggested changes, as well as to effectively track changes to the RAT CD-ROM. This tracking of changes included brief explanations of how issues were resolved and these reminders were invaluable because they explained why and how changes were made. However, in future evaluations of the RAT CD-ROM I would ensure that these logs are recorded as computer documents so that they can be searchable for easier exploration.

The next section of this chapter is a summary and conclusion of the two evaluation rounds of the RAT CD-ROM.

5.10 Conclusion

This chapter described the design, development, implementation and evaluation of a computer martial arts resource called the RAT CD-ROM. The resource was designed to support the learning and teaching of RAT in both the face-to-face and online environments.

The multiple methods used during evaluation, including observation, learner feedback, expert evaluations, and records, contributed to a complex, but holistic evaluation showing that the RAT CD-ROM has grown in effectiveness, usability, functionality, and appeal. The effort involved in conducting two rounds (i.e. cycles one and two) of formative evaluation contributed to important decision-making and might have saved considerable re-development time. Important changes to the architecture of the resource could be made early in its development, thus avoiding the necessity to carry out wider and more complex

changes later when development was complete. The development research diagram (Fig. 3.1) is a useful summary of the iterative design cycle which has taken place, as the evaluation and testing in practice, documentation, and reflection has enabled the analysis of the practical problems and the development of solutions to be re-examined and improved providing guidance for future development and evaluation attempts.

The learner feedback and my own participant observation supports the notion that RAT martial arts knowledge, skills and attitudes can be facilitated in computer supported learning environments. Furthermore, this type of learning environment including video clips, images, animations, mind maps and learner contributions adds significantly to an effective design. The expert reviews, cognitive walk-through activities and the learner feedback demonstrated the importance of effective categorisation of knowledge through the use of a tree menu system. While users of the RAT CD-ROM cannot complete activities on the CD, the creative and collaborative learning activities contained in the syllabus and course pages required learners to create learning artefacts, which were later added to the RAT CD-ROM. Evidence obtained through learner feedback and expert reviews suggests that as a result of these learning activities and the resulting artefacts produced, these types of creative and collaborative learning activities are effective in martial arts computer supported learning environments.

In addition to addressing the three main research questions discussed above, the evaluation of the RAT CD-ROM also shows that the resource has been fulfilling its purpose. The learner feedback and grading results show that the resource could potentially be used effectively by learners who are geographically located elsewhere from the face-to-face classes. The learner feedback, expert reviews and participant observation suggest that the visual media, especially the video clips, have contributed improving the effectiveness of the previously text-only syllabus. The inclusion of learner generated content on the RAT CD-ROM addresses the issue of there being no medium for RAT practitioners to store new knowledge about RAT.

The next chapter describes the second component of the RAT Online project: the RAT Online courses.

Chapter 6: RAT Online Courses

This chapter covers the evaluation of the second main component of the RAT Online project: a series of RAT Online courses. Four online courses were conducted consecutively over a period of around two and a half years. These courses included: (1) the Bear Hug course, (2) the Wheel Spanner course, (3) the Belt course, and (4) the Pen course. Each course was considered as a development cycle (see Fig 3.1) in much the same way as the two evaluation rounds of the RAT CD-ROM where changes were made after each cycle.

The purpose of this part of the RAT Online evaluation is to determine the effectiveness of the RAT Online learning environments, as well as to evaluate their usability, functionality and appeal. This series of courses and evaluations was conducted in order to contribute to a set of design principles which will function as a basic template for the practical aim of implementing a RAT Online learning environment. This environment will be comprised of a combination of reference learning resources as evaluated in the RAT CD-ROM chapter as well as online collaborative learning environments for studying RAT. Furthermore, it is intended that the documentation of the four evaluations of the courses will contribute to answering the three research questions. These include whether RAT knowledge, skills and attitudes can be facilitated and developed in online learning environments, what design best supports effective RAT martial arts learning environments, and what types of learning activities and software tools are effective in RAT martial arts learning environments. It is also plausible that the findings in this chapter may contribute to a broader field of interest, such as education more generally but also in subject areas where there is a blend of cognitive and kinaesthetic learning.

The first part of the chapter is an overview of the purpose of the RAT Online courses, followed by a general description of the courses. Different to the RAT CD-ROM chapter which included an explanation of the development decisions and technology used to create the RAT CD-ROM before the evaluations, in this chapter the development and technology is discussed under each course section because a number of technology changes were made in each course. The next section covered is the first of the online courses, the smaller scale pilot Bear Hug course followed by the larger more in-depth course, the Wheel Spanner

course. Then the Belt course is discussed and finally a scaled down evaluation of the Pen course evaluation is described.

The evaluation of the RAT Online courses is no less complex than that of the RAT CD-ROM. In fact, perhaps it is even more so as there is more learner output that had to be analysed. However, I believe that even though in each course there are small participant groups, the range of data sources helps to provide a supportive picture for learning RAT knowledge, skills and attitudes online. These courses contribute to a greater understanding of how social constructivist learning environments can facilitate the learning of RAT higher order cognitive skills, as well as encouraging a value for creative and collaborative learning, and importantly that psychomotor skills can be learned online.

A range of evaluation instruments were used for each course, most of which will be familiar to the reader from the RAT CD-ROM chapter. After a discussion of each course a brief conclusion will be provided, followed by a conclusion for the chapter at the end.

The purpose of the RAT Online courses is described next.

6.1 Purpose of the RAT Online courses

The purpose of conducting the RAT Online courses was to provide online RAT learning experiences to address the following issues: (1) the increasingly geographically separated RAT learning community, (2) the potential to cover RAT theory topics online and increase the time in face-to-face classes for the perfection of physical skills, (3) the provision of a centralised online location across intra- and international boundaries to discuss and contribute to RAT theory, (4) the creation of a growing knowledge repository to store and share learning artefacts, and finally (5) to contribute to sparse research in the area of physical knowledge and skills in the online learning sphere. It was felt that an online learning environment would address all of the above issues.

Next a description of the RAT Online courses is provided.

6.2 The RAT Online courses described

The RAT Online courses are each different in their own right, however the aim of each was an attempt to: (1) promote strategic thinking and learning about RAT, (2) promote the group and individual creation and representation of new RAT knowledge, (3) foster collaborative learning and a value for the opinions of others to promote one's own learning, and (4) to promote the learning of physical RAT skills. Furthermore it was intended that running the courses multiple times would contribute to the reliability of the study. Where the RAT CD-ROM was intended as not so much a learning environment and more of a learning resource, the RAT Online courses each have the express aim of providing learning and collaboration opportunities online for participants, i.e., learning environments.

The course delivery platform changed with each new course, as this series of courses was carried out over an extended time frame and circumstances and the availability of different technologies meant that changes were required to sustain the project. These changes are depicted in the descriptions of each course provided below and might be useful to show how projects of this nature can and need to adapt to achieve effective outcomes in such complex conditions. Moreover this description of events reflects the rapidly changing technology environment.

Similar to the evaluation of the RAT CD-ROM this component of the RAT Online study is evaluated from several perspectives involving various participant groups, such as the learners, experts, and participant observer. The methods used will be covered in each of the sections below as well as a more detailed description of the participant groups.

The bear hug course is discussed next.

6.3 Part 1: The Bear Hug course

The Bear Hug course was a pilot course to evaluate whether the RAT Online project was worth pursuing further. This course was in fact the first attempt at providing online learning for RAT in this project. Based on the success of the course and the participant

feedback the study was expanded to include the development of the RAT CD-ROM and additional RAT Online courses.

Before discussing the evaluation, basic background information will be provided about the course, starting with the course aims.

Course aims

The primary aim of the Bear Hug course was to determine whether RAT and other self-defence knowledge and skills can be learned online. The course was designed to take advantage of online communication tools encouraging the active participation of learners to identify and solve self-defence problems by applying RAT theory using a social constructivist learning approach.

The entire course is based around a single self-defence problem, that is, the rear bear hug. A rear bear hug is a technique where an assailant grabs their victim from behind wrapping both arms around the victim's body, either under or over their arms. In this course, the self-defence problem is made more complex because the victim is lifted in the air. From a self-defence perspective this is a particularly dangerous position to find oneself, especially if the assailant is bigger and stronger than the victim. Furthermore, the rear bear hug while being lifted in the air is not an attack that is often trained in martial arts schools. This is at least my observation. This is not to say that it is never practised of course, but this problem was chosen because of the lower likelihood of participants having done this technique previously and so attempting to avoid bias in the study. However, if someone had done this technique before, it was expected that they would share their experience with others on the course, as well as extend their knowledge and experience.

The course was designed to run for around two weeks during which time the participants were required to analyse the self-defence problem, discuss possible solutions and create techniques to escape the rear bear hug.

Development and course tools

An online course was designed and developed in a proprietary learning management system (LMS) called Web Course Tools (WebCT). A set of five HTML web pages and a cascading style sheet (CSS) were created using Macromedia (now acquired by Adobe)

Dreamweaver as the development software. The five pages contained the instructions for the course tasks and were embedded into the WebCT course environment. The built in WebCT discussion forum tool was used to host the first four topics of the course, while the Mail tool was used for the fifth task.

Participants

In this first RAT Online course, the participants included the learners and me as participant observer. Ten all male learners took part in the course and ranged in age from 18 to 53 years old. Eight of the learners trained in RAT, while the other two trained in other clubs. All of the participants had trained in other martial arts previously, either in the RAT club or elsewhere. These additional martial arts included Karate, Kendo, Eskrima, Ju-Jitsu, Kung Fu, and Krav Maga. Of the eight RAT practitioners six took part in face-to-face RAT classes (in Durban, South Africa), while the remaining two had previously trained in RAT in the face-to-face classes but had moved to the United Kingdom. These two participants took part in the course remotely, as did the two non-RAT participants (one in Johannesburg and the other in Durban). All the other participants took part in the course remotely from Durban.

Evaluation methods

This evaluation consisted of three data collection methods (Table 6.1), which included the learner contributions during the course, an online questionnaire, and participant observation. The methods taken together provide insights into the four evaluation areas of interest, including functionality, usability, appeal, and effectiveness. The matrix (Table 6.1) shows which evaluation areas are covered by each method. It was intended that the multiple methods will provide an opportunity to cross-check findings.

Table 6.1: The bear hug course evaluation matrix

Methods	Instruments	Functionality	Usability	Appeal	Effectiveness
Learner output	Learner contributions				X
Learner feedback	Questionnaire	X	X	X	X
Observation	Participant observation	X	X	X	X

Course description and tasks

The course consisted of an instructions page containing the course objectives and instructions on how to work through the course. There were five main tasks in the course, each of which consisted of a number of sub-tasks. None of the tasks counted towards a final score. The tasks were designed to build on each other going from a structured task in the beginning to less structured creative tasks towards the end, matching the approach taken in cognitive flexibility theory (Spiro et al., 1992a). The whole course was designed around communication and collaboration to develop new techniques while I was available as the facilitator to guide learners through the tasks. This approach was in line with social constructivist learning (Vygotsky, 1978). It was intended that through the reflective activities and challenging each other's views that learners would gain in Bloom's cognitive and affective domains (Bloom et al., 1956; Krathwohl et al., 1964) as well as experiencing minimal psychomotor learning (Singer, 1982). Learners were also expected to be able to apply general principles underlying RAT, such as MCT. An online chat tool was provided for the participants' convenience should they need to discuss any aspect of the group work and a discussion forum was used for most of the course tasks.

The tasks entailed:

1. **Task 1:** Identifying the self-defence problem, distinguishing between the problem and a similar self-defence situation, creating a list of possible techniques for each situation, then a list of preferred techniques. Using the discussion forum, participants were encouraged to submit images or video clips of the techniques if required for further explanation.
2. **Task 2:** Reading and viewing the comments of other participants, evaluating each other's techniques pointing out good and problem areas with reasons in the discussion forum.
3. **Task 3:** Discussing the problem and any principles applied in the picture as a group, developing a series of techniques to deal with the problem as a group and then choosing one person from the group to demonstrate the techniques and upload photos or video clips of the techniques into the discussion forum.
4. **Task 4:** Providing any further comments to the list of techniques in task 3, refining the list and adding explanations for each technique and then submitting this information in the discussion forum.

5. **Task 5:** Providing feedback about the course. This short online six question questionnaire gathered basic biographical information and information about the course experience.

The next part of this section covers the course evaluation, which includes the following sub-sections: (1) the learner contributions, (2) the online questionnaire, and (3) participant observations. There was minimal communication outside the course environment. Thus communication is not discussed for the Bear Hug course.

6.3.1 Learner output: learner contributions

Each task (discussion topic) was first analysed with TextStat, which is a text analysis software tool. TextStat is a basic word and syllable counting tool. This part of the analysis was used to gain an overall picture of the kind of martial arts and self-defence topics covered in the course to determine if these topics matched the kinds of knowledge required for this course. A TextStat text file was generated for each task and then the text was copied into Microsoft Word and further analysed by removing all grammatical words, such as prepositions and articles (e.g., to, from, the, a), as well as irrelevant words such as names, dates, etc. Then synonyms and misspelt words with the same meaning were grouped together and a numbered list was generated in Word.

The range of self-defence ideas was broad which included the frequent mentioning of self-defence categories, such as striking techniques, grappling, and psychological barriers. Some of these words included: fence (psychological barrier), advantage, kick, strangle hold, attack, avoid, awareness, and numerous others. The range of categories and techniques mentioned indicates that as a group important ideas were identified when analysing a self-defence problem.

This stage was used merely as a starting point for this analysis, as it was not clear how many of these self-defence concepts mentioned were generated by the course facilitator as opposed to the participants. Moreover the context of the discussion demonstrates the participants' level of understanding when using the words. It was felt that it would be

better to review the quality of each of the posts in their entirety rather than instances of individual words.

Thereafter each discussion task was downloaded and placed into individual Microsoft Word documents and saved in Rich Text Format (RTF). These RTF files were added to the QSR NVivo software and each message was coded by name of participant so that it would be easier to read what each participant wrote individually. This would become a useful marking tool in later courses. Each of the participants' responses could then be analysed to determine if they had completed the tasks successfully.

Overall there were 76 discussion messages including the facilitator posts, mostly focused around the course tasks with some of them being about technical issues.

A brief description of the first four tasks follows. Task 5 is discussed under learner feedback: online questionnaire.

Task 1: Identify the self-defence problem

Four of the participants posted responses to the task, all of which were high in quality. Their responses covered a wide range of self-defence topics and categories. These responses showed that the participants had recognised the danger of this self-defence problem and they already started creating solutions to the problem, while recognising the importance of awareness, avoiding such situations, escaping as soon as the opportunity arises, using implements as weapons, and the problems associated with bigger and stronger attackers, as well as the possibility of multiple assailants. The remaining participants, except for two of them provided responses to at least one of the other tasks. Sometimes these responses included information required for tasks other than the ones they were supposed to be doing. It seemed almost as if the various tasks produced a natural flow of conversation. However, this can make it difficult for me as facilitator to group responses into the various course task sections.

The following excerpts from the participant forum postings seem to demonstrate a cognitive engagement with the topic:

- a. “You have to be extremely [aware] of your surroundings.

The moment he has got hold of you, you are in a very vulnerable position. So as he grabs you, you have to immediately react and take advantage of the fact that you still have your feet on the ground.”

- b. “The problem is the feet off the ground, as the person being hugged has no balance control and therefore is at a disadvantage.”
- c. “The problem if your feet are off the ground is that you cannot root yourself to create the necessary leverage to free yourself.

... Once free you can either run away (escape) or counter with a variety of techniques.

... The best would be to have a high level of awareness and try to avoid getting into a situation where one is caught in a bear hug...”

- d. “...All of the above are escapes using implements to inflict pain, I don’t see the point in counter attacks if you can get away, the longer you wait the more chance you will have of getting yourself in a worse situation...anyone is welcome to challenge/disagree.”

Task 2: Read and evaluate

Six of the participants posted messages related to this task. In addition to expanding on the previous discussion postings and engaging cognitively with the task, participants appeared to be demonstrating an affective engagement through their analysis of others’ ideas while showing respect when doing so. This is in accord with the social constructivist approach taken in the course design.

The following response shows how one of the participants identified a further problem related to the bear hug attack, as well as pointing out a potential risk if one of the techniques suggested by another participant is used.

- e. “... If there are multiple assailants one can distract you and the other can grab you making it very difficult to escape. One problem with the body drop

to grab the leg is that one must be careful not to allow the assailant access to your neck to apply a choke or stranglehold.”

The discussion excerpts below show how affective appreciation of being able to read other people’s responses appeared to be contributing to a growing understanding in the participants about this self-defence situation.

- f. “I have read the replies, and am impressed by most of [the] answers/comments. [Participant’s] question is very relevant...

... I also agree, about the escaping part. Make as much distance between you and the danger. Put a few obstacles between him and you, assess the situation, and make your next move.”

- g. “From reading [Participant’s] and [Participant’s] response/comments, I became aware of mishaps in my techniques...

...I was glad [Participant] mentioned the creation of a noisy commotion as I also thought about that but then thought it was stupid, (and so I’ve learned, nothing in self-defence is stupid).”

- h. “Making a lot of noise to create awareness of your situation to others did occur to me too, however making the attacker panic has got disadvantages too such as the attacker resorting to using weapons to silence the victim. Personally I would create a false sense of security for the attacker and act passive[ly] in the hope of fooling/surprising the attacker.”

- i. “...As suggested by [Participant] the use of a sharp weapon of sorts would be first prize...

...One point to mention regarding the use of the rear head but is that you do not know how tall the attacker is or what angle their head is. Towards the base of the back of the head is a dangerous area to be using to strike with as you run a real risk of concussing yourself.

... Adding on to these principles you cannot be fancy with the techniques

you apply as any action that does not bring immediate results is only going to evoke an increase in aggression from the attacker.”

Task 3: Discuss the problem and demonstrate techniques

Again six participants took part in this task, with one of them demonstrating an increasing engagement in the course. He was quieter in the beginning, but after having read the other participants' discussion posts he initiated some interesting ideas.

One person from the group was required to submit images or video clips of a set of techniques agreed upon by the group. This part of the task was not completed mainly due to the lack of technology available to take photos and video clips. However this part of the task was completed in task 4.

The previous discussions provided a good platform for further discussion about principles and techniques in this self-defence situation, as participants acknowledged each other's input and built upon ideas. The principles discussed were shaped into useful strategies to deal with such self-defence problems.

The comments below demonstrate the collaborative nature of the participants' forum posts and their emerging knowledge, especially that self-defence is about more than simply dealing physically with the attack and more about avoiding, escaping, distracting and awareness. The participants also seemed to develop an increasing confidence in intellectual debate providing reasons for what they had to say. The cyclical reflective process seems to have helped develop greater insight for a solution to a complex self-defence problem and might have been supporting the course as an appealing learning environment.

- j. “There are some very appropriate points being discussed. It shows the necessity of understanding grappling concepts as this gives one more options when there is close body contact as in a bear hug...

... I think to make a noise is a good idea as it could distract your assailant and possibly attract help.”

- k. “I like the idea of what [Participant] and [Participant] have said about wrapping your leg around his, the only problem I can see ...

...Everything that has been said so far by everybody sounds great, I really like the idea of shouting and screaming to distract him and/or attract attention (really good!).”

[This participant’s involvement was minimal in the first task, but seemed to escalate as the course progressed. He posted a few other messages in this forum task.]

- l. “In light of [Participant’s] points (which I found very good) I think we have to evaluate the position very carefully with regard to which techniques we use based on our strength/size.”
- m. “...One point I would like to debate is this fear of going to ground. Yes I know that there are many good reasons why this is a fatal move in most self defence techniques which I support completely. However in the light of the fact that you are immobilised, unable to defend or attack and unsighted a short visit to the ground would put the advantage back on the side of an experienced wrestler...”
- n. “Having read all the discussions, and thinking again about the whole subject, I decided to have a good look at the picture in Task one again. This is just an idea that occurred to me...”

Task 4: Refine the list

Much of this discussion revolved around having the final photos and list of techniques uploaded. One participant volunteered to take the pictures and submit them for the group with the other participants providing him with the list of techniques to photograph. Some of the discussion that ensued was then about logistical restrictions to take the pictures, such as technology and time.

Some of the other participants contributed to the list refining it even further and also went to the extra trouble of doing further independent research and sharing it with the group.

The final submission included nine quality techniques which included variations (options) of basic techniques. The techniques were uploaded as photos, which can be used by other RAT members. This demonstrates to some degree that one participant has developed psychomotor skills in order to demonstrate the techniques, but with static photos it makes it difficult to determine the level of psychomotor development. Motion is required to better

evaluate psychomotor skills. This aspect would be a challenge for future RAT Online courses.

The comments below illustrate some of the points discussed above.

- o. "...I cannot submit any photos because I have no computer or web cam..."
- p. "...all my friends are working at the moment so I have no one to take pictures with..."

...Looks like Sunday may be the only day for me...I'll do my best to get the pics done, my web cam only works when attached to the computer so it's difficult."

I was also thinking....for those who don't have access to web cams and digital cams you could send me a list of techniques to act out, all I need is detailed instructions to the techniques (which we have to provide anyway)...

I've got someone to help me either on Sunday or Monday, hope that's not too late..."

- q. "Of the discussions which I find interesting and very relevant (all the techniques will work under given circumstances) the one thing I think that stands out to my mind is the need to be aware of what is happening around you..."
- r. "I've thought a lot about the whole subject, and decided to go a little more into this particular area. These techniques work for me, and they are relatively simple. I am going to copy a little bit out of..."
- s. "Great pics [Participant]... I really take my hat off to you for taking the trouble to post the pics. Just one thing though... [going on to point out an issue with one of the pictures]"
- t. "...I just want to say that all the ideas that have come up have been great and that the course has been to me a success. It's opened up my mind to defences and attacks."

The next section describes task 5, the online questionnaire.

6.3.2 Learner feedback: online questionnaire

The online questionnaire consisted of six questions which nine of the participants answered using the internal mail tool in WebCT. Interestingly two of the participants who had responded to the questionnaire had not completed any tasks, but claim to have learned by reading other participants' contributions. Another active participant did not complete the questionnaire. Most of the questions were open ended in nature, and included basic biographical information, which has already been provided above. The last three questions will be discussed in this section. These included:

- Did you find the course benefitted you in any way? If so, how?
- What difficulties did you experience in the course?
- Would you like to take part in any other online course of this nature?

Task 5: Course questionnaire

Each of the question's feedback will be covered below.

Did you find the course benefitted you in any way? If so, how?

Even though not all of the participants took part in the tasks, all who have responded felt that doing the course benefitted them in some way. It could be argued that the participants would be inclined to say they benefitted from doing the course because they could be identified through the WebCT mail tool which was used to gather the feedback. However, the questionnaire was more in the style of a semi-structured interview in which case the respondents would have been identifiable.

Overwhelmingly the reasons participants provided for their positive responses revolved around being able to read other people's perspectives and how the tasks challenged participants to think, helping them to develop a greater understanding of the particular self-defence scenario and about self-defence more generally. The comments support the social constructivist learning design in this course, as well as the complex nature of the task starting with a simple image contributing to the learning which was inspired by cognitive flexibility theory (Spiro et al., 1992a).

The feedback below illustrates the findings above.

- u. “Yes it did. It was quite interesting that from just one picture the topic could be expanded so much, and how other points of view were brought into discussion.” [This participant did not take part.]
- v. “It benefitted me in seeing other people of different ages, sizes and grades perspectives on the given situation. Also for me it was the first time I have taken part in an online discussion group so it was a learning experience.”
- w. “The course was interesting and very unusual for me. I am not at all familiar with these types of study techniques via the internet, and found it a little intimidating at first, but soon got the "hang" of things...

... The whole concept made me "think", a lot more than I normally would have about a particular self defence scenario, and what techniques could be used.”

- x. “The course enlightened me in certain aspects of martial arts and many other things I had not considered before...I also got to view my opinions and see others while interacting and learning from people. This course also raised awareness and made me think about the situations I could be in by the lack of awareness.”
- y. “Yes, the course benefitted me in a very challenging way. At first, looking at the first task, mind went ‘simple’ but then as I analysed the situation further I began thinking in a way that was very unusual for me - this was provoked by the task itself and the response from the other people involved in the course. This is what made me enjoy it also. The course also made us put to practice what we actually know or what we think we know which was very challenging because when you think you know something you don’t feel the need to do it but then when you do it you learn a lot more than you anticipated (i.e. practise our theory). The course made me more open minded with respect to real life situations (from the other guys’ response[s] a whole lot of things sprung up – (the ‘what if’s of the situation).”

What difficulties did you experience in the course?

The difficulties surrounding technology were anticipated, but the feedback confirmed this. What it also shows is that participants were engaged enough in the learning process to manage to participate. One of the participants could not take part at all purely because of computer problems. Also bad Internet connectivity affected some participants, which was a known problem in South Africa at that time. Other issues included lack of time, having to use work resources which affected how much time could be spent on the course, and the lack of partners to try the techniques out on.

Below is a selection of comments illustrating the issues experienced by participants.

- z. “My main problem was using a facility belonging to the company I work for and during work time (I was limited to the amount of time I could spend on the course and was also often interrupted).”
- aa. “My time allocation was erratic, and I did not do the course in a scheduled manner...

... I do not have anyone to try out these techniques on.”
- bb. “Time constraints as I was writing exams during the first week ..., being the first time I was not sure who would arrange task 4 and finally not having a training partner to work with for the pics.”
- cc. “Finding a partner for demonstrating techniques was more difficult then I first thought ...

...A few technical problems with the web cam and the reduced quality as well as restricted space (because of the web cam attached to computer). These problems can be overcome and I may now have access to a digital camera from a friend.”
- dd. “Personally, it is no excuse, I have found it difficult to find time with trying to fit in both studying and work, and also that when the course started I was away for the first weekend and did not have access to the net.”

Would you like to take part in any other online course of this nature?

All of the participants felt that they would like to take part in another RAT Online course and some volunteered further feedback as to how courses of this nature could be improved.

The feedback below provides a few of the suggestions for future RAT Online courses.

- ee. “In all honesty the course was fantastic... Possibly more for me because of my isolation. It would be very beneficial to be able to do more such courses, if the topics were relevant. I would also like to have short training courses that I can follow, set targets and exchange ideas. I am talking about different weight training, fitness, techniques/principles, discussion groups, interesting articles, hints and tips, self study material (books, videos, web sites etc)...”
- ff. “I liked this course, time seemed like a problem but I think if we have a week or two per class then I would definitely like to do more classes like this.”
- gg. “Yes, longer duration.”

Next a few of my own observations are provided.

6.3.3 Observation: participant observation

The pace of the course was demanding given the time constraints that some participants mentioned. This might have been the reason I had to encourage participants to complete their tasks. Despite the initial perception that participants were not as self-motivated as expected, it seems as if this might have been a false perception and that they were actually quite self-motivated and it was other influencing factors in their lives that might have been preventing them from participating as fully as expected in the beginning. Also some of the participants went above and beyond the requirements of the course and carried out their own research.

Judging by the level of participation, the quality of the work produced, as well as the positive participant feedback, this course prompted me to advance the RAT Online project to the next stage, which included the development of the RAT CD-ROM and designing and running further online courses.

6.3.4 Bear Hug course conclusion

This course was designed with a social constructivist (Vygotsky, 1978) approach. Thus the course included discussion tasks as the primary learning method and guided the choice of the discussion forum tool as the main technology delivery medium. Cognitive flexibility theory (Spiro et al., 1992a) influenced the sequencing of the course from the simpler task of making a list in the beginning of the course to the more creative tasks of designing and evaluating techniques and then submitting the photos as solutions to the self-defence problem. The analysis required of the problem in the photo as well as of each others' work was intended to encourage the higher order thinking skills such as analysis, synthesis and evaluation discussed in Bloom's Taxonomy (Bloom et al., 1956). Furthermore multiple contextual training (MCT), as derived from Universal Grammar (Cook, 1988) and prototype theory (Taylor, 1989) also informed the design and facilitation of the course. It was intended that by using MCT the single photo would be a catalyst for a string of ideas and these ideas would fit into the bigger picture of martial arts knowledge, pushing and extending participants' ideas even if they had trained in a previous martial art, possibly having a more restricted range of techniques.

The results of the course are satisfactory, demonstrated through the evidence of learning and understanding generated in the discussions. The appropriate choice of the discussion forum tool to facilitate discussion seems to have worked well and the good standard of course work and camaraderie supports the social constructivist approach taken in the course. Albeit fast paced, an appropriate course sequence helped to achieve the aims of the course through the use of cognitive flexibility theory in the design. Course participants exhibited Bloom's higher order thinking skills through their intelligent analysis and evaluation of each others' work, as well as by creating solutions to the problem. They have claimed that their knowledge has been extended from their previous level before the course. Furthermore, participants also displayed positive affective attitudes and were able to

constructively criticise without offence, as well as offer solutions and reasons for their criticisms. MCT helped me as facilitator to think broadly and guided my evaluation and responses to participants' posts. MCT and the open learning approach in RAT also seems to have extended the thinking of learners beyond their previous thought patterns about martial arts.

This course was a success, but was tarnished slightly by technology issues and the reality of time constraints demanded by more important responsibilities in life. These results have provided some answers to the three research questions; the most significant being that RAT knowledge and attitudes can be facilitated and learned in computer supported learning environments, with a tentative hint at the development of skills. A design based on the eclectic-mixed methods-pragmatic paradigm (Reeves & Hedberg, 2003) allowing the integration of multiple approaches such as social constructivism, cognitive flexibility theory, Bloom's Taxonomy and RAT supports effective learning in these environments. More is required in subsequent evaluations to find out about the visual and technical design components. It would seem that a basic design approach in a martial arts computer supported learning environment would be to include activities that promote the collaborative creation of knowledge and the tools to support these activities.

The course also demonstrated the potential to address the following issues in the RAT community and learning: bringing people together from geographically separated locations to learn RAT, high quality learning experiences to develop in participants a deeper understanding of RAT theory so that more time can be used in face-to-face classes on the development of skills, the provision of a centralised online location for practitioners to contribute to RAT knowledge, the creation of a RAT knowledge repository for practitioners to contribute and share knowledge, and the contribution to research in the area of learning physical types of knowledge and skills online.

The RAT Online project was significantly expanded after this course and greater effort was placed into developing and demonstrating psychomotor skills.

The Wheel Spanner course discussed next was a longer more in-depth course than the Bear Hug course.

6.4 Part 2: The Wheel Spanner course

The Wheel Spanner course was designed as a more fully developed learning environment using the experience gained from the Bear Hug course. The main purpose of the Wheel Spanner course was to increase the range of learning activities and outcomes covered in the Bear Hug course and then evaluate the effectiveness of the course using a number of methods and covering various areas of evaluation, such as the usability, appeal, and functionality of the learning environment with the aim of answering the research questions.

This section provides an account of the design, development, and implementation of the Wheel Spanner course within the number of evaluation dimensions discussed.

Next, the aims of the course are provided.

Course aims

The Wheel Spanner course was not only designed to evaluate the effectiveness of teaching and learning RAT Online, but also had the practical aim of providing an opportunity for learners to gain useful knowledge, attitudes and skills. As all of the participants were already martial arts practitioners and most already trained in RAT, a topic had to be chosen that none of them would have learned before. While RAT practitioners train how to use weapons and defend against weapons, we do not encourage members to carry them. Part of the RAT training method is to develop the knowledge and skills to be able to apply previous learning to new situations, such as learning how to use a weapon and then applying this knowledge to the use of implements as potential self-defence tools.

In this course the four sided wheel spanner is used as a self-defence tool. The wheel spanner is the type typically kept in the car boot and usually used to change car tyres (Fig. 6.1). This tool was chosen given the perception that stopping at the side of the road in South Africa at that time was a potentially threatening situation and a tool that could be used to free oneself could be useful. Thus there would be a practical outcome and the course would not be encouraging the carrying of weapons for the explicit purpose of self-defence.



Fig. 6.1: Four sided wheel spanner

The discussion and sharing of ideas in the Bear Hug course was perceived to have promoted learning to occur. The idea of discussion and knowledge sharing formed the basic building blocks of the Wheel Spanner course, but the outcomes of this course also required more convincing evidence of the development of physical skills. A greater range of learning activities was included, such as the development of strategy in self-defence and the representation of learner knowledge. As such the learning activities are more complex in this course compared to the Bear Hug course, also requiring the use of a greater variety of technical tools.

This course was extended in duration, lasting around one month (23 February – 31 March 2004) to account for the additional learning activities and reflective time for the more challenging learning outcomes. As an incentive learners were told that they would receive a RAT course certificate upon successful completion of the course. Learning artefacts generated during this course would be added to the RAT CD-ROM for other learners to view and use.

Development and course tools

I was granted special permission to use the University of KwaZulu-Natal's instance of WebCT to carry out research for the Bear Hug course. Given that most of the Wheel Spanner course participants were not students of the university and not on the student database it was felt that continuing to use the university's instance of WebCT was not

sustainable if I was looking to release RAT Online to the wider world. WebCT did not contain tools required for the new learning activities designed for this course. Furthermore, I did not want to carry out this research while having to rely on any one single technology. While evaluation of the technology does indeed form an important part of evaluations of this nature, given the rate of change of technology it was deemed more important if this research resulted in a set of learning design tasks for RAT that could potentially be deployed on various online learning systems.

For the above reasons a custom website platform was developed using Microsoft Active Server Pages for the web pages and CSS for the layout. Adobe (formerly Macromedia) Dreamweaver was used to develop the ASP pages which included an explanation of the course as well as the task pages. The task pages and the top menu contained links to the various learning tools. Before developing the course Microsoft Word was used to create a storyboard containing all the text for each learning activity. A digital camera was used for photos of course material and edited and compressed to smaller file sizes using Adobe Photoshop. A free ASP discussion forum (Web Wiz Forums) was set up and plugged into the RAT Online website for the discussion activities. Macromedia Flash Communication Server was used to develop white board chat rooms, a video chat, as well as four virtual self-defence rooms. Course participants were also advised that they could use the RAT CD-ROM to access the mind mapping software called Freemind. The course was hosted on the RAT Online website.

Participants

This course consisted of three participant groups: the learners, experts, and me as participant observer.

In the learner group 12 candidates indicated that they were interested in doing the course. Nine all male participants began the course with one of them dropping out shortly after the course started. Eight participants were active in the course but only six completed most of the tasks and received course certificates at the end. The course participants ranged in age from 14 to 50 and several had trained in multiple martial arts ranging from nine months to 27 years martial arts experience. A total of 12 martial arts were represented (Japanese Ju-Jitsu and Brazilian Ju-Jitsu were placed into one group as both belong to Ju-Jitsu), but participants were not necessarily experts in these martial arts. Five of the participants had

trained in RAT previously and three were new to RAT. Only one participant had never trained in RAT before. Four (effectively three as one of these participants never completed the course) of the participants had taken part in the previous Bear Hug course, while the remainder had never taken part in an online martial arts course. Two of the participants took part in the course remotely from the United Kingdom, one in Australia and the remainder in Durban, South Africa.

Two expert reviewers were able to take part in the Wheel Spanner course who both reviewed the course using the user interface rating form and the teaching evaluation form. Both of these experts also evaluated the RAT CD-ROM. No martial arts experts were willing to evaluate the course, mainly because of Internet connectivity issues. Thus there was no content expert evaluation in this course.

Evaluation instruments

Seven evaluation methods were used to collect data for this course covering functionality, usability, appeal, and effectiveness (Table 6.2). These methods included the learner contributions, an online questionnaire, post course interview, user interface rating form, teaching evaluation form, participant observation, and development and implementation log. A greater variety of evaluation instruments and reviewers were included for this course to provide a more holistic review of the course shedding light on important design decisions and the effectiveness of the online method of learning RAT.

Participant observations, the development log, and communication data are presented as needed to support findings only and are placed within the flow of the discussion. It was decided that placing this information within the context of the discussion (of learner output, learner feedback, and expert evaluation) would afford easier reading.

Table 6.2: The wheel spanner course evaluation matrix

Methods	Instruments	Functionality	Usability	Appeal	Effectiveness
Learner output	Learner contributions				X
Learner feedback	Questionnaire	X	X	X	X
	Post course interview	X	X	X	X
Expert evaluation	User interface rating form	X	X	X	X
	Teaching evaluation form				X
Observation	Participant observation	X	X	X	X
Records	Development and implementation log	X	X	X	X

Course description and tasks

The full name of the course was “The Four-Sided Wheel Spanner – X-Bar: An Introduction”. As this course would require greater physical activity and martial arts movements, a safety warning message was placed on the home page, as well as a number of important safety suggestions and links to all the course information and tasks. The site was divided into the following main areas with links and drop down menus to each sub-page (Fig. 6.2): course home, information, tasks, course tools, contacts, and resources.



Fig. 6.2: Wheel spanner course menu

The information menu item contained links to the following pages: about this course (explaining what is required of learners to complete the course successfully, the course duration and that the material generated on the course will be added to the RAT CD-ROM), grading criteria (and mark allocation for each task), and certification information. The tasks menu contained links to all the tasks in the course, while course tools contained links

to the discussion forum, video chat, virtual self-defence rooms page, whiteboard, and a page about Freemind. The contacts menu item contained the names and email addresses of course participants, and resources contained links to a number of artefacts deemed useful for the course, such as images used within the course, a movie clip, the old face-to-face wheel spanner course, a fight scene mark sheet, an example certificate, and software. In addition to the top menu, the task pages each contained links at the bottom of the page indicating which task is next and visual cues were provided to assist learners with navigating the site, such as links being underlined and coloured in blue and visited links being coloured in red.

The 'about this course' page explained what was required of learners as a set of general learning outcomes. These included advising the learners that they would be doing more than learning a collection of techniques, but rather that they would be constructing a syllabus through a series of active knowledge building tasks. They were also advised that they would be expected to demonstrate proficiency in their newly learned wheel spanner skills, as well as apply their strategy knowledge in various self-defence situations. Reeves & Hedberg's (2003, pp. 34-36) eclectic-mixed methods-pragmatic paradigm forms the overarching approach in the Wheel Spanner course design experiment. Like the Bear Hug course, this course was designed with social constructivism (Vygotsky, 1978) as its cornerstone. Hence once again this approach guided the choice of collaborative tools, such as the discussion forum, chat and others described in the tasks below. The course structure was built using cognitive flexibility theory (Spiro et al., 1992a) as a guide for the sequencing of tasks and for their complexity. Bloom's Taxonomy (Bloom et al., 1956; Krathwohl et al., 1964) was used to inform the course outcomes. MCT and the open RAT approach were used to design and guide the facilitation of the course.

Assessment was continuous with most of the tasks carrying a mark contributing to an overall total of 100%. A marking rubric was created for the mark bearing tasks and each task was given an active name given the active nature of the learning tasks. Participants were also asked to provide a mark for their peers in some of the activities, but these marks were not used as for the most part participants did not do this part of the tasks. The following were the eight main course tasks with their allocated mark weighting: (1) Reflect, Research and Experiment (0%), (2) Watch a Movie (0%), (3) Comment and Practise (10%), (4) Video Chat (5%), (5) Experiment and Discuss (10%), (6) Represent your Knowledge

(20%), (7) Virtual Self-Defence – Discussion and Simulation (15%), and (8) Practise and Record your Knowledge (40%).

Below is an overview of each of the tasks.

1. Task 1: Reflect, Research and Experiment

Participants were asked to reflect upon what weapons are and how they came about, as well as the types of objects that can be used as weapons. The participants were also asked to perform independent research on different martial arts and their use of weapons, as well as the origins of the weapons and their original intended use (e.g., as farming implements or purpose-built weapons). The participants were then asked to begin physically experimenting with the wheel spanner and explore how it could be used for self-defence. They could refer to the old face-to-face wheel spanner course syllabus document to help with the task.

2. Task 2: Watch a Movie

Participants were encouraged to watch a short video clip showing a person defending himself with the wheel spanner against two attackers. This task was intended to stimulate ideas about the range of techniques that can be used.

3. Task 3: Comment and Practise

In this task participants were required to submit a discussion forum (Fig. 6.3) post after having conducted further practise. This discussion post required three main pieces of information: (1) whether the wheel spanner fits into the participant's view of what a weapon is with reasons, (2) whether the wheel spanner shares or does not share attributes with other conventional weapons, stating which weapons and the attributes, and (3) based on any previous knowledge participants were asked to list the main attacks and defences (i.e., techniques) possible with the wheel spanner, providing reasons why the wheel spanner would be useful for each technique.

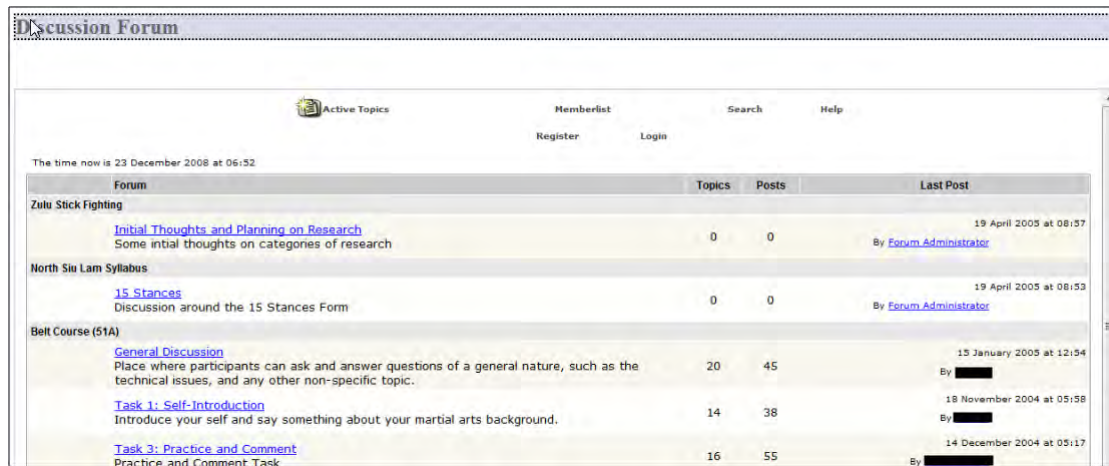


Fig. 6.3: Discussion forum tool

4. Task 4: Video Chat

This was a synchronous learning activity. Learners met online at an agreed date and time to further discuss the positive and negative aspects of the wheel spanner as a self-defence tool and to initiate a discussion about categorising the various techniques, e.g. which techniques would fall under the category 'strikes'. Participants were encouraged to read the comment and practise task and cover all the types of techniques discussed. A video chat was used in case participants wanted to demonstrate a technique that was difficult to describe (Fig. 6.4).



Fig. 6.4: Video chat

5. Task 5: Experiment and Discuss

This task required learners to find a trustworthy training partner and continue experimenting with the techniques and ideas shared from previous tasks. A further safety message was provided at this point. Participants were advised to attempt to cover techniques from all categories, such as strikes, grips, blocks, etc. They were then asked to share their experiences in a discussion forum about which techniques work well and which do not. They could upload media, such as images, drawings, animations, or video clips to support their explanations.

6. Task 6: Represent your Knowledge

This was a group mind mapping task and consisted of two parts. Firstly, three groups were formed and learners were required to meet in the synchronous whiteboard chat room created for their group (Fig. 6.5). They were asked to discuss all the various categories covered so far and begin to build a mind map representing all this knowledge, while applying important self-defence principles. Secondly, after the chat and once they had agreed on their final map they were then required to use Freemind or any other tool (even take a screen capture of the whiteboard mind map) and upload the mind map in the discussion forum set up for this task.

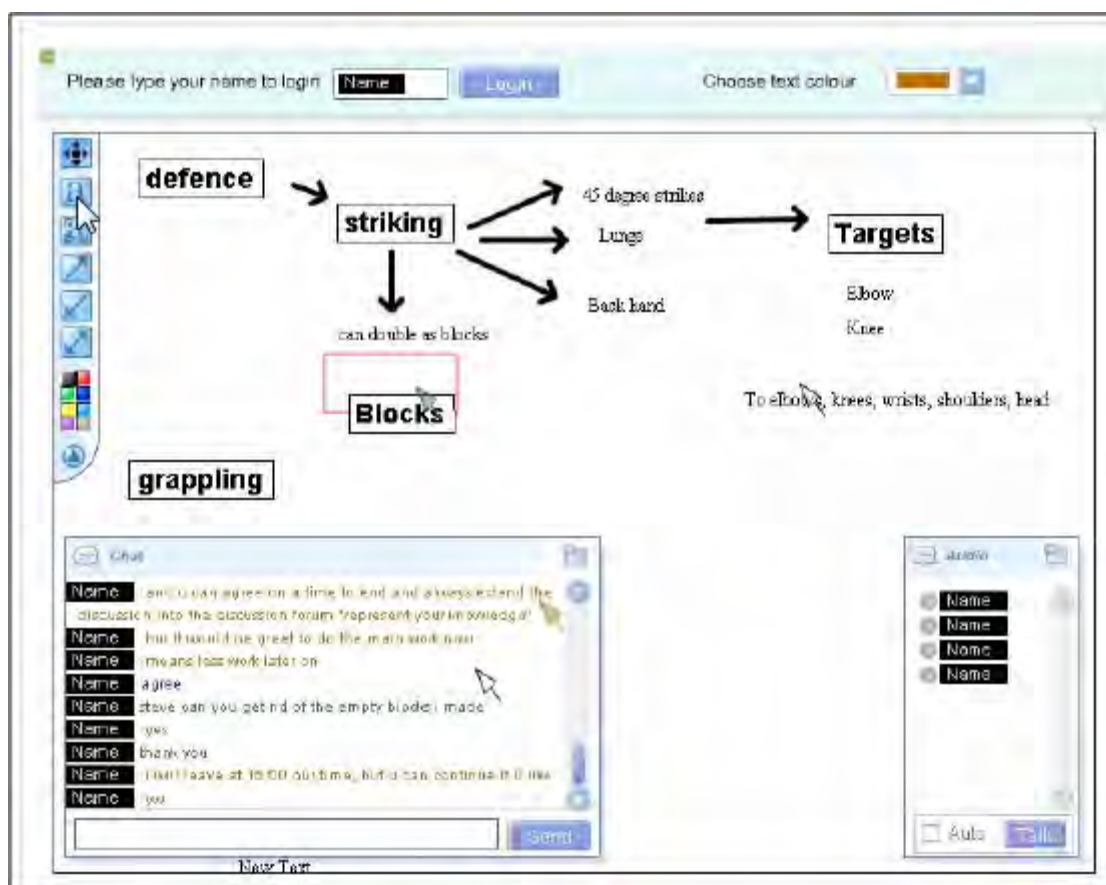


Fig. 6.5: Whiteboard chat room

7. Task 7: Virtual Self-Defence – Discussion and Simulation

This task required learners to meet with their group in one of the four virtual self-defence chat rooms and over the duration of this synchronous activity they would have an opportunity for discussion in each of the rooms. The rooms represented four different self-defence scenarios. These activities were created using the shared object tool in Flash Communication Server (Fig. 6.6). The victim in each scenario was the shared object, which meant that all the participants in the chat had the ability to move the victim into various positions and so visually represent strategy. The victim would move in real time, so all chat participants would see this movement. To prevent chaos, participants took turns to move the victim and would let others know in the text based chat if they would like to move the victim. Learners were required to apply technical self-defence knowledge, apply strategic knowledge, and consider ethical and legal implications, as well as how to avoid dangerous situations.



Fig. 6.6: One of the Virtual self-defence rooms

8. Task 8: Practise and Record your Knowledge

In this task participants were expected to practise the physical skills they had been experimenting with or use the techniques created by others in the group and then create an unedited video of themselves performing the techniques with a partner. The proviso that the video was to be unedited simulates the normal face-to-face martial arts and RAT grading assessment approach as closely as possible. Because the videos were unedited it implied that learners had to practise the techniques in order to perform the grading without simply practising each technique, pausing the camera and practising the next. This recording was a mini syllabus created by the participant and consisted of three sections: (1) techniques (at least 20), (2) a fight scene (a self-defence scenario created by the learner), and (3) sparring in three different situations. The mark weighting allocated to this task (40%) implies that there is a high regard for the development and demonstrated evidence of RAT martial arts skills resulting from this course. Due to bandwidth issues, participants

were required to post the completed recording to me for review instead of uploading the video to the website.

The remainder of this section provides a more detailed explanation of the course evaluation, which includes the following sub-sections: (1) learner contributions, (2) online questionnaire, (3) post course interview, (4) user interface rating form, (5) and teaching evaluation form. As mentioned earlier the participant observations, as well as the development and implementation log form part of the discussion.

An online focus group was also created to gather further in-depth feedback but nobody participated. My perception of the participants' lack of interest in the focus group was that they had already undertaken a significant number of activities during the course and probably felt that the online questionnaire was enough feedback. As mentioned elsewhere in this study, evaluators can take heed of not overloading evaluation participants with too many requests and imposing on their time.

6.4.1 Learner output: learner contributions

Each of the course tasks will be briefly discussed covering the main findings of the evaluations of each. The tasks generated a large amount of discussion, but to discuss all of this in detail is a study of its own. The main interest for me was that participants could demonstrate that they were engaged in the course process and if they fulfilled the task requirements satisfactorily it meant that they would pass the course. Also because I assumed they had never learned this topic before I considered that the successful completion of tasks was a demonstration of their learning.

The course tasks were evaluated using a marking rubric and if participants' output matched the requirements they would be awarded the appropriate marks. Discussion posts and the video chat transcripts were exported from the discussion forum to Microsoft Word, converted to Rich Text Format (RTF) and then added into QSR NVivo for analysis. Separate categories (nodes) were created for each task in NVivo. Each task was then further categorised creating nodes for each participant. The various discussions were then coded in NVivo by each participant's name. This allowed me to focus on one person at a

time and collate all their input when marking the course. A further category was created for each person's assessment section for each task. On these pages the marking criteria were placed as well as the marks for the participant for that task. The participant names and marks were then placed in a Microsoft Excel spreadsheet. For the represent your knowledge task and the video grading participants were marked using appropriate rubrics for each task.

The tasks requiring learner output carrying marks are discussed below.

Task 3: Comment and Practise (10%)

Seven learners participated in this task, while the remainder appeared to lurk. For the most part the discussion was of a high standard and developed by participants continuously building on the previous participants' discussion posts. Judging by what participants said in the forum they also seemed to have arrived at their current level of understanding through their own research and experimentation with the wheel spanner. As course facilitator I provided intermittent summaries of the categories as they emerged. Even though the standard of most posts was high, not everyone addressed the marking criteria and will have lost marks as a result.

The learner output in this first collaborative task illustrates how the knowledge seemed to be 'growing' by building on each other's posts. This demonstrates that the task design and tools supported the social constructivist approach being applied.

Task 4: Video Chat (5%)

Six participants were able to take part in the video chat. Two were not able to take part due to access issues from their workplace. The remaining participant who had been actively engaged in task 3 dropped off the course at this point due to personal reasons.

The video chat crashed twice and after the second time it was decided that we had discussed enough so ended the chat. Two chat transcripts were generated and then placed into the discussion forum as a record and reference for later tasks, as well as for the participants who missed the chat. It was understood that the technology being used for the chat was new and undergoing testing for this course, but it was a frustrating experience nonetheless.

The video capability was used, mainly by me to provide an online presence and two participants who had a webcam to check if the video was working. However the video capability was not used for its intended purpose of demonstrating difficult to explain techniques and the discussion was more focused around the topics and the text. I tried to demonstrate the techniques, but when the chat server crashed we abandoned the idea.

As a learning activity the chat seem to achieve its design aims. Participants discussed the topics and were cooperative, yet also constructively critical with the exception of one participant who only said “hello” and no more. He also arrived more than 30 minutes late for the chat. The chat was free flowing, but was channelled to topic by me in order to cover the important self-defence categories covered in the previous task. Using a facilitative approach worked well to involve everyone in the chat and discuss the important issues. However based on the performance of the chat server and the minimal use of the video, it could be just as efficient to use a simple text chat in the next course.

Task 5: Experiment and Discuss (10%)

Six participants took part in task 5 and their posts reflected an increasing engagement with the topic. Participants were able to experiment with a broader range of techniques and principles based on the work submitted by others in previous tasks. The body of knowledge was growing and being constantly refined as people tried out the ideas being discussed and reconsidered their own previous posts. Attempting variations of techniques is a key element of MCT and an effective method of developing new techniques. One participant went to extra lengths to illustrate his examples with 3D graphics (Fig. 6.7). He also designed a safe wheel spanner for training purposes (Fig. 6.8). This was an unexpected course outcome, but demonstrates what is possible when learners are engaged in the learning process. Participants continued to develop advanced strategy and tactics of self-defence that go beyond the mere training of techniques.



Fig. 6.7: Block to shin



Fig. 6.8: Safe training device

This task was successful as participants demonstrated higher order cognitive ability through their analysis and evaluation of each other's posts and creative application of their knowledge by the creation of useful 3D graphics and the design and creation of a safe training device that can be used in future courses of this nature. The social characteristics of the course seems to have had a positive impact on the willingness to collaborate and the open nature of RAT as a martial art might have contributed to the participants feeling safe to discuss any possibility of self-defence.

Task 6: Represent your Knowledge (20%)

As described above, this task consisted of two stages: first a synchronous activity run in the shared whiteboard, followed by the submission of a mind map in the discussion forum set up for this task.

In the shared whiteboard chat six participants took part. There were three separate chat sessions and all six participants had an opportunity to take part in at least one session. The session was repeated to accommodate those participants who couldn't make it to either the first or the second sessions. This meant that some participants repeated the session in order to give others the opportunity to collaborate in a group. While the chat transcripts were captured and loaded into NVivo the chat did not contribute to the final mark for this task. This part of the activity was intended to support the creation of the mind map which was submitted in the second part of this task. The chat covered a variety of topics, such as about the whiteboard technology and controls, administrative issues, as well as categories and techniques in the mind map. The chat was useful but did not seem as rich with ideas as the previous tasks. Also participants initiated the creation of their mind maps, but did not go too far in developing them further during the chat.

Seven participants submitted six 'represent your knowledge' learner artefacts in the second part of this task. Participants could submit any method of representing their knowledge, so long as it was in a digital format that could easily be viewed by others. This was meant to be a group task, but participants preferred to submit individual work (with the exception of two participants) based on their discussions in the first part of the task.

Two of the submissions were more conventional texts consisting of headings and sub-headings to provide the structure and to show relationships between items. The remainder of the participants submitted mind maps (two Freemind mind maps, one created in Microsoft Word, and another a scanned hand-written paper-based mind map). All participants demonstrated a synthesis of knowledge gained from previous tasks.

The collaborative component of this task did not seem as effective as the previous tasks, but the opportunity to reflect and construct their own representation of their knowledge seems to have been highly effective based on the participants' submissions. It was unclear whether as a result of an inadequate task design or technology issues, but it would seem in

this task the construction part of social constructivism was more effective than the social part. The learner output was added to the RAT CD-ROM to share with other RAT members who did not take part in the course.

Task 7: Virtual Self-Defence – Discussion and Simulation (15%)

Only four participants took part in the virtual self-defence chat. The two UK participants and the Australia participant could not synchronise a time to take part, which was unfortunate as the session that was conducted seemed to be an effective learning experience with three participants achieving near to perfect scores and one full marks.

The chat transcripts were copied from the chat rooms and pasted into Microsoft Word. These documents were then loaded into QSR NVivo and coded by participant name and by assessment criteria for each participant. As with previous tasks, this enabled me to focus on the learner contributions one at a time. For convenience the full chat transcripts were uploaded to the discussion forum so that participants could go back and review the discussion and the chats could be shared with participants who could not take part.

The dual ability of being able to immerse oneself within the four self-defence environments moving the victim around in space and the ability to discuss the topic contextualised the task. Based on the learner output this contextualised environment appears to have been an effective learning opportunity for participants to apply their prior knowledge (both from previous course tasks and knowledge before the course) to unique situations. The participants covered all marking criteria, including the application of technical knowledge, strategy, ethics, legal implications, and ways to avoid or evade conflict.

Task 8: Practise and Record your Knowledge (40%)

Only four participants could arrange to video record their final task and they could only do so because I had an analogue video camera. However, the tape was damaged and could not be used. Fortunately I was observing as the filming was taking place, so I was able to evaluate the participants as I would in a conventional grading assessment. It was a pity that these performances could not be shared on the RAT CD-ROM as the final video grading tasks of the subsequent two online courses were. Given that the tape was damaged, two of

the participants who had performed consistently well throughout the course and who could not do the video grading were given the benefit of the doubt and granted a pass for this task.

Of those who did do the video grading, they all demonstrated learning in the psychomotor domain. They showed that they could create a syllabus of techniques based on the 'represent your knowledge' artefacts (such as mind maps), that they could apply strategy and skills in a pre-arranged fight sequence, and that they had practised sufficiently to take part in free unrehearsed sparring against attackers. Even though the level of physical expertise varied between the more experienced martial artists in the group and the less experienced, with the more experienced participants demonstrating more fluid movements, the result is satisfactory and represented an important milestone in the RAT Online project. This milestone was the challenge of showing that physical skills can be facilitated online.

The next section covers the learner feedback gathered from the online questionnaire.

6.4.2 Learner feedback: online questionnaire

When the course was complete participants were directed to an online questionnaire covering the following main sections: personal details, martial arts/fighting sport experience, course feedback, and further information and comments. The biographical information has already been discussed. The course feedback and further information and comments sections are discussed in this part of the chapter.

The course feedback section consisted of 27 statements spread across the following topics of interest: course environment, course tasks, course tools and learning aids, and learning. Participants were required to rate each statement on a likert scale of 1-5, where 1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, and 5=strongly agree. The tasks and activities rating consisted of four questions and a further comments and explanations area. Participants were provided with a free text entry area for each of the five questions. In addition to the further comments and explanations, the participant feedback will also be included within the flow of each section below, as this information was useful to further explain the data.

There were eight respondents to the questionnaire, which means that the data cannot be used for significant statistical evidence. However selected data are briefly discussed in this section for any observations of interest.

Course environment

The course environment refers to the website, as well as all the technological tools/software used to run the course. This part of the evaluation related to the appeal of the course, the functionality, and the usability (in this case the navigation).

This part of the questionnaire consisted of the following three statements:

1. The course environment (i.e. the website) looked appealing.
2. The technical components of the course operated flawlessly.
3. It was easy to find my way around the site.

Table 6.3: Wheel spanner course environment

Course Environment	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Missing	Total
(1) Course environment appealing				6	2		8
(2) Technical components flawless	1	4	2	1			8
(3) Easy navigation			2	3	3		8

All participants agreed that the course environment (website) was appealing (Table 6.3), but it would have been better to see more people strongly agreeing with the statement. This satisfactory result is supported by the following participant statement: “Overall I thought the course was excellent and I have developed as a martial artist. The design of the site is very professional and the content of the course kept you interested. Thanks to [course facilitator] and all who participated for their hard work.”

Clearly there were technology issues as the results show and these varying unsatisfactory ratings can be corroborated by my own participant observations, as well as from implementation logs which show a number of technology issues especially with the video chat and the whiteboard. The following participant comment also shows that the course effectiveness was compromised by technology problems: “Something needs to be done with [the] video chat link because this is very important and [with it] crashing all the time makes it lose its effectiveness.”

Significant effort was invested in creating an easy to navigate website, so the result was unexpected, especially as there was no perceived difficulty on the part of the participants. The post questionnaire interview however helps to explain this rating for navigation.

The course tasks data are discussed next.

Course tasks

The course tasks section of the questionnaire was intended to provide useful information about safety and the effectiveness of the course tasks. This section consisted of the following statements:

1. There was **insufficient** safety advice.
2. The course tasks were logically structured.
3. The instructions for each task were **not** clear.
4. Marking the other learners' activities was a valuable learning exercise.
5. The "Reflect, Research and Experiment" task was a useful learning activity.
6. The "Watch a Movie" task helped change my understanding of how the wheel spanner can be used as a weapon.
7. The "Comment and Practice" task was a valuable learning activity.
8. The "Video Chat" task was a useful learning activity.
9. The "Experiment and Discuss" task was **not** a useful learning activity.
10. The "Represent your Knowledge" task was a valuable learning activity.
11. The "Virtual Self-Defence" task was a valuable learning activity.
12. The "Practice and Record Knowledge" task was a valuable learning activity.

Table 6.4: Wheel spanner course tasks

Task	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Missing	Total
(1) Insufficient safety advice	2	3	1	2			8
(2) Logical structure			1	3	4		8
(3) Instructions not clear	1	5		2			8
(4) Marking other learners valuable		1	2	2	2	1	8
(5) Reflect, research, experiment useful				3	5		8
(6) Watch a movie helped understanding				4	3	1	8
(7) Comment and practise valuable			1	2	5		8
(8) Video chat useful	1		1	2	2	2	8
(9) Experiment and discuss not useful	3	3		1	1		8
(10) Represent your knowledge valuable			1	1	6		8
(11) Virtual self-defence valuable			1	2	4	1	8
(12) Practise and record knowledge valuable			1		6	1	8

The responses to “There was insufficient safety advice” points to an area for improvement (Table 6.4). Two participants agreed with the statement and even though the small number of respondents is not statistically valid, any perceptions about a lack of safety should be taken seriously. Thus for future courses the safety advice will be placed more prominently in the course, as well as formatted in such a way to stand out to participants.

The responses to “The course tasks were logically structured are satisfactory” (Table 6.4) are pleasing and indicate that the basic course structure could be retained for subsequent RAT Online courses. This satisfactory result may also be providing some degree of support for the structured to ill-structured task continuum, which is aligned with cognitive flexibility theory (Spiro et al., 1992a).

“The represent your knowledge task was a valuable learning activity”, “the virtual self-defence task was a valuable learning activity”, and “the practise and record knowledge task was a valuable learning activity” statements received overall favourable ratings (Table 6.4). These tasks were designed as challenging, reflective, and highly collaborative tasks, using Bloom’s Taxonomy (Bloom et al., 1956) as a guide to design the higher order thinking activities of analysis, synthesis and evaluation, as well as cognitive flexibility theory with the inclusion and placement of the three (listed above) more ill-structured and complex tasks towards the end of the course following on from the earlier more structured tasks, and finally social constructivism (Vygotsky, 1978) as the basis of creating knowledge together with others and challenging each others’ ideas to form better interpretations of one’s own knowledge. The earlier discussion tasks seemed to have provided a solid foundation for the participants to build upon their knowledge, as I observed that they seemed more confident to engage in the final three more complex tasks.

The statements relating to the earlier collaborative tasks “The Reflect, Research and Experiment task was a useful learning activity”, “The Comment and Practice task was a valuable learning activity”, and “The Experiment and Discuss task was **not** a useful learning activity” were all rated satisfactorily (Table 6.4). “The Video Chat task was a useful learning activity” however received a very mixed rating. The implementation log shows that the chat crashed several times and the comment by one of the participants (above) is further evidence of this functionality problem. The fact that the technology did not work well makes it difficult to determine if the poor rating is due to a badly designed learning activity or just that the tool itself is not sufficient. My thinking was that the task itself could be useful meaning that in subsequent courses a better chat tool would be required. The following comments supports this view “It was like entering the other people’s minds and see[ing] what and how they think; in a way opening yourself also, increasing your awareness” and “I think this could have been very useful if only the internet connection could not have rendered it useless as it was shutting down all the time.”

“Marking the other learners' activities was a valuable learning exercise” was not rated highly, which was expected (Table 6.4). During the course I observed that participants were not really putting as much effort into this activity as they were with other more

relevant activities. This is how one of the participants described this activity “It took too much time, was difficult to remember who had done what and felt counter-productive.”

Lastly, even though “The Watch a Movie task helped change my understanding of how the wheel spanner can be used as a weapon” was rated highly, one of the participants provided the following comment, which prompted me to change the task order in subsequent RAT Online courses, “To be honest, ... one does not need to actually see the wheel spanner being used. It also can work negatively whereby we assume that the techniques used in a video may be the only techniques that are possible. It would be better to start with a blank mind and see what we can develop then watch the video.” This comment is useful support for the constructivist approach used in this course, except of course that in the constructivist approach one assumes that learners have prior knowledge.

Next the course tools and learning aids responses are discussed.

Course tools and learning aids

This section of the evaluation was included to evaluate the effectiveness and usefulness of the course tools.

The course tools and learning aids section of the questionnaire consisted of the following statements:

1. The media resources (i.e. images, movies, and pdf's) were useful learning aids.
2. The discussion forum was **not** a valuable learning tool.
3. The video chat room was a valuable learning tool.
4. The whiteboard chat room was a valuable learning tool.
5. The virtual self-defence chat rooms were **not** valuable learning tools.
6. The mind mapping software was a useful tool.

Table 6.5: Wheel spanner course tools and learning aids

Course tools and learning aids	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Missing	Total
(1) Media resources useful				6	2		8
(2) Discussion tool not valuable	5	1		1	1		8
(3) Video chat valuable	1		2	3		2	8
(4) Whiteboard valuable tool		1	3	1	2	1	8
(5) Virtual self-defence not valuable	2	2	2		1	1	8
(6) Mind map software useful			2	1	3	2	8

Overall the only area of this evaluation that received an overwhelmingly satisfactory response was “The media resources were useful learning aids” (Table 6.5).

“The discussion forum was **not** a valuable learning tool” and “The virtual self-defence chat rooms were **not** valuable learning tools” both received a better rating than the other evaluation statements, however with some neutral and negative responses (Table 6.5). I suspect that the negative “not” used in the statements might have caused some confusion and if phrased in positive terms both of these evaluation dimensions might have been rated more highly. The following comment prompted this line of thinking “...some of the questions are confusing to answer, especially with the double negative and then point system. So if I say NO and vote 4 then is that a stronger No?”

The results for “The video chat room was a valuable learning tool” and “The whiteboard chat room was a valuable learning tool” were no surprise given the software failure of the chat already mentioned and I remember the whiteboard chat being extremely difficult to control, as the synchronous nature of the tool meant that people would all talk and add to the mind map at once (Table 6.5). The following participant comment supports my own recollection of the whiteboard chat task: “Don't know what to call it but it was when we got together in groups with the whiteboard to discuss and formulate the mind maps. The

mind maps were great but I found the disjointed process of trying to communicate without talking over each other frustrating.”

For the most part “The mind mapping software was a useful tool” was rated satisfactorily (Table 6.5).

The learning part of the questionnaire is discussed next.

Learning

This section of the questionnaire was designed to elicit information about the effectiveness of the course.

The learning section of the questionnaire consisted of the following statements:

1. The topic of the course (i.e. the four-sided wheel spanner as a weapon) was useful.
2. The course helped me gain new knowledge.
3. The course helped me gain new skills.
4. The course facilitator's approach was too inflexible.
5. Before the "Online Wheel Spanner" course I **did not** think that martial arts could be learned online.
6. After taking part in the "Online Wheel Spanner" course I feel that martial arts can be learned online.

Table 6.6: Wheel spanner course learning evaluation

Tools and Learning Aids	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Missing	Total
(1) Topic useful				2	6		8
(2) New knowledge				2	6		8
(3) New skills				3	5		8
(4) Facilitator inflexible	3	4				1	8
(5) Before did not think can learn MA online		2	2	2	2		8
(6) After think can learn MA online			1	2	5		8

The results for statements (1-4) are encouraging and coincide with the expert review findings, the course artefacts produced by participants and level of participant interaction, as well as my own perceptions of the course (Table 6.6). The high rating for topic usefulness might correlate with the high level of engagement of participants in the course, prompting a higher motivation level. The good rating for new knowledge supports the methods of generating new knowledge in RAT, such as multiple contextual training, the collaborative nature of the course to generate knowledge together informed by social constructivism, the ill-defined nature of the higher level tasks designed around a cognitive flexibility underpinning, and Bloom's Taxonomy used to design learning tasks that draw on higher order thinking skills, such as analysis, synthesis and evaluation. The rating for new skills is important in this study given the kinaesthetic nature of martial arts. A martial artist without skills would not be considered a martial artist in any serious sense. The high rating for facilitator flexibility helps to demonstrate that the constructivist ethos of encouraging multiple perspectives is being carried out in practice. One participant comment supports the new knowledge results: "This course I would say challenges your knowledge of martial arts and also expands it too, you learn new things all the time so you just got to have a go."

The spread of results for "Before the "Online Wheel Spanner" course I **did not** think that martial arts could be learned online" is varied. This was to be expected, especially since some participants had not taken part in a previous online martial arts course. The results of

“After taking part in the "Online Wheel Spanner" course I feel that martial arts can be learned online” however exemplify a changed perception by course participants. This result is significant support to continue with the RAT Online courses as a viable means of teaching/learning RAT. The following comment illustrates how one participant’s perception changed: “In the beginning I was a bit apprehensive that learning online would work. But discussing and exploring opened my mind to things I would have never thought of. But I learnt most when I tried to apply all the theoretical skills to practice. When I made the video I can definitely say I learnt the most.” This comment is also strong support for the effectiveness of the collaborative nature of the social constructivist design of the course, as well supporting the effective development of martial arts skills.

Next the rating of the tasks and activities is discussed.

Tasks and activities rating

This section of the questionnaire was intended to capture information about which tasks and tools were most and least valued by the participants helping to ascertain the effectiveness of the various elements of the course. This information was helpful for the design of the next RAT Online course. Once again, it was a pity that there are so few respondents to provide statistically significant data, but the data is supported by participant comments, a limited post questionnaire interview, participant observations, and expert reviews.

The questions as well as the results of each question are discussed below.

1. What was the most useful learning task?

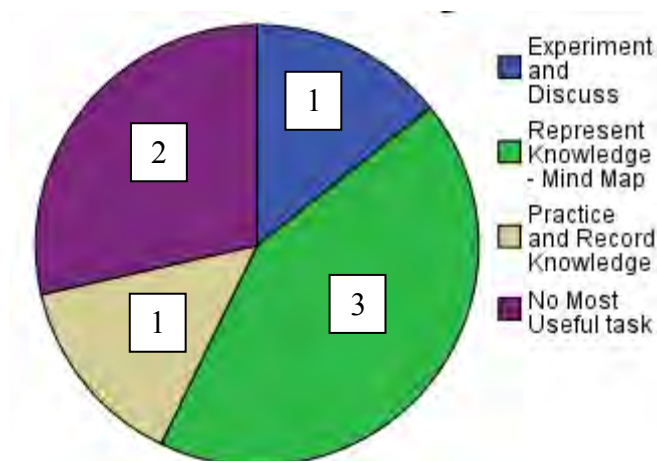


Fig. 6.9: Wheel spanner course most useful learning task

Most participants felt that the “represent your knowledge” task (the individual mind map activity) was the most useful (Fig. 6.9). These findings are strongly aligned with (social) constructivism where the creation of knowledge is highly valued, as well as the sharing of knowledge to improve one’s own understanding. This task also required participants to apply and generalise their knowledge. The following participant comments support these views:

- hh. “Encouraged a free flow of interesting ideas and forced one to really think, test and formulate what they had learnt.”
- ii. “This was a more do it yourself task than any other task. It was like you [are] presenting your “whole” self to be marked, commented on, criticised, i.e., best learning experience and also I learned a lot from looking at other people’s mind maps.”
- jj. “Mind Map, by creating a mind map, one gets a better understanding of the entire system. Once you actually look at a mind map you can apply it to almost every weapon based system that fit[s] similar parameters. Also there is no such thing as a complete mind map. Things can always improve.”

Given the technology issue with aspects a part of this task, the good participant rating supports the idea that it was not the task itself that was problematic, but that aspects of the task might require re-design. Namely, that a new tool was required to replace the synchronous whiteboard component.

2. What was the least useful learning task?



Fig. 6.10: Wheel spanner course least useful learning task

It was also of interest to find out what the least useful task was to determine if there might be any correlation between the tasks and the underlying theories. Most participants felt that there was no least useful task and two of their comments suggested that all tasks had some use (Fig. 6.10). However, the remainder of the participants who answered this question varied in their responses. One participant claims that the chat crashing was the cause of the task's ineffectiveness, another that the whiteboard was not easy to use, another that watching the video was not necessary and might have impeded creativity, while the remaining participant said that marking other learners was too time consuming and difficult to remember who had done what. What I find interesting in all these responses, except the chat response is that none of these tasks were as collaborative in nature as the most useful tasks. Could this be indicating that participants have a higher regard for the collaborative tasks?

This feedback, while not extensive, prompted the following changes in the next RAT Online course: (1) marking other learners would be removed as an activity, (2) a new whiteboard tool would need to be found, (3) reference material such as video clips would be moved to a position later in the course, so as not to impede creativity early in the course, and (4) a new chat tool would be required and video capability would not be required.

3. What was the most useful learning tool (e.g. discussion forum, video chat, etc.)?



Fig. 6.11: Wheel spanner course most useful learning tool

The discussion forum was rated as the most useful learning tool, followed by the virtual self-defence rooms, and lastly the video chat (Fig. 6.11). It was no surprise that the discussion forum was rated highest, as I observed during the course that is where most of the interaction and sharing of knowledge took place. Again this choice of tool and its rating is supportive of the social constructivist approach used in the course design. The following comments support the use of the discussion forum as a tool for knowledge sharing.

- kk. "I enjoyed the feedback of the forum."
- ll. "Able to communicate your ideas, receive feedback and encouragement.
Able to review at own convenience and revisit to refresh oneself if one had been away for a while."
- mm. "The discussion forum because it gave everyone a chance to learn what other people have to say about a particular subject."

The virtual self-defence tool was rated highly as a tool for sharing ideas, but also for applying strategic self-defence knowledge. This demonstrates that the tool was used appropriately for this type of knowledge. I have high expectations of the usefulness of this type of software application as they mature with technology advances. The following comments support the virtual self-defence rooms as an effective learning tool.

- nn. "You can visually represent your thoughts and actions and the technology works well and it's easy to use."
- oo. "I liked the virtual self defense tool. Where you could move the people

around and comment on the positions. Good for tactical and visualizing situations. Strangely enough, the chat attached to it seemed to work for me even though I did not like the "plain" chat. Perhaps it's because it focuses the conversation and only [one] situation at a time can be displayed."

There is use for the video chat but the technology failings made it difficult to judge its effectiveness.

4. What was the least useful learning tool (e.g. discussion forum, video chat, etc.)?

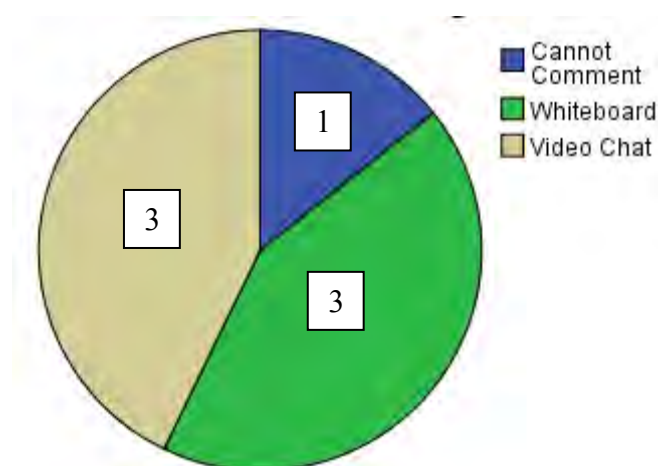


Fig. 6.12: Wheel spanner course least useful learning tool

As expected both the whiteboard and the video chat were rated least useful learning tools (Fig. 6.12). Both crashed during the synchronous activities and the whiteboard was not user-friendly, as everyone began posting ideas all at once causing a lot of confusion. As already mentioned, new tools would be required in subsequent courses.

A brief post course interview was conducted to cross-check feedback from the online questionnaire.

6.4.3 Learner feedback: post course interview

A short unstructured interview was conducted with six of the participants. These interviews were conducted mostly to gain a general feeling about the course and to elicit information not covered in the questionnaire or to expand on feedback provided in the

questionnaire. The interviews were informal and the conversations took place face-to-face, by email and by phone (one of which was between South Africa and Australia).

In these interviews participants were given the opportunity to expand on any aspect of the course and there were no set questions. As a result there was not really much discussion. However there were a few useful observations made by the interviewees.

There were two comments about the synchronous stage of “task 6: represent your knowledge” where the whiteboard tool was used. Both interviewees remarked that the whiteboard was too uncoordinated and uncontrolled with the number of participants. They both thought that the idea of a shared white board was a good one though. One interviewee suggested that it might be better for each participant in a course to have a whiteboard space to brainstorm ideas. This idea would be considered for the next RAT Online course. The other interviewee also commented that the virtual self-defence task required more control over the technology to hand over permission to participants so that they can move the characters on screen.

Another participant said that he had difficulty remembering the course website address. When I asked him why this was difficult he said that he had to sift through his emails to find the initial email with the course URL each time he accessed the course instead of adding the address to his favourites menu. This activity caused him to take a while to become orientated in the course, but once in the course environment he had no problem. This comment helps to explain at least one of the two middle ratings for the statement “It was easy to find my way around the site”. Going by the questionnaire data alone it would be easy to misinterpret the results as the site itself was not easy to navigate. He also commented that the video quality in “watch a movie” was not very good. Lastly he mentioned that he was as yet undecided about whether martial arts can be learned online because people might think they know without actually doing the martial art and that they might think it is easy to receive a certificate. These comments seem to be consistent with conventional thinking in the martial arts where a high value is placed on persistent practice over an extended time frame lasting years. He added that it was better to reinforce the tasks. By this he was referring to more physical practise.

Given the small participant numbers and the potential to gather more useful information to support observations and questionnaire results, I thought it would be beneficial for this study to enhance the post course interviews in subsequent RAT Online courses and create semi-structured interviews so that there would be greater consistency over the topics discussed.

The next section takes a different angle on the evaluation and is a look at the user interface as evaluated by two experts.

6.4.4 Expert evaluation: user interface rating

Two of the experts who evaluated the RAT CD-ROM agreed to evaluate the user interface of the Wheel Spanner course. The user interface rating form was once again employed for the evaluation. Like the RAT CD-ROM evaluation the user interface rating form was useful to evaluate the functionality, usability, and appeal of the Wheel Spanner course. All of these factors contribute to developing a ‘picture’ of the effectiveness of the course. This part of the evaluation helps to support findings of other parts of the Wheel Spanner evaluation, such as the learner feedback and participant observation. It is also an opportunity to identify possible issues. The experts evaluated each dimension on the scales and although space was provided for comments, only one of the experts made one comment.

As with the RAT CD-ROM expert evaluations (and subsequent uses of all expert rating forms in this chapter), the squares represent the development goals for each dimension and the circles represent my own expected ratings. The patterns are produced by connecting the expert ratings with lines (Fig. 6.13). These patterns were useful visual analysis tools.

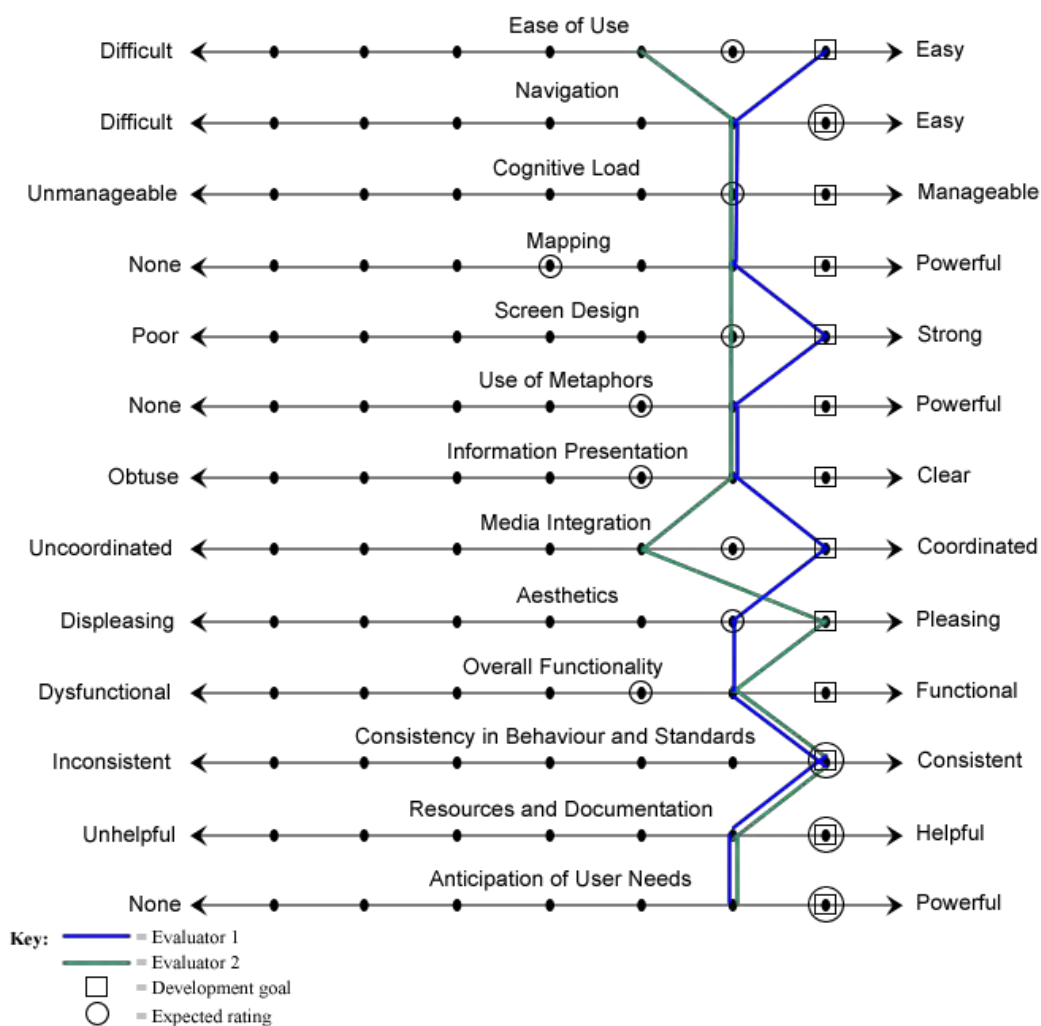


Fig. 6.13: Wheel spanner course user interface rating form

The expert ratings are not far off the development goals and the expected ratings. Although two straight lines down the extreme right of the scales would represent an optimum evaluation, the pattern produced by the evaluation depicts a satisfactory result. In nine of the thirteen evaluation dimensions the two experts have provided the same ratings making the patterns produced by the lines similar, which suggests a level of reliability of the rating instrument even though experts had different opinions about some of the dimensions. This expert evaluation helps to support the positive feedback about the user interface by learners on the course.

Although the overall result of the evaluation is satisfactory there is room for improvement along several of the dimensions which have not received optimum ratings on the development goals.

Because the site received a good rating for ease of use, the overall structure of the site would be sustained for the next RAT Online course, but greater fine-tuning might help to improve the rating. It was felt that ease of use could be improved by presenting information more clearly.

Participants could navigate the site by means of the top drop down menus, as well as by using the “next task” links within the tasks area of the site. The navigation appeared to work well and learners did not seem to have any significant issues with navigation, so perhaps the navigation could be improved by revisiting the information presentation of menu items, such as by prefixing the name of each task by its task number in the menu as well as on page headings, e.g. “Task 6: Represent your Knowledge” instead of only “Represent your Knowledge”. This could provide greater clarity and potentially improve navigation. In addition to “next” links, “back” to the previous task links would also be provided so that learners could move backwards and forwards through tasks with greater ease as well as having the option to use the top menu.

The use of metaphors dimension was rated highly, but I was starting to feel that this dimension was more useful for an initial evaluation of the RAT CD-ROM with its file explorer metaphor than it was for this course website. One expert’s comment/question suggests that the metaphor is obvious but at the same time vague as the question mark indicates: “Interactive reference library metaphor?” The site is really based on categories of information, so in a sense like a library, but one may question whether categorisation is itself not a metaphor but rather a capability of the mind. The site is really a web page metaphor. It was decided that for the next course the development goals on the rating form for this dimension should be more neutral than they were for the RAT CD-ROM, but no change would be implemented on the course website to change the metaphor.

It was expected that improvements to information presentation and breaking down text into small units, such as bullets and paragraphs might improve the cognitive load rating by making information easier to process. The changes to information presentation and minor navigation improvements may also improve the mapping rating. However no significant other changes would be made to change mapping.

The basic design will be maintained for the next course website, but minor changes will be made to improve the graphics and layout of the site. The video chat, whiteboard, and virtual self-defence produced a number of errors such as server crashes during implementation and therefore were not reliable. A number of technology changes were required to improve the overall functionality of the site. The next course would use a more fully developed example syllabus (instead of a single example video clip) and would require a greater degree of care to ensure there are no mistakes when integrating the greater quantity of media.

No substantial changes were planned for the next RAT Online course to improve the consistency in behaviour and standards, as the Wheel Spanner course was deemed satisfactory in these areas.

A more fully developed example syllabus with appropriate media was thought to increase the usefulness of the next RAT Online course, as well as improve the resources and documentation rating.

Based on evaluations of the RAT CD-ROM it was decided that anticipation of user needs would be more appropriately evaluated by martial arts (content) experts. Thus anticipation of user needs was removed from the user interface rating form and placed in the content expert rating form for the next course evaluation.

Next, the teaching evaluation is discussed, which helps to verify if the course as implemented fits the underlying learning approaches used in the design.

6.4.5 Expert evaluation: teaching evaluation

The same two experts who evaluated the user interface agreed to evaluate the teaching dimensions of the Wheel Spanner course using the teaching evaluation form. The teaching evaluation form was useful for shedding light on the effectiveness of the course and backing up or opposing findings from the learner output and feedback. It was useful to be able to see from experts' points of view if indeed the course as implemented was constructivist in nature, whether it fostered collaborative learning, and that learning theory

that promoted higher order thinking characterised the course. Satisfactory ratings in these areas would show a deliberate use of the supporting theories and link the examples of learner output and feedback as plausible instances of effective learning as designed for this course.

One of the experts did not rate the martial application and martial theory dimensions because she felt that she did not have the required expert knowledge to rate these dimensions. Like the RAT CD-ROM evaluations, these two evaluation dimensions as well as kinaesthetic/technical skill were moved to the content expert evaluation form for the next course evaluation. The other expert rated all the dimensions and provided additional written feedback about several of the dimensions.

The results (Fig. 6.14) show that most of the ratings were close to the development goals.

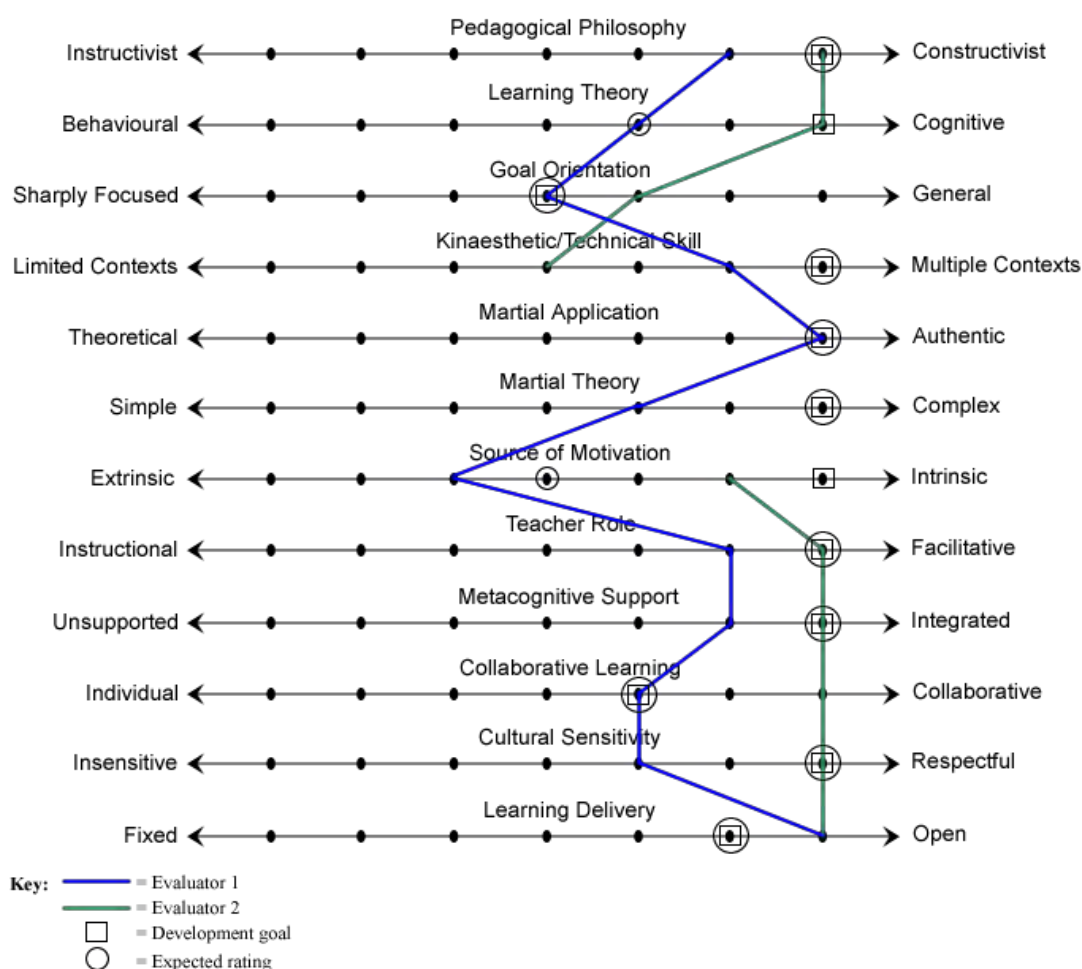


Fig. 6.14: Wheel spanner course teaching evaluation form

Four of the dimensions (kinaesthetic/technical skill, martial theory, source of motivation, and cultural sensitivity) were not rated as satisfactorily as intended or expected.

Although kinaesthetic/technical skill and martial theory along with martial application would move to the content evaluation form in the next course evaluation, it was felt that it was my responsibility to address these current ratings to help make decisions to inform the design of the next RAT Online course.

My initial response was to disagree with the ratings for kinaesthetic/technical skill and martial theory because the represent your knowledge task required learners to construct their own mind maps of principles, categories and techniques that can productively be applied across multiple contexts. The learners demonstrated that they could generate productive output that could be applied in multiple contexts. The practise and record your knowledge also required learners to demonstrate their ability in various sparring exercises which were unrehearsed bouts of attacks and defences. In order to perform satisfactorily in this type of exercise, the combatant requires the ability to apply their skills in multiple contexts, because they do not know which situation they will be confronted with next. The fast pace of these exercises does not allow time to think and work things out. Furthermore the virtual self-defence simulations required learners to think strategically in complex situations. Despite my disagreement with these ratings, perhaps they serve to show the influence of cognitive flexibility theory with both structured (and more restricted) and unstructured learning taking place. Therefore the ratings are not at the extreme right ends of the scale even though I had expected that they might be with the much higher rate of complex tasks. Similar tasks would be included in the next RAT Online course.

It was not surprising that source of motivation was not rated as highly as intended or expected because of my own perception that I had to keep the course on track by reminding learners of task deadlines when they were overdue. Hence the development goal and expected rating are placed in different locations on the scale. One of the expert's adds: "Both [intrinsic and extrinsic]. I think all media is extrinsic? Intrinsic driven from forces inside self? Response to media is a response to extrinsic factor even if it affects internal states?" This comment shows this dimension is exceedingly difficult to implement effectively in a course, as another person's internal states are largely an unknown. Interestingly, even with my perception and the expert rating the course appeal as evaluated

by the learners is in opposition to these findings showing the learners were deeply engaged and motivated. The quality of their output does seem to suggest a high degree of engagement.

Cultural sensitivity is another of the dimensions marked for potential improvement, as it was rated two points away from the development goal and expected rating by one of the experts. She pointed out that: “I think all the ‘shoulds’ in the language might alienate those unused to disciplined fields of endeavour? Can these be rephrased on the course info?” Work would be required to improve the tone of the language used in task instructions to be less ‘instructive’. Some of the language on the RAT CD-ROM was also found to be quite ‘instructive’. Perhaps this use of language is an artefact of many years of participating in highly disciplined martial arts training environments and it takes an outside expert to recognise it.

A final comment made by one of the experts on the teacher role dimension suggests that even though the facilitator took on a central role, there was evidence of guidance and negotiation; the kinds of attributes required in a facilitative learning environment: “I think [the] facilitator takes on a central controlling role though if I read the discussions plenty of structure and guidance and instructions as well as negotiation and communication.” Overall the result for teacher role was satisfactory and makes a useful model of behaviour for subsequent courses.

The course conclusion now follows.

6.4.6 Wheel Spanner course conclusion

Like the Bear Hug course, this course was designed from a social constructivist (Vygotsky, 1978) perspective providing many opportunities for participants to collaborate with each other. The structure of tasks from more structured to ill-structured was informed by cognitive flexibility theory (Spiro et al., 1992a) and the emphasis on higher order thinking skills were derived from Bloom’s Taxonomy (Bloom et al., 1956). The RAT approach (informed by other theories) to martial arts provided the grounding for the topics covered and a way of thinking about martial arts. These approaches and this evaluation were bound

together by the eclectic-mixed methods-pragmatic paradigm (Reeves & Hedberg, 2003, pp. 34-36).

While the course as carried out and evaluated from its multiple perspectives was not perfect with issues such as lacking motivation to complete tasks on time, technology issues, and some tasks requiring redesign, the Wheel Spanner course provides a more complete and satisfactory outcome than the Bear Hug course. This is especially so with respect to covering more areas of the research questions.

Participants demonstrated, through their course output and feedback that they had gained in RAT knowledge, attitudes, as well as skills. The more holistic evaluation of the design to include not only the pedagogical elements, but also the web and software tools design (user interface) shows some of the important pragmatic considerations when designing, developing and implementing online learning environments. Finally, it was demonstrated that collaborative and knowledge creation activities supported by software tools enabled participants to engage in an effective learning environment.

It was deemed important to perform another round of evaluation to check whether the results are not simply accidental and that it was the design that contributed to the success of the course, especially as the Wheel Spanner course was significantly expanded compared to the Bear Hug course. Thus, another course similar in design and scope was created with the aim of teaching how the belt can be used for self-defence. The next section is devoted to a discussion of the Belt course.

6.5 Part 3: The Belt course

Where the Wheel Spanner course was an extension of the Bear Hug course, the Belt course was designed as a course of more or less equal complexity to the Wheel Spanner course and was used not only to corroborate the earlier findings for this mode of learning RAT, but was also an opportunity to use the evaluation feedback to improve this type of course.

Several technology changes were implemented in the Belt course as well as modifications made to the learning activities, all of which are described below.

This section begins with a depiction of the course aims.

Course aims

Similar to the Wheel Spanner course, the Belt course was designed with practical outcomes in mind for the learners. The course was designed so that learners would gain in knowledge, attitudes, and skills in RAT. Again all of the participants had experience in a range of different martial arts, which meant that a topic had to be chosen which they were unfamiliar with in order for this to be a valid study. In my experience many empty hand (no weapons) martial arts share similar physical characteristics and if one of these were chosen it could be argued that the participants are simply adapting existing skills making these study results contrived, but in my experience weapons often have vastly different characteristics requiring different skill sets. Thus, it was decided that another weapon course would work well. For the same reasons as the Wheel Spanner course, an everyday item was chosen as the weapon. This time the course was aimed at teaching how the belt can be used for self-defence. Of course, learners were expected to apply their prior knowledge and skills, but the gap in skills was deemed to be much greater than if an empty hands course had been chosen.

This course was designed to last for four weeks (15 November 2004 – 15 December 2004) with similar learning activities to the Wheel Spanner course. The course duration was extended until late January 2005 because of the Christmas holiday period. The basic course concept and structure was maintained with modifications to some tasks, as well as to the order of tasks based on participant feedback and participant observation in the Wheel Spanner course. Due to various issues several of the technologies used were also changed which had an impact on the design, showing that sometimes learning design is guided by the capabilities of the technologies available, which is in opposition to the use of technologies being guided by the learning design. As an incentive learners were once again offered certification upon successful completion of the course. Any learner artefacts created during the course were added to the RAT CD-ROM for the benefit of learners who did not take part in this course, as well as for future iterations of the course.

Development and course tools

Once again Microsoft Word was used to create a storyboard depicting the design and wording of the course. Dreamweaver was used to create a website using Microsoft ASP and CSS. A digital camera was used to take photos for the example syllabus part of the course, as well as an analogue video camera to make example video clips. Adobe Photoshop was used to edit and compress images and Microsoft Windows Movie Maker was used to digitise and compress the video clips to WMV format. Web Wiz Forums was used again for the discussion forum activities and a free ASP chat script was used for a text based chat tool. A free tool called Netomat (now defunct) was used for a shared whiteboard tool for collaborative mind mapping and as a replacement for the virtual self-defence rooms. The 3D images for the virtual self-defence scenarios were created in a software program called Poser. Participants were also encouraged to use Freemind, a free mind mapping program.

Participants

Three participant groups took part in this course evaluation, which included: the learners, experts, and participant observer.

The learner group initially consisted of 16 members who registered in the forum with thirteen beginning the first course task, ten participants completing task 3 (the first mark-bearing task) followed by a rapidly waning level of participation. Seven all male participants committed to taking part with six of them completing most of the tasks. Five participants received course certificates. The participants' ages ranged from 15 – 51 years and as mentioned all had trained in martial arts previously, but none had trained in a martial arts system involving flexible weapons. Their martial arts experience ranged from 3 – 28 years and included a spread of 12 different martial arts represented including RAT. In this course only three of the participants had trained in RAT previously. Four of the seven committed participants had taken part in a RAT Online course before. Five of the participants took part remotely from Durban, South Africa, one from London, United Kingdom, and the remaining participant from Melbourne, Australia. One participant who only completed the first non-mark bearing task was from China.

The two experts who evaluated the Wheel Spanner course using the user interface rating and the teaching evaluation forms were asked to take part again and a third expert also agreed to evaluate the Belt course using the same two evaluation instruments.

Three experts were contacted to evaluate the course from a content expert perspective, but only one completed an evaluation form. He had more than 30 years of martial arts experience. It seems that as soon as I mentioned that the courses were online it became somewhat of an imposition on people's time, as well as problematic due to their poor Internet connections.

Evaluation instruments

Nine evaluation instruments were used to collect data about the functionality, usability, appeal, and effectiveness of the course (Table 6.7). These included learner contributions, an online questionnaire, post course interview, incomplete course interview, user interface rating form, teaching evaluation form, content expert evaluation form, participant observation, and development and implementation log. As with the Wheel Spanner course evaluation a wide range of evaluation perspectives was deemed necessary to develop a more complete picture of the successes and issues involved in a course of this nature, which provide useful decision-making information. Again any observations or records will form part of the flow of the text.

Table 6.7: The belt course evaluation matrix

Methods	Instruments	Functionality	Usability	Appeal	Effectiveness
Learner output	Learner contributions				X
Learner feedback	Questionnaire	X	X	X	X
	Post questionnaire interview	X	X	X	X
	Incomplete course interview			X	X
Expert evaluation	User interface rating form	X	X	X	X
	Teaching evaluation form				X
	Content expert evaluation form			X	X
Observation	Participant observation	X	X	X	X
Records	Development and implementation log	X	X	X	X

Course description and tasks

The full name of this course was “Using Your Belt for Self-Defence: An Introduction”.

Once again a prominent safety message was placed on the course home page, marked in red and bolded. Two participants in the Wheel Spanner course had indicated there was insufficient safety advice, so a safety page was also added to the Belt course as an extra precaution. The safety message on the home page contained a link to the safety page, which contained more detailed safety information. There was also a link to the page on the main top menu (Fig. 6.15). A navigation (top) menu, link colours, and next and back links (with target page names) on the task pages similar to the Wheel Spanner course were provided. The site was divided into the following main areas with links and drop down menus when sections contained sub-pages: course home, information, safety, tasks, course tools, contacts, and resources.

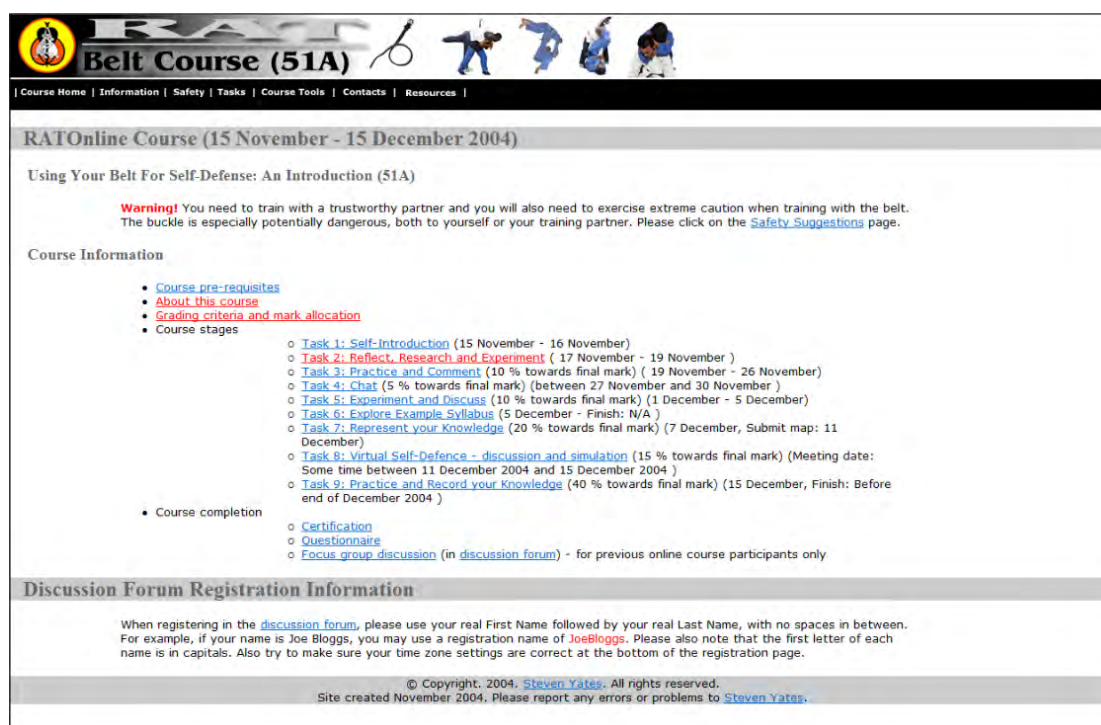


Fig. 6.15: Belt course home page

The information link contained a drop down menu with links to the following pages: about this course, grading criteria (and marking allocation), and certification. The safety link when clicked opened the safety page directly. The tasks link contained a drop down menu with direct links to all the tasks in the course (described below). The course tools page was different to the Wheel Spanner course, as there were technology changes. Course tools

contained links to the discussion forum, chat, Netomat, and Freemind. The contacts link opened a page containing the names of the participants and their email addresses so that they could contact each other outside the course environment if required. The resources link opened a page containing a number of useful resources, such as a site map, images, an example Belt course syllabus, an animation, documentation (including a fight scene marking sheet so that learners understand how they are assessed in the final task and an example certificate for the course), and links to software, such as Freemind, the Java Runtime Environment, and Netomat environment created for this course.

The 'about this course' page contained a list of learning topics or activities for the course rather than learning objectives. These were manifest in the learning tasks. These topics included learning methods to use the belt for self-defence, increasing knowledge and understanding of self-defence, gaining new or improving existing skills in self-defence and using the belt for self-defence, learning new ways of thinking about martial arts and self-defence, about learning and about online learning, being assessed for increased knowledge and understanding, and being assessed for technical (physical) expertise in performances.

Once again assessment in the course was continuous with most tasks carrying a mark weighting, while some tasks did not have a mark allocated to them. A marking rubric was created for each task and made explicit to learners on the grading criteria and mark allocation page so that learners were fully aware of which elements are important for each task. There were nine tasks in the course, including: (1) Task 1: Self-introduction (0%), (2) Task 2: Reflect, research and experiment (0%), (3) Task 3: Practise and comment (10%), (4) Task 4: Chat (5%), (5) Task 5: Experiment and discuss (10%), (6) Task 6: Explore example syllabus (0%), (7) Task 7: Represent your knowledge (20%), (8) Task 8: Virtual self-defence – discussion and simulation (15%), and (9) Task 9: Practise and record your knowledge (40%). Each of the task instructions were simplified and reduced for easier reading.

The following is an overview of each task:

1. Task 1: Self-introduction

A self-introduction activity was included to facilitate easier discussion later in the course by aiming to develop rapport early on in the course. Participants were asked

to provide their name and age, saying whether they had trained in combat arts previously including which arts and their experience, and whether they had taken part in an online course before. They posted their responses into the discussion forum created for this course (Fig. 6.16).

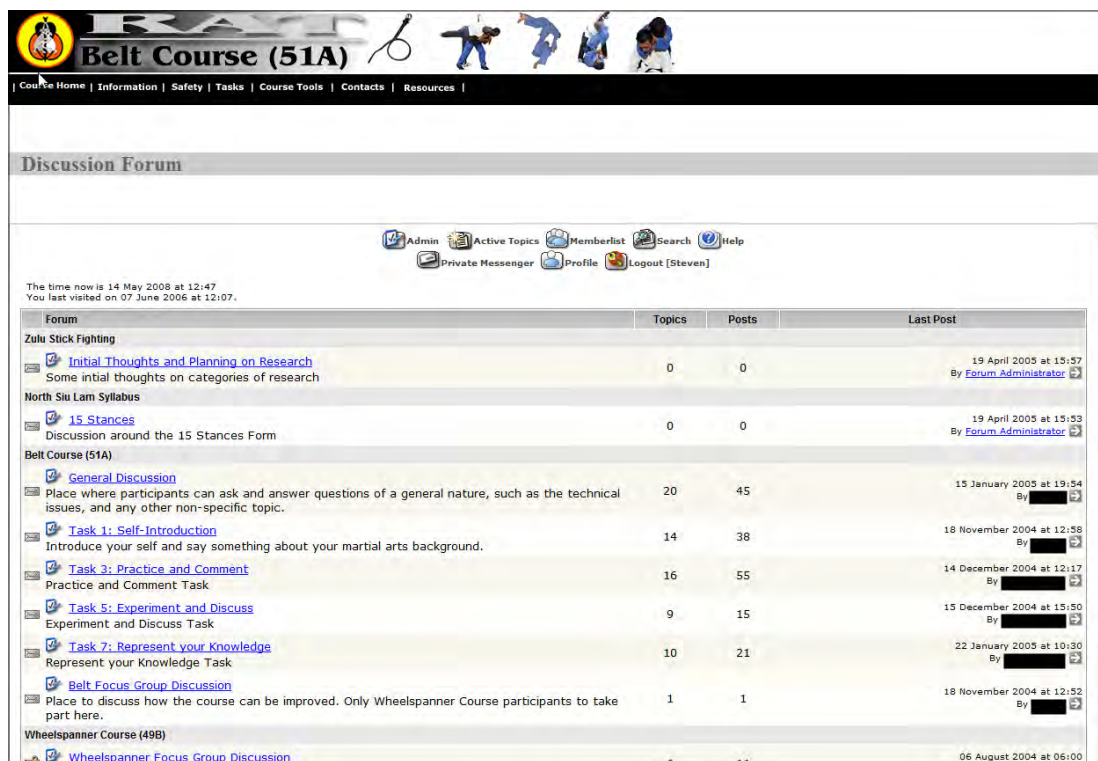


Fig. 6.16: Discussion forum tool

2. Task 2: Reflect, research and experiment

The instructions for this task were much simplified compared to the Wheel Spanner course. Participants were asked to think about what a weapon is, perform independent research about different weapons, and experiment with the belt as a potential weapon with or without a partner. Links to the example Belt course syllabus were also provided, as well as to the safety suggestions page.

3. Task 3: Practise and comment

There were two main parts to this task: (1) practise techniques learned in task 2, and (2) post a discussion message (using the discussion forum) in which participants were required to list the attributes of the belt and how it ‘behaves’ when used as a weapon, which weapons it is similar to, and list categories of techniques the belt might be useful for in self-defence (e.g., strikes, because the belt is long and flexible).

4. Task 4: Chat

In this course a text based chat (Fig. 6.17) was used instead of a video chat to discuss the positive and negative aspects of the belt as a weapon, to discuss specific techniques, and share experiences about training with the weapon. The chat was to last a maximum of 90 minutes.

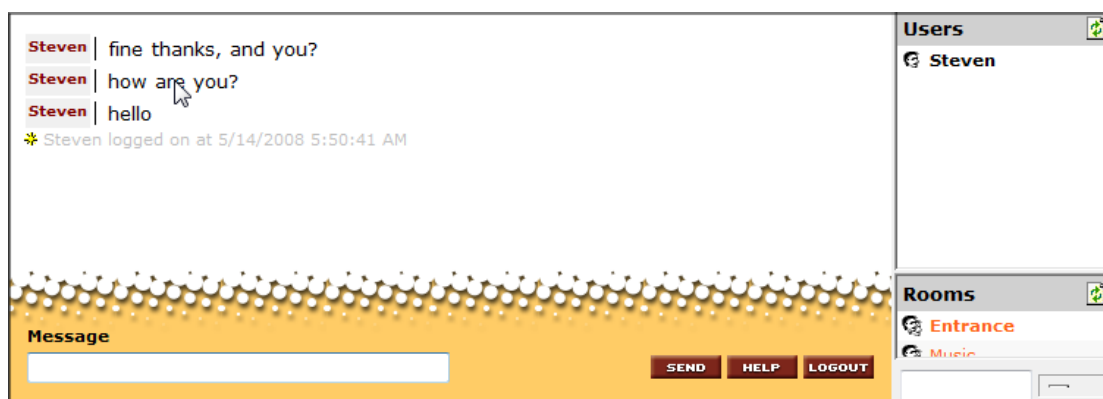


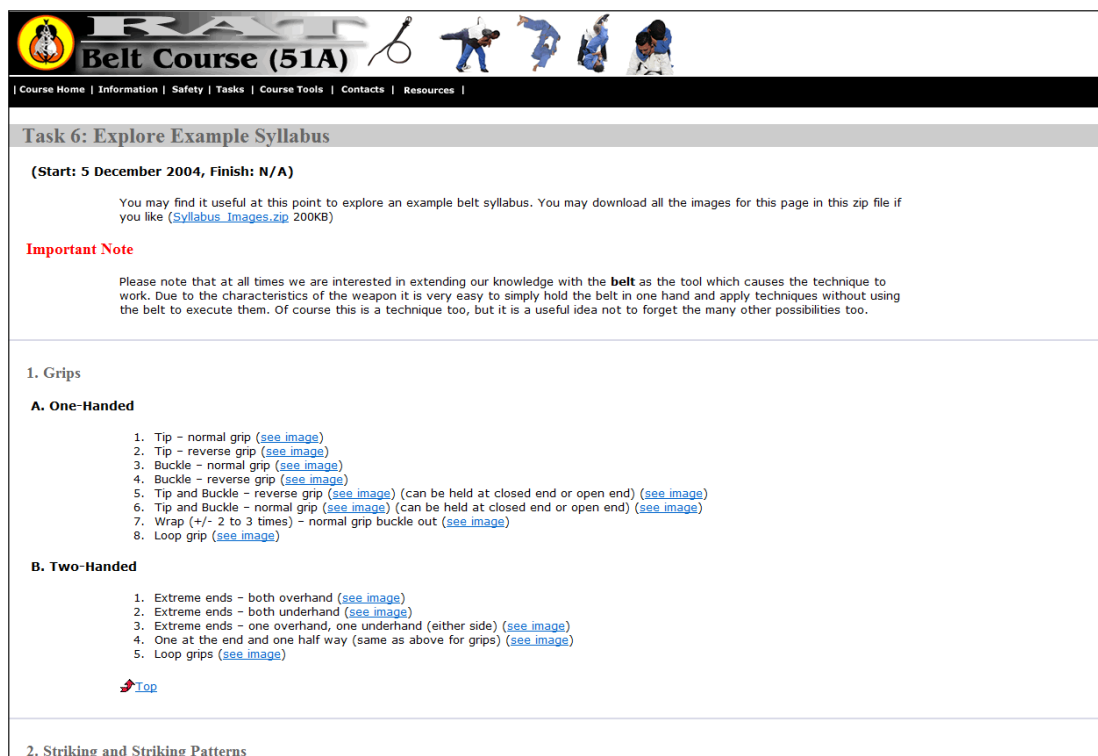
Fig. 6.17: Belt course text chat tool

5. Task 5: Experiment and discuss

In this task participants were required to continue experimenting with the belt as a weapon using the ideas discussed so far over a period over a few days. They were expected to cover techniques from all major categories of techniques, such as striking techniques, defences, locking techniques and so on. They were then required to post a discussion forum message before a deadline saying which techniques work well and which do not. They were encouraged to upload photos, animations, or videos to help explain difficult concepts.

6. Task 6: Explore example syllabus

At this point participants were directed to the example syllabus created for the belt (Fig. 6.18). The syllabus was more fully developed than the Wheel Spanner example syllabus (i.e., the old Wheel Spanner course), as it included images, labelled images and an animation. This task was intended to help prompt further ideas and building on the participants' developing knowledge.



IBAF Belt Course (51A)

| Course Home | Information | Safety | Tasks | Course Tools | Contacts | Resources |

Task 6: Explore Example Syllabus

(Start: 5 December 2004, Finish: N/A)

You may find it useful at this point to explore an example belt syllabus. You may download all the images for this page in this zip file if you like ([Syllabus_Images.zip](#) 200KB)

Important Note

Please note that at all times we are interested in extending our knowledge with the **belt** as the tool which causes the technique to work. Due to the characteristics of the weapon it is very easy to simply hold the belt in one hand and apply techniques without using the belt to execute them. Of course this is a technique too, but it is a useful idea not to forget the many other possibilities too.

1. Grips

A. One-Handed

1. Tip - normal grip ([see image](#))
2. Tip - reverse grip ([see image](#))
3. Buckle - normal grip ([see image](#))
4. Buckle - reverse grip ([see image](#))
5. Tip and Buckle - reverse grip ([see image](#)) (can be held at closed end or open end) ([see image](#))
6. Tip and Buckle - normal grip ([see image](#)) (can be held at closed end or open end) ([see image](#))
7. Wrap (+/- 2 to 3 times) - normal grip buckle out ([see image](#))
8. Loop grip ([see image](#))

B. Two-Handed

1. Extreme ends - both overhand ([see image](#))
2. Extreme ends - both underhand ([see image](#))
3. Extreme ends - one overhand, one underhand (either side) ([see image](#))
4. One at the end and one half way (same as above for grips) ([see image](#))
5. Loop grips ([see image](#))

[Top](#)

2. Striking and Striking Patterns

Fig. 6.18: Example belt course syllabus

7. Task 7: Represent your knowledge

The Netomat tool was used for this task to create shared whiteboard areas to be used to create group mind maps (Fig. 6.19). A synchronous chat tool was used in conjunction with the whiteboard on the same page. Participants were asked once again to include all the main types of techniques, as well as to start developing details or sub-categories. Once this discussion had taken place, participants were asked to create a mind map for upload in the discussion forum. A link to the Freemind software was provided to create a mind map, but any tool could have been used. A link to an example mind map was also provided for participants for their guidance.

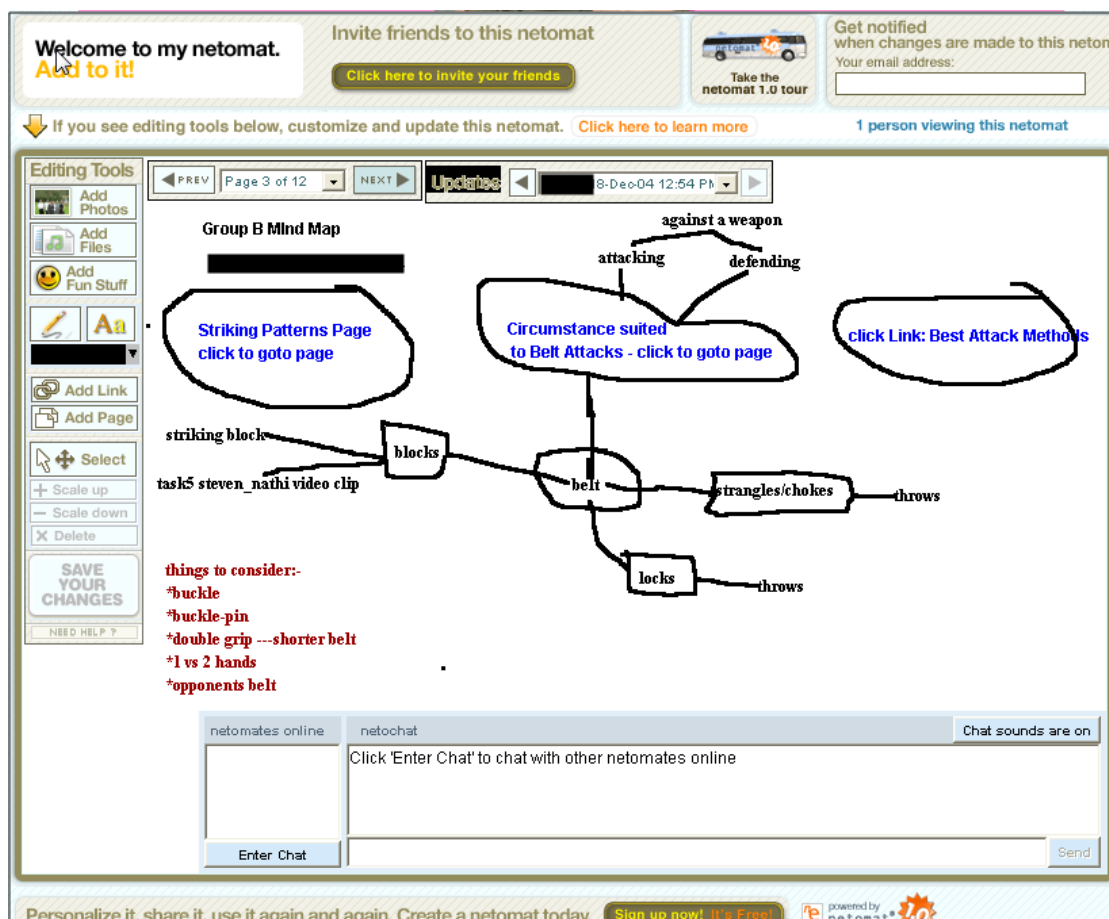


Fig. 6.19: Netomat whiteboard group mind map area

8. Task 8: Virtual self-defence – discussion and simulation

The Netomat software was used to create four self-defence scenarios, one of which included an animation. The virtual self-defence rooms in Netomat were more static than those used in the Wheel Spanner course, as the movement of images was not in real time. Participants had to be informed when to refresh the page when someone had moved an object. However, the tool provided enhanced interactivity, as participants could draw and write on the scenario, showing arrows for direction of escape for example (Fig. 6.20). Participants were required to meet in the room and discuss each of the scenarios one at a time. The discussion was a free discussion being guided by me as facilitator. Participants needed to demonstrate knowledge of self-defence techniques, especially as applied to the belt, but importantly an awareness and understanding of strategy, ethics, legal implications, and how to avoid dangerous situations was also required.



Fig. 6.20: Virtual self-defence scenario 3

9. Task 9: Practise and record your knowledge

Like the Wheel Spanner course learners were required to use knowledge gained in previous tasks to construct a syllabus of their own and then practise the techniques. Once they felt skilful enough, there were to video record themselves in one uninterrupted unedited session. Once complete, they were to send the video to me for assessment. Once again the guidelines included the following three main categories: (1) techniques (demonstrate 20 techniques) from all main categories, (2) a fight scene around 30 seconds in length demonstrating principles of strategy, and (3) sparring (against an unarmed attacker, against multiple attackers, and against attackers armed with other weapons).

As in the previous section about the Wheel Spanner course, this section covers a detailed description of the evaluation. The section is grouped into the following sub-sections: (1) learner contributions, (2) online questionnaire, (3) post course interview, (4) incomplete course interview, (5) user interface rating form, (6) teaching evaluation form, and (7)

content expert evaluation, with supporting data where appropriate from participant observations, the development and implementation log, and if there are any relevant communication records.

6.5.1 Learner output: learner contributions

Like the evaluation of the learner contributions in the Wheel Spanner course, the description of the Belt course learner contributions is focused around work produced by learners that supports their successful completion of the course tasks, as well as highlighting alignment with theoretical approaches used in the design and implementation of this course. Discussion of this work may also serve to answer the key research questions, as well as how effective the course was.

For analysis discussion forum posts were once again converted to Microsoft Word documents and linked within QSR NVivo for coding into themes.

Each of the mark-bearing tasks is discussed next.

Task 3: Practise and comment (10%)

Ten participants posted responses for this task, nine of whom posted messages which addressed the criteria for successful completion of the task. Although there is no way of knowing for sure, some of the participants' responses indicated that they had actually experimented with using the belt as a self-defence tool in order to develop a greater understanding of the belt's attributes as a weapon. The experimentation was required to complete the aims of this task. Most of the discussion posts demonstrated that even at this early stage of the course participants had begun deep reflection about the categories of the belt as a self-defence tool and had already initiated a discussion about strategy.

The quality of the conversation generated through this task demonstrated that the learners seemed engaged in the subject matter. While not all participants generated multiple conversation threads, they did seem to be at least reading each others' posts because they often commented on previous posts to deliver their own message. The social nature and the building of new knowledge are aligned well with the social constructivist underpinning of this course. This finding is not dissimilar to the same task in the Wheel Spanner course.

Task 4: Chat (5%)

The implementation log for this course shows that there were three separate chats, each with different participants taking part. The different chat sessions were arranged to accommodate the varying availability of the participants, due mainly to time-zone differences and work and study commitments.

Seven participants took part in total with four in the first session (morning), then two participants in the second (evening of the same day), and lastly one participant took part in the third session a few days later.

The implementation log reflects that the chat was fraught with issues, mostly technical. In the first session some participants were automatically logged out, one participant arrived 35 minutes late, and the chat did not seem to be recording the complete chat history. The unreliable chat history meant I had to continuously disengage from the chat to copy the chat history in order to recover it for records and to generate a summary. In session two participants were faced with a different set of problems. Neither of the two participants had Internet connections at home, so one of them arranged to chat at a computer at my home, and the other from my parent's home (both with dial-up Internet connections). There was a bad electric storm that night and excessive lighting. Also one of the participants was only seeing his messages after some time, so eventually we decided to abandon the online chat and meet at my home to have the chat face-to-face and post a summary up in the discussion forum for the other participants to read. The third session seemed to run slower than expected, but a short focused chat ensued. A summary of each chat session was created and posted into the discussion forum so that participants not taking part in a particular chat session could read the content. The summaries were also useful as a review of topics discussed.

Like the Wheel Spanner course the chat transcripts were copied from the chat tool and pasted into Microsoft Word, which were then linked into QSR NVivo for analysis.

The chat did not seem as rich in discussion as the previous discussion tasks and seemed less coherent, which is probably due to the shorter duration of the activity and the multiple conversation threads that tend to occur simultaneously. The technical issues may have also

contributed to the apparent reduced number of ideas and perceived lack of coherence. However the chat did generate interesting ideas and by this point in the course participants seemed a lot more confident in discussing their ideas. The chat did help to focus on a few areas and to complete the task with relative rapidity in comparison to the durations of the previous tasks. The chat also demonstrated the social nature of the course in action once again, but guidance was required by me to keep discussion on track.

Task 5: Experiment and discuss (10%)

Five participants took part in this task with two of them working together to create and submit five video clips to help explain their techniques. These video clips were added to the RAT CD-ROM for future reference by other RAT learners. One participant of this pair also submitted a complementary text discussion post to provide a summary of their findings after making the clips. I found that the submission of these video clips was an effective means of demonstrating the participants' emerging skills, as well as a form of confirmation that they had actually been experimenting with the belt techniques. I would consider a compulsory video task of this nature around the middle of the course to be a necessity in a longer RAT Online course, such as a complete RAT rank. This would be useful to enhance the psychomotor outcomes of these online courses.

All the discussion posts showed that participants were willing to share their experiences. These posts also demonstrated that the participants actually had been experimenting with the belt techniques or at the very least had thought deeply about them. Most participants also seemed to be experimenting with a wide variety of techniques from various categories of self-defence, such as strikes, locks, throws, etc. However others seemed to be refining their repertoire and rather than expanding, they were narrowing down their techniques to those that they felt would work for them. All participants provided examples to illustrate their ideas.

Where appropriate participants responded to other posts, as well as acknowledging when others had responded to their posts.

While this discussion was not as lengthy as task 3, it seemed that participants were becoming more focused on the topic by being to the point and showing a greater degree of confidence in their responses. This may be attributed to their increased understanding and

actual physical practice with the belt. All five participants satisfied the requirements for the successful completion of the task.

Task 7: Represent your knowledge (20%)

Six participants completed task 7 and they submitted their own individual interpretations of their current knowledge of the belt as used for self-defence. Two participants used Freemind to create mind maps, two participants used image editing programs to represent their knowledge, one used Microsoft Word, and the remaining participant used a different mind mapping tool (Mind Manager) and generated a PDF file from the original.

The first stage of this task using the Netomat tool was only partially used. The requirements for the synchronous part of this task in this course were relaxed compared to the Wheel Spanner course, because the participants were given a time period of a few days to meet online with their group and work on their mind maps in their own time. There is evidence of work being initiated, but none of the mind maps seemed complete. Like the Wheel Spanner course the synchronous part of this task did not seem as effective as the asynchronous part where the participants submitted their completed work in the discussion forum. The implementation log also shows that I had experienced a few issues when saving updates (which were not showing up) in the Netomat tool. I also met one of the participants in the Netomat chat and he reported that he was a bit confused with the tool and was there to experiment a little to learn more. The participants seemed to prefer to submit their own artefacts for this task rather than group mind maps. All mind maps were added to the RAT CD-ROM for reference purposes and to share with other RAT practitioners.

All of the work submitted by participants was of a high quality showing that they were able to apply their knowledge of the belt in self-defence to create their own unique knowledge representation of this topic. The two example mind maps serve to demonstrate the simplicity of the mind maps, but also their potential productive power to represent a vast amount of knowledge (Fig. 6.21 and 6.22). The second of these images is not the complete mind map.

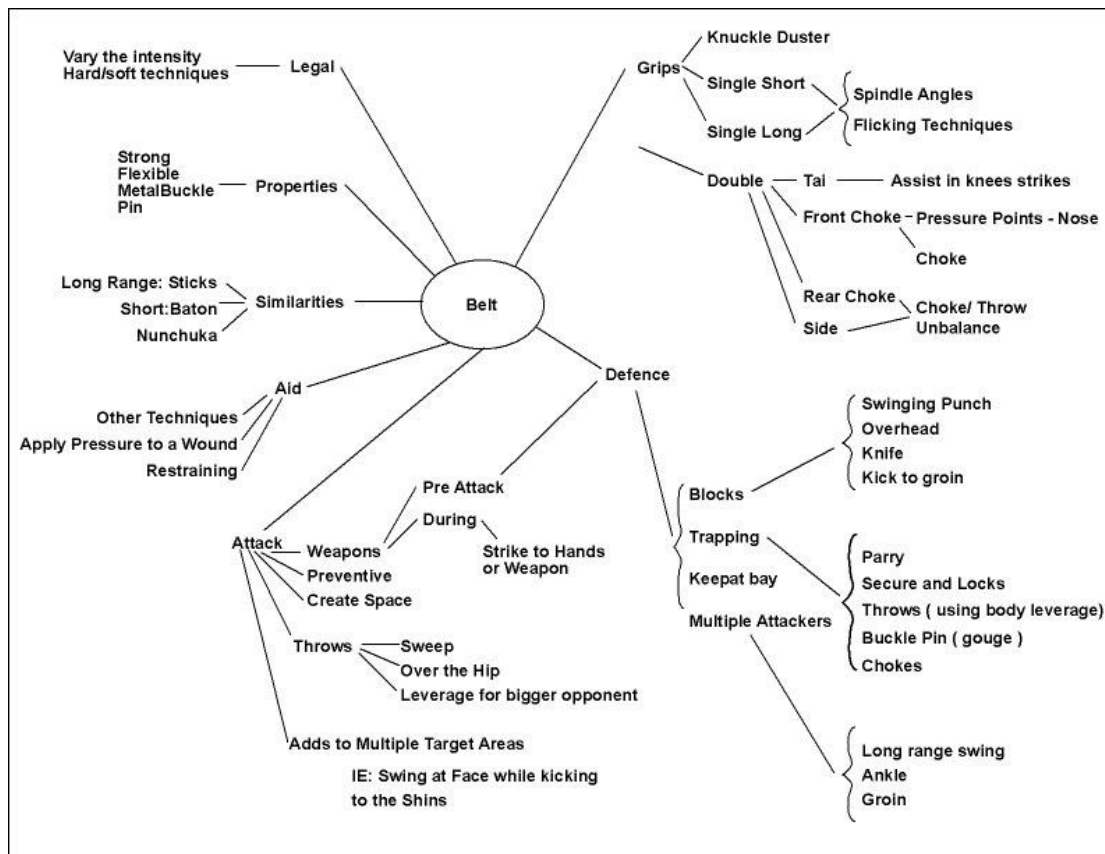


Fig. 6.21: Example mind map 1

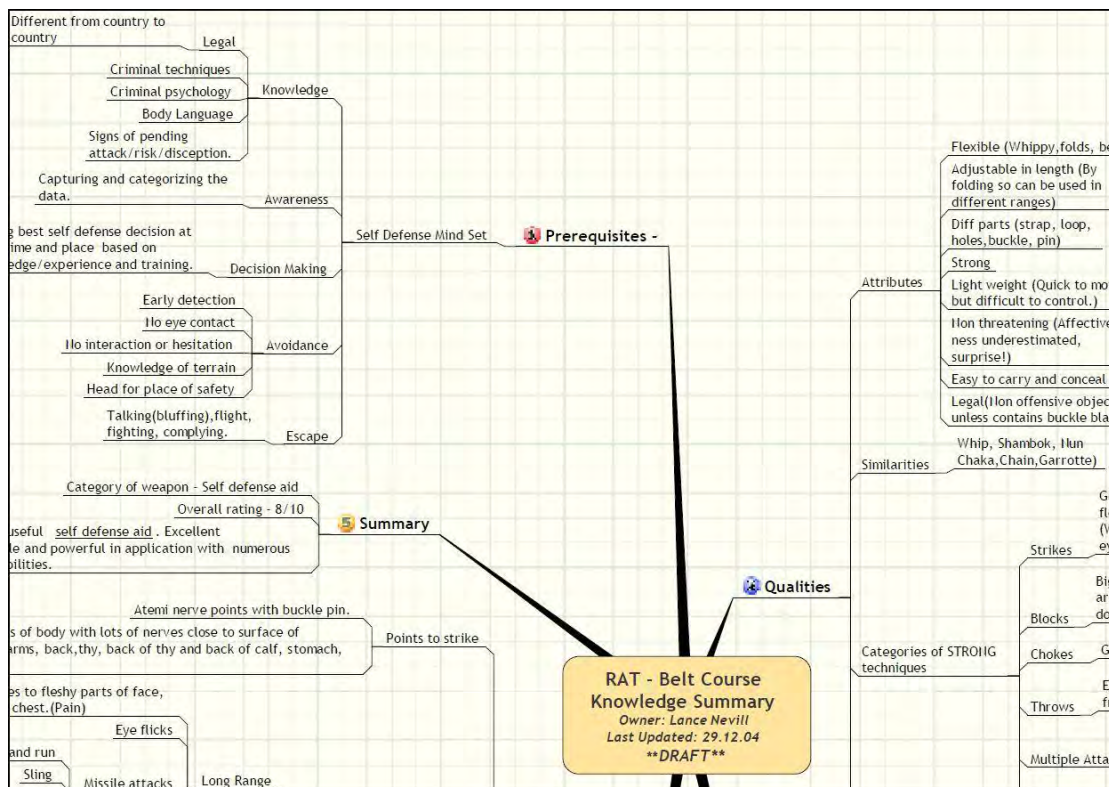


Fig. 6.22: Example mind map 2

In my view the work submitted by participants in this task matches the theoretical understanding of self-defence issues even of advanced level martial artists, however the physical skills of online course participants would require many years of physical practise to attain an equal skill level as advanced martial artists.

Task 8: Virtual self-defence – discussion and simulation (15%)

The Netomat tool had no feature available to record the two virtual self-defence chat sessions, so I kept a hand-written log of events during the implementation of each the two one hour long chats. After each session several participants volunteered to summarise various chat scenarios and post them in the discussion forum to share with other participants. The transcripts were exported to Microsoft Word and then added to QSR NVivo for coding.

Five participants were able to take part in this task. In the first chat two participants took part and in the second, three participants took part. One of the other participants wanted to take part in the task, but the Netomat software did not seem to work on his Apple Macintosh computer at work.

The implementation log shows that there were several issues impeding the effectiveness of the experience. Some people were late for the chats, but they say it was due to modem problems. Most of us connected using dial up Internet connections. Furthermore participants were logged out in the middle of the chats and had to log in again. The tardiness of participants and the logging out and back in again made it challenging to maintain the flow of the chat.

Despite the above technological issues, according to my own observation this task was a valuable learning experience. This observation is backed up by the high quality summaries that were submitted. Below is an extract from one of the summaries showing the consideration of factors in the environment during self-defence, as well as an affective appreciation of the experience.

pp. “Second Option: There is a bench to the right that could be used as a barrier between you and the attacker. We debated how this could be used and came

up with the following:

- a) Moving to the bench enables you to keep the assailant in front of you and in your line of sight.
- b) Using the bench provides an obstacle but doesn't obscure you[r] vision.
- c) May be an opportunity to deploy your weapon i.e. belt. from behind the bench
- d) We also thought that the bench provides a better defensive position than the tree. If the assailant jumps, [or] climbs over the bench you can immediately launch an attack with them on the back foot or in a compromised position. Alternatively hot foot it out there while they negotiate the obstacle.

Thanks to all the guys on the chat for the robust and engaging debate, it really got me thinking about the various options...hoping that I'll be that conscious if a situation like this arises.”

The participants considered a range of topics, including laws, ethics, weapons, the possibility of multiple assailants, and strategic considerations, such as the environment, obstacles, and bystanders. The context provided by the scenarios appeared to have been a catalyst for deep, rich and complex discussion and constructive debate. In my view the complexity of the scenarios was appropriately designed to draw out participants' knowledge so that they could apply it in new ways. Out of all the learning tasks, this task and the practise and record your knowledge tasks were the most ill-defined but in my view produced the most valuable outcomes to be an effective RAT practitioner. But it was also evident that participants were relying on knowledge and experience gained from earlier learning tasks. So it would seem that the earlier structured tasks contributed to the effectiveness of the later more ill-structured tasks.

Task 9: Practise and Record your Knowledge (40%)

Four participants submitted their final video gradings and one committed participant had no means to record his final grading. The rest of his work was of a high standard and he was included in the final group of five who received their course certificates. The four video gradings were incorporated into the RAT CD-ROM to share with other RAT learners.

This task drew together the three important high level elements of Bloom's Taxonomy (Bloom et al., 1956; Harrow, 1972; Krathwohl et al., 1964): knowledge, attitude, and skills. Participants' knowledge was demonstrated in their videos by their construction of scenarios and their own syllabus of techniques. They showed motivation and drive to do the preparation work for the video and then complete it successfully, but also in that an appropriate attitude is required to complete the sparring exercises successfully. Not only did they require persistence if the activity became difficult, but they were also required to demonstrate restraint and respect for their sparring partner. Finally, all participants demonstrated that they had acquired a suitable level of physical skills to use the belt as a self-defence tool. This finding corresponds with findings in the Wheel Spanner course and with what participants have claimed. It is my view that the video task is an essential element of online courses involving physical skills and the idea is evolving that this type of learning online is more plausible.

Next, the online questionnaire is covered.

6.5.2 Learner feedback: online questionnaire

As per the Wheel Spanner course the participants were directed to an online questionnaire covering the following sections: personal details, martial arts/fighting sport experience, course feedback, and further information and comments. The biographical information has already been discussed earlier. As was done with the Wheel Spanner course online questionnaire section, the course feedback and further information and comments sections are discussed in appropriate sections of this part of the chapter. The same will apply to the Pen course discussion.

The questionnaire was simplified and laid out more clearly than in the Wheel Spanner course, with each section having been labelled according to its topic and all related questions were placed within their topics. The questionnaire was piloted before it was used and changes were made accordingly. The course feedback section consisted of 28 statements spread across the following topics: course environment, course tasks, course tools and learning aids, and learning. Once again participants were required to rate each statement on a likert scale of 1-5, where 1=Strongly Disagree 2=Disagree 3=Agree 4=Strongly Agree 5=Other. I tried to avoid neutral answers in this questionnaire, as they

were not helpful previously, so “other” was used in case people had not completed the task or wanted to provide alternative feedback. The tasks and activities section once again consisted of four questions, but this time each question was accompanied by a drop down menu so that participants could select their choices instead of having to type them into a free text area. Each of the sections was followed by a free text area for further comments about the respective sections. Lastly there was an area for further information and comments.

Like the Wheel Spanner course there were eight respondents, but one of them had not completed most of the tasks and he responded to these items in the questionnaire making them invalid, so his questionnaire results are omitted for this evaluation. I will begin with the course environment section.

Course environment

This part of the questionnaire consisted of the following statements seeking information about the appeal, functionality, and usability of the course website:

1. The course environment (i.e. the website) looked unprofessional.
2. The technical components of the course operated flawlessly.
3. It was easy to find my way around the site.

Table 6.8: Belt course environment

Course Environment	Strongly Disagree	Disagree	Agree	Strongly Agree	Other	Missing	Total
(1) Course environment unprofessional	6	1					7
(2) Technical components flawless	1	3	1	2			7
(3) Easy navigation		1	3	3			7

The course environment overall was rated (Table 6.8) similarly to the Wheel Spanner course. “The technical components of the course operated flawlessly” showed an improvement over the Wheel Spanner course, however there was still much room for

improvement. Navigation was rated more or less the same as the Wheel Spanner course.

The following comments reflect some of the above results:

- qq. “Easy to navigate, clear, consistent and unambiguous.”
- rr. “...on occasion was not able to upload zipped files. Netomat, did not know to refresh all the time.”
- ss. “Had one problem earlier during the course – accessing Netomat, but later I could find it. Reason:- I was looking at the wrong course – Wheel Spanner course.”
- tt. “The web site was highly professional in its design. Great work.”

The next section covers the course tasks.

Course tasks

The course tasks section of the questionnaire consisted of the following statements:

1. There was insufficient safety advice.
2. The course tasks were logically structured.
3. The instructions for each task were clear.
4. “Task 1: Self-Introduction” was a useless learning activity.
5. "Task 2: Reflect, Research and Experiment" was a useful learning activity.
6. "Task 3: Practice and Comment" was a useful learning activity.
7. "Task 4: Chat" was a useful learning activity.
8. "Task 5: Experiment and Discuss" was a useful learning activity.
9. "Task 6: Explore Example Syllabus" was a useful learning activity.
10. "Task 7: Represent your Knowledge" was a useful learning activity.
11. "Task 8: Virtual Self-Defence" was a useful learning activity.
12. "Task 9: Practice and Record Knowledge" was a useless learning activity

Table 6.9: Belt course tasks

Task	Strongly Disagree	Disagree	Agree	Strongly Agree	Other	Missing	Total
(1) Insufficient safety advice	4	3					7
(2) Logical structure			4	3			7
(3) Instructions clear		1	4	2			7
(4) Self- introduction useless	5	2					7
(5) Reflect, research, experiment useful			3	4			7
(6) Practise and comment useful			2	5			7
(7) Chat useful			4	3			7
(8) Experiment and discuss useful			2	4	1		7
(9) Explore example syllabus useful		1	3	1	1	1	7
(10) Represent your knowledge useful			2	4	1		7
(11) Virtual self- defence useful			3	2	2		7
(12) Practise and record knowledge useless	5	1			1		7

The changes made to make the safety information more prominent seem to have worked given the marked improvement in the rating for “There was insufficient safety advice” (Table 6.9). The ratings for “the course tasks were logically structured” and “the instructions for each task were clear” also showed slight improvement over the Wheel Spanner course. Although one participant had the following to say about the course structure: “Some of the course tasks could have been combined or separated more...seems that some tasks were quite similar in objective.” Yet another participant comment contradicts this one: “A logical evolution of techniques and I found the video section very helpful in noticing flaws, distance and positioning.”

Statements 4-8 received good ratings and although the course structure was not quite the same as the Wheel Spanner course, these results are overall better than those in the Wheel

Spanner course demonstrating that some of the issues had been in part resolved in the Belt course.

The result for “Task 6: Explore Example Syllabus” was a useful learning activity” is interesting, as I cannot work out why the example syllabus would not be useful. Perhaps it is because this activity is not on the same level of active learning as the other tasks.

Statements 10-12 were rated highly as they were in the Wheel Spanner course with a few results of “other” due to some participants not taking part in those activities. Again the high rating for these tasks indicates their value in stimulating thinking to occur. The following comment about the virtual self-defence task supports this view: “Virtual self-defence had a few technical problems, but was time well spent as it forced one to think.”

The course tools and learning aids are discussed next.

Course tools and learning aids

The course tools and learning aids section of the questionnaire consisted of the following statements:

1. The “discussion forum” was a valuable learning tool.
2. The “chat room” was a valuable learning tool.
3. Netomat was a valuable learning tool.
4. Freemind (the mind mapping software) was a useful learning tool.
5. The media resources (i.e. images, movies, animations and pdf's) were useless learning aids.
6. The grading criteria page helped me understand what was required of me for each task.

Table 6.10: Belt course tools and learning aids

Course tools and learning aids	Strongly Disagree	Disagree	Agree	Strongly Agree	Other	Missing	Total
(1) Discussion forum valuable			3	4			7
(2) Chat room valuable			4	2	1		7
(3) Netomat valuable		2	2	2	1		7
(4) Freemind valuable				2	5		7
(5) Media resources useless	4	2	1				7
(6) Grading criteria helped understand requirements			4	3			7

As with the Wheel Spanner course the discussion forum was once again rated highly (Table 6.10) and the following comment serves to support this good rating: “Discussion forum and looking at other peoples’ contributions helped a lot in the learning process...different views – eye-opening...more awareness” and “An essential part of the course making the learning experience and communication more meaningful.” These comments once again support the social constructivist design of the course and its effectiveness, as well as contributing to an evolving picture of what makes these RAT Online courses work effectively.

The chat was rated higher in the Belt course than it was previously, probably due to its more stable platform (Table 6.10).

There were mixed responses for “Netomat was a valuable learning tool” (Table 6.10). In hindsight this question should have probably been split into two statements, because the tool was used as a replacement for the (Wheel Spanner course) whiteboard for the mind map activity, as well as for the virtual self-defence task. The following comments illustrate some of the feelings about the Netomat tool: “Netomat I thought was quite clunky and awkward to use” and “...Netomat is a bit sketchy, but one was able to get the point across.”

Most participants used other software to create their mind maps and not Freemind, hence the many “other” responses for “Freemind (the mind mapping software) was a useful learning tool” (Table 6.10).

The usefulness of the media resources were rated well, as was the rating for “The grading criteria page helped me understand what was required of me for each task” (Table 6.10).

Next the learning section is discussed.

Learning

The learning section of the questionnaire consisted of the following statements:

1. The topic of the course (i.e. the belt as a weapon) was **useless**.
2. The course helped me gain new knowledge.
3. The course helped me gain new skills.
4. The course facilitator's approach was inflexible.
5. Before the "Online Belt" course I did not think that martial arts could be learned online.
6. After taking part in the "Online Belt" course I feel that martial arts can be learned online.
7. The course was what I expected an online martial arts course would be like. **Please give a reason for your answer.**

Table 6.11: Belt course learning evaluation

Tools and Learning Aids	Strongly Disagree	Disagree	Agree	Strongly Agree	Other	Missing	Total
(1) Topic useless	5	1	1				7
(2) New knowledge	1			6			7
(3) New skills			2	5			7
(4) Facilitator inflexible	5	2					7
(5) Before did not think can learn MA online	3	1	2	1			7
(6) After think can learn MA online			3	4			7
(7) Course met expectations		1	3	2	1		7

The results for “the topic of the course (i.e. the belt as a weapon) was useless” are satisfactory with one person agreeing with the statement, although I think this was an error resulting from the negatively framed statement (Table 6.11). The following comments support the favourable rating for the usefulness of the topic: “The subject of the course helped me realise the potential of the belt” and “The course was good and I learned how useful daily items such as a belt could be used to defend yourself against an opponent. Nice work.”

Once again participants felt that they had gained new knowledge and skills as a result of doing the course (Table 6.11). One participant disagreed that he had gained new knowledge, but I suspect that this is an error in completing his form, as this same questionnaire contained a comment alluding to the learning that occurred. These results together with other evidence gathered during this course, such as expert reviews, participant observation, and learner output, as well as the results of previous courses seem to indicate that the success of the previous courses was as a result of the course design. These results are also contributing significantly to the view that the development of RAT knowledge, skills and attitudes can be facilitated in computer supported learning environments (the first research question).

“The course facilitator's approach was inflexible” was rated higher than the Wheel Spanner course, which is a satisfactory result (Table 6.11). A flexible approach is required, as

learners are the one's creating the knowledge and the various views could easily conflict with the facilitator's.

Like the Wheel Spanner course there was a shift from "Before the "Online Belt" course I did not think that martial arts could be learned online" to a greater confidence in the possibility of learning martial arts online in the ratings for "After taking part in the "Online Belt" course I feel that martial arts can be learned online" (Table 6.11). This demonstrates that participants felt comfortable that the learning experience was effective.

"The course was what I expected an online martial arts course would be like" had mixed results, but most participants agreed with the statement (Table 6.11). The participants' positive approach might well have contributed to the success and effectiveness of the course. The following three comments provide further evidence of the course effectiveness, the value for knowledge sharing, the benefits of the ill-defined nature of RAT as a flexible martial arts approach, and a value for individual knowledge construction as opposed to forcing a singular understanding.

- uu. "Am looking forward to the next one. As I have had exposure to constructivist learning, I wasn't surprised by the format. I feel that most people however would be surprised as most martial arts are rigidly defined and controlled and don't make allowance for negotiation of meaning and understanding of techniques."
- vv. "The ability to share information and then go out and practice it. It also confirmed similar thoughts of what works and what does not. One is able to learn from others' postings and adopt what they feel will be beneficial to them."
- ww. "It was more than I expected having done other such courses. The content, exercises and knowledge sharing helped me to push my boundaries of understanding further. It was a great learning experience..."

The tasks and activities part of the questionnaire is discussed next.

Tasks and activities rating

The tasks and activities rating included the questions below. Unfortunately there was minimal participant feedback about the tasks, but further feedback was elicited in the post questionnaire interview.

1. What was the most useful learning task?

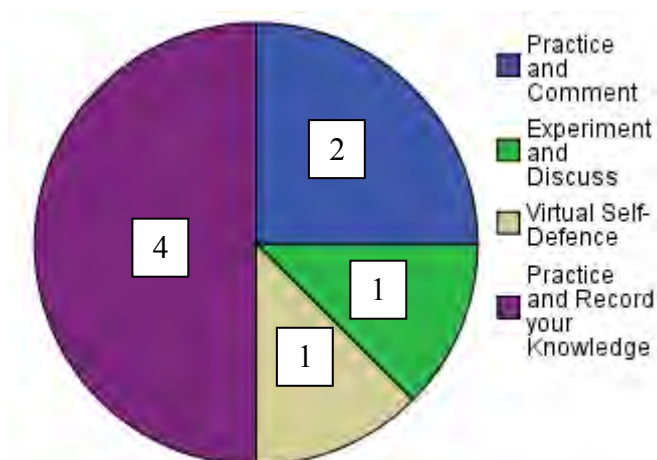


Fig. 6.23: Belt course most useful learning task

Interestingly the most useful learning task changed from the “represent your knowledge” task in the Wheel Spanner course to the “practice and record your knowledge” task in this course (Fig. 6.23). Perhaps this was a result of more people completing the task this time. Therefore they experienced the value of the recording as a learning activity.

2. What was the least useful learning task?



Fig. 6.24: Belt course least useful learning task

The self-introduction task was rated the least useful, but all respondents also agreed that the task was valuable when rated in its own right (Fig. 6.24). It seemed to me that the task was helpful in developing rapport amongst the group and for gauging participants’ levels of understanding at the start of the course. However, as a learning activity per se, it is not

as useful as some of the later tasks because it only elicits background biographical information about participants. It would seem that the task fulfilled its purpose as designed.

3. What was the most useful learning tool?

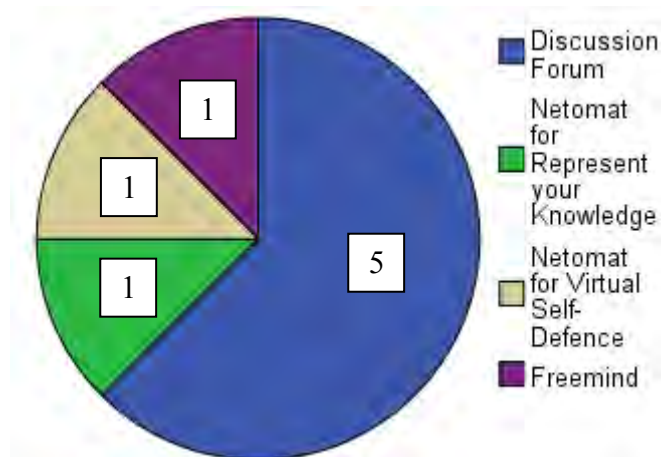


Fig. 6.25: Belt course most useful learning tool

Once again the discussion forum was rated as the most useful learning tool (Fig. 6.25), as it was in the Wheel Spanner course. Presumably this is due to similar reasons as described previously. Namely, it is a useful tool to share ideas and interact with other participants. The virtual self-defence tool seems to have lost some ground and the online whiteboard for creating the mind map appears to have gained some ground. I noticed there were not as many complaints about the whiteboard in this course, but neither was there much activity in the whiteboard. Perhaps the fewer complaints were really a result of there being other options available for participants to construct their mind maps.

4. What was the least useful learning tool?

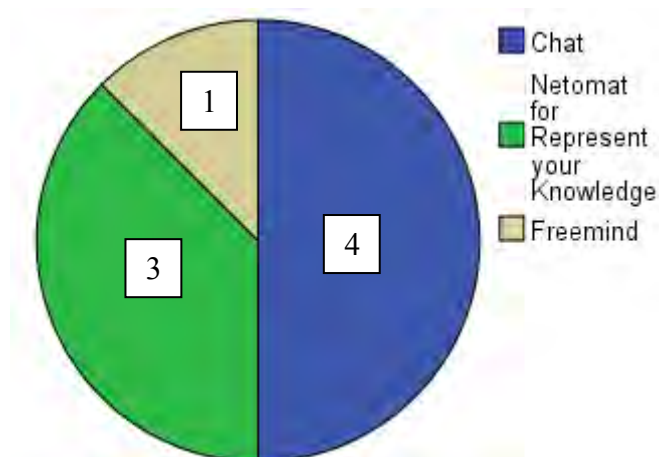


Fig. 6.26: Belt course least useful learning tool

This time the chat was rated the least useful tool, followed by Netomat (the whiteboard) for “represent your knowledge” (Fig. 6.26). One participant commented: “I said the chat was the least useful learning tool not because it really was, but because of the shortage of input from other people who were not in the chat. Knowledge learned there was limited because we were such a few (only 3 people). A lot was learned, but I feel we would have learned more if more people were on the chat.” As participant observer I viewed the chat as a useful and quick way of consolidating and summarising prior learning in the course, not so much an activity for gaining new knowledge. In a sense it was a way to accommodate and assimilate the various viewpoints.

Participants were generous in offering further information, some of which is provided below.

Further information and comments

The following comments reaffirm that the course was effective in facilitating the learning of RAT martial arts knowledge, skills and attitudes, that the underlying constructivist design of the course is an effective means to design collaborative activities and apply appropriate tools.

- xx. “The ability to discuss and negotiate ideas with other participants really made the course worthwhile...laying down ideas and seeing them challenged force you to re-examine techniques and I had to change some of my ideas based on feedback from the group. It is however essential that practice is done to make real the mind knowledge...”
- yy. “I feel that I have gained from this course and can add this to my arsenal of techniques. It would be interesting to see others’ gradings on how they interpreted the course and the various techniques.”
- zz. “A lot of thought and planning went into this course... This course stimulated new ideas on the use of the belt.”
- aaa. “As I have said before this course is miles ahead of anything else I have seen. Fantastic work [Facilitator name]. I can see all your experience, knowledge and passion be expressed in these pages. Thanks for all the hard

work and an enjoyable course.”

Next the post course interview is discussed.

6.5.3 Learner feedback: post course interview

Some of the results of the online questionnaire prompted me to follow up on a few issues, as I wanted to gain a greater insight into some of the results and feedback. This was also a useful exercise to gain confirmation on certain of the results. I felt this was a necessary step given the small respondent group. Furthermore, the interviews were another opportunity to gather feedback corresponding to the theories used in this project. This section provides an overview only of the interviews, as there were five A4 pages of feedback offered.

Five participants were interviewed with eleven questions. These questions covered the following topics as identified after analysing the questionnaire results: (1) course and task duration, (2) the similarity of course tasks, (3) safety advice, (4) the effectiveness of the practise and record your knowledge task, (5) the technical components, (6) Netomat and feedback on the two tasks, (7) most useful task, (8) least useful task, (9) most useful tool, (10) least useful tool, and (11) comparison of course with previous courses. The QSR NVivo software was used to group the responses into their various questions and themes.

Some participants felt that the course continued for too long with the extensions that were granted, while others thought it was just right. Those who thought it was too long acknowledged that this was because some participants did not stick to the deadlines, which prolonged everything.

Only one participant commented that some of the tasks were too similar, but I wanted to double-check this with the other participants. In the interview one of the interviewees confirmed that he thought some of the tasks were similar saying that “the exact purpose was lost”. However after going back and checking on the course tasks, he thought that they were not repetitive, but felt that the difference could be made clearer in the marking criteria. This point was taken and used to improve the Pen course.

As safety is critical in RAT training, I wanted to be confident that participants did not have any concerns about the safety advice. All participants were happy with the safety advice provided and said that they remembered reading it and its location. One participant offered advice to ensure that the safety advice is more visible, saying “As long as it is in a different colour to the rest of the text...”

The feedback about the technical components confirmed results in the questionnaire, as well as my own observations. People experienced issues with the functionality of the Netomat tool and Internet connectivity which caused people to be logged out of the chat. One participant using an Apple Mac computer had issues viewing the Windows Media Video (WMV) movie clips. People also complained that the Netomat tool was “... a bit cumbersome” and “...very difficult and unwieldy to use” for the mind map task.

In an effort to simplify the online questionnaire there was only one question about the Netomat tool, however in hindsight this was a mistake, as the tool was used for two different tasks. In the interview I wanted to find out the usefulness of the tool as appropriate to the mind map and virtual self-defence tasks. Most participants thought that Netomat as used for the mind map task was difficult and not user-friendly, however thought that Netomat was appropriately applied to the virtual self-defence task.

Interestingly the responses in the interview varied slightly from the questionnaire results. Although there was still strong value for the practise and record your knowledge task, interviewees also showed a preference for the represent your knowledge task, which did not feature in the questionnaire results. Represent your knowledge did however feature strongly in the Wheel Spanner course questionnaire results. Two participants also valued the chats as secondary but useful tasks. Perhaps this anomaly in the results is due to only one choice being available in the questionnaire and that even though the video grading was becoming more valued, the represent your knowledge was also still valued, but perhaps not as highly due to the stronger correlation of the video grading task and the development of martial arts skills.

I was interested to find out a bit more about the self-introduction task, as it was rated the least useful task, but I observed during the course that participants were highly engaged in the task. Everyone seemed to agree that the task was necessary so that participants can

develop rapport. One participant commented that, “If you think of the practicality of developing knowledge in the belt, it is not necessary, but it helped make people feel comfortable.”

As far as the most useful learning tool, there was still a variety of preferences, including Netomat for virtual self-defence, the discussion forum and minimally the chat. These results do not completely correspond to the questionnaire results, but do correspond to my observations of the usefulness of these tools during the course.

The interview responses for least useful tool corresponded with the questionnaire results showing that the chat and Netomat for the mind map were the least useful tools.

Those participants who had done a RAT Online course before felt that the course was an improvement over previous courses. One of the participants who had not done an online course before said, “Even though I haven’t done one before, this one [Belt course] makes you want to do the next one – progress.” The following interviewee responses support the evaluation approach taken in this project.

bbb. “I think because you made them, they’ve become better.”

ccc. “I think it’s the quality. There was more focus. The technical difficulties that were experienced in the previous course were amended. It was structured to expect and cope with difficulties. It was more flexible. The software was of better quality. ...even if a third or fourth person arrived late they could be accommodated [referring to the chats].”

I thought that perhaps gaining feedback only from engaged course participants who successfully completed the course might be one-sided. Therefore I contacted those participants who had started the course, but never completed it for further feedback about the course to determine if there was anything about the course that put them off. The incomplete course interview is discussed next.

6.5.4 Learner feedback: incomplete course interview

Four participants responded to my inquiry about reasons why they never completed the course. Two of the participants were out the country for a significant part of the course and neither had Internet access during that time, which prevented them from completing the course. The other two participants both had no time, as their workload increased significantly. Both worked at the same company at that time. One of the participants commented: “Otherwise the course structure and concept was excellent... thank you again for putting on a brilliant system.” Based on the participant feedback I can conclude that there was nothing about the course design or implementation that was the cause of them not completing the course.

Next the expert reviews are discussed, starting with the user interface rating.

6.5.5 Expert evaluation: user interface rating

In this evaluation three experts agreed to rate the Belt course, two of whom had also rated the Wheel Spanner course user interface and teaching dimensions. It was intended that the previous experience of evaluating the Wheel Spanner course by two of the experts would make it easier for them to recognise changes made as a result of that evaluation and rate the Belt course accordingly. In this evaluation two of the experts provided supporting comments for many of their ratings. Unfortunately one of the experts omitted to rate screen design and media integration without providing a reason.

The power of the rating scales as a visual analysis tool is once again demonstrated because when one compares the patterns produced by the Wheel Spanner course and the Belt course one can immediately notice differences in the course ratings (Fig. 6.13 and Fig. 6.27). While overall the result is satisfactory showing a number of improvements and some dimensions rated much the same as before, there is still room for improvement along some dimensions.

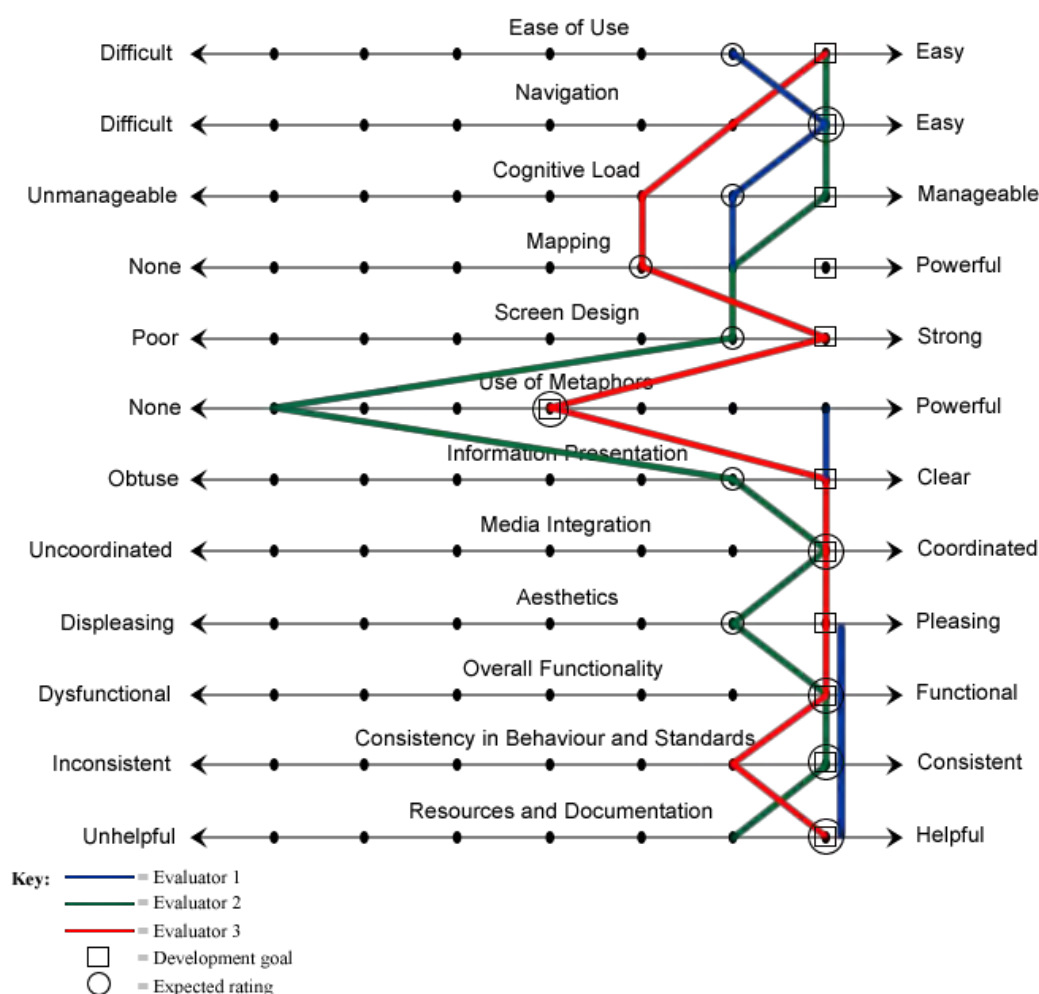


Fig. 6.27: Belt course user interface rating form

Use of metaphors

My attention was immediately drawn to the changed shaped of the evaluation pattern around the centre (Fig. 6.27). Compared to the previous evaluation, use of metaphors illustrates a significant change in the ratings. Not only has the general pattern changed, but the experts differed widely in their ratings. At the end of the Wheel Spanner evaluation I had doubted that there is in fact a meaningful metaphor in operation that needs to be understood for users to be able to use the website, other than the website uses a 'website drop-down menu' metaphor. I decided to include this dimension in the evaluation once more, but had placed both the development goal and expected rating in the centre of the scale to reflect its neutrality. One of the experts rated use of metaphors right in the centre and provided the following comment reflecting my own concern with regard to this dimension:

- ddd. “The metaphor is not evident and I think that means that whatever it might be is not so in your face and is working fine. (I did like the option to select an icon/avatar, liked the options given for this and also that one can choose one’s own – I think details such as this really personalize online (learning) experiences).”

Another expert rated the dimension on the extreme right ‘powerful’ side of the scale, while the remaining expert rated this dimension on the extreme left ‘none’ side of the scale. Clearly there is a discrepancy. Referring back to the RAT CD-ROM evaluation experts mentioned that the seeming absence of a metaphor in place meant that the metaphor was operating as it should because it was causing minimal disruption to their use of the CD-ROM. This resulted in a high rating. However it is perfectly understandable if this dimension receives a low rating if there is no apparent metaphor in operation. The expert providing the rating of ‘none’ had the following to say:

- eee. “The use of metaphors with respect to navigation through the site is unclear to me. Perhaps my understanding of the site structure and navigation is not complete. I think the navigation toolbar you have chosen to use draws its power more from the appropriate, logical chunking of information than relation to any metaphor.”

The fact that both of the above comments are similar, but the ratings are so dissimilar shows that the inclusion of use of metaphors might not be as meaningful and valuable as intended for the evaluation of the RAT Online courses. I can see the value of including this dimension in the evaluation of a learning system built around a theme such as an office theme, but as websites are a fairly new invention, the structure and menu systems are in fact really website metaphors and users do not really have any other prior experience or existing metaphor to compare with. This dimension seems much more related to the navigation and structure of the website than use of a metaphor. In future RAT Online evaluations involving the expert evaluation of the user interface I will exclude use of metaphors as a dimension to be evaluated.

Even though there were no other real issues with the remaining user interface evaluation dimensions, I will use this opportunity to present more of the rich information that two of

the experts provided, as they serve to support the design and implementation of the Belt course as being an effective RAT Online learning environment.

Ease of use

The improved ease of use rating is demonstrated in the following expert comment.

- fff. “The site was easy to operate and was generally exceptionally well laid out. I found the navigation was easy to understand and the course was excellent at making explicit the flow of activities that was to follow right from the first page.”

Navigation

The subtle changes to the site to improve navigation seem to have had a positive effect as is demonstrated by this expert’s feedback. In addition to his feedback, he provided a solution as well as a small Javascript code to help improve the navigation.

- ggg. “Navigation through the course pages was well facilitated and easy to do. Strengths of the navigation system include the use of ... [explaining all the strengths of the site and reasons why they are strengths]”

Cognitive load

One expert rated the cognitive load dimension on the development goal, another rated it the same as the Wheel Spanner evaluation (i.e. one point from the development goal) and the third expert rated the dimension three points away from the development goal. While in one respect this rating is an improvement, in another it is a regression, but taken together perhaps it means there is no change at all. The strength of expert ratings is that each individual’s feedback is valued and the additional written feedback is what provides useful information. In future uses of the expert rating forms, I would redesign the forms to make feedback an essential part of the evaluation. The expert feedback supports the Belt course site as being structured into manageable sections.

- hhh. “I think the cognitive load looks quite heavy BUT I think the course seems well ‘chunked’ to alleviate this.”
- iii. “I believe the course content on this site is well structured and presented in easily

manageable chunks for students to assimilate and work with. The higher frequency of postings with smaller amounts of information in them typical to online courses of this nature would further improve the cognitive load characteristics of the site.”

Mapping

The lack of overt changes to the mapping dimension after the Wheel Spanner course is reflected in the more or less unchanged rating provided by two of the experts. The third expert rated this dimension one point further away from the development goal. One of the experts was experiencing problems with the network the day that she carried out the evaluation, so this could have affected the rating. She has acknowledged the slow network in her feedback below. The other expert comment below confirms the presence and functionality of the visited links and that when clicked they appear in a different colour. Again the importance of the navigation menu is highlighted, but the expert suggested that the addition of ‘bread crumb’ links would be a useful feature of the site’s mapping.

jjj. “When I clicked on a section and then returned to the link again it did not seem to be a different colour so I am a bit uncertain as to how the mapping cues work to enable [the] user to know where they have been already in a session – may have been the slow links today though?”

kkk. “Generally the student always knows more or less where they are in the site structure. If they lose this orientation for some reason, resolution is one click away thanks to the permanent top menu and its easy link system. Also, the presence of bold headers on each page tell the student what content they are looking at...

... The use of colour changes indicating links that have already been visited is effective and serve to inform students of their progress through the course material.”

Screen design

The screen design rating was the same as the previous evaluation of the Wheel Spanner course. One of the experts highlighted that database driven websites at that time were often not as accessible for visually challenged readers, because the text size could not be altered

in the Internet browser by the user. This capability would be an important feature to correct when a RAT Online learning website is released to the public. The other expert provided further supporting evidence for the satisfactory rating for screen design and also made a commented on how the site enables improved download speed. Once again navigation was highlighted.

III. “I think the screen design is good though as you know I see the down-side of database driven pages is that one cannot alter the text size.”

mmm. “I found the use of visual and textual elements were effectively combined to make a site that was easy to navigate and read. The text size was large enough to be easily readable...

... The danger of incorporating images of high quality on every page and the resulting increase in bandwidth usage does not apply here because of the small size of the images, and the way that the rest of the site is not graphically intensive. I like the way that often images that have included for download from the site were compressed before being made available. You’d be surprised how few people go to these lengths when it comes to downloads...

...The conservative use of colours on this site promotes the overall design and feel of the site.”

Information presentation

The better than average rating for information presentation in the Wheel Spanner course, as well as efforts to improve the clarity of text on the Belt course website might have prompted the move of the expected rating one point closer to the development goal. Two of the experts rated this dimension on the development goal, while the third rated the dimension on the expected rating. So overall the rating for information presentation is better than satisfactory. One of the experts found that the wording in the discussion forum was ambiguous, which is a potential information presentation issue (see the first comment below). No learners expressed concern with this issue which might be because the learners did not need to review the discussion forum messages over a specified period in the past as was required by the experts. So this issue might be unique to the function of reviewing the

course. Even so, it is an issue worth investigating further. The other comment supports the above average rating for this dimension.

- nnn. “When I looked at the discussion forum and I had the option to look at the messages ‘from the year’ I found that ambiguous – did it mean only from 2005 or from the last 12 months? I see when I tried it that it meant for the last 12 months and I almost did not check as I knew the course took place in 2004 – so perhaps this needs to be changed?”
- ooo. “The information on this site is well presented and reads in a well-structured and coherent manner. I found the content was appropriate and was presented in manageable chunks so students would not be overwhelmed when reading the texts.”

Media integration

Like information presentation the expected rating for media integration was moved one point to the right and onto the development goal. This was done due to the satisfactory rating in the Wheel Spanner course as well as the additional work to include a greater range of media and link the required media in the context of its use (i.e. within the example syllabus). A separate resources area was also included so that learners could find and view the media from different access points. For this course I used the experience of dealing with multiple forms of media on the RAT CD-ROM. Of the two experts who rated this dimension, both rated it on the development goal. Both comments below support this satisfactory rating, but the first is also a reminder of the Internet connectivity issues that one of the experts was having the day she evaluated the course.

- ppp. “By the way although I had difficulty loading the images and having to wait for ages without being able to proceed as it was not opening in a new window, once I had downloaded the pics and put them in a folder and then switched to View/Thumbnail – I had the most useful display of instructional pictures and I appreciated that the names of each picture described exactly what I was seeing – Great!”
- qqq. “I found the media to be well integrated into this site. Resource intensive video was only used when necessary and there was no superfluous use of images on

the site. The relevant links to images and video were referenced in the appropriate section of text, making linking to the images easy. The insertion of large images into the text was avoided with links being used instead to provide the users with the choice to download the images or not.

The inclusion of a resource page was also a good idea, making it possible for those constrained by slow connections at certain times to download the images when it suits them and to keep copies on their local machine rather.”

Aesthetics

Apart from improving the graphics on the website especially in the header area, the Wheel Spanner site layout was maintained in the Belt course while making a few improvements to the cascading style sheets to improve the appearance of text and headings. A minimalist look was the intended design goal. Although the changes were expected to make subtle improvements to the site, it was not expected that they would be significant enough to warrant a much improved expected rating. With a third reviewer included in the evaluation, the rating has improved with two of them rating the dimension on the development goal and the third on the expected rating. The feedback below illustrates that the changes have had the desired effect.

- rrr. “The site is a good example of a clean-cut site where navigation has been simplified and the overall look of the site is one dominated by simplicity. The colours used provided ample contrast to make the text easily readable... The inclusion of themed pictures in the header bar complemented the inclusion of text in the content area of the page. A limited range of colours were used, adding to the clean and simplistic appearance of the site. Overall, the site meets its functional requirements well while maintaining an uncluttered and clean look.”

Overall functionality

The Belt course included a number of technology changes, which were less experimental than the tools used in the Wheel Spanner course, such as the video chat, whiteboard, and virtual self-defence rooms. The Netomat tool was used to replace the whiteboard and virtual self-defence rooms and was hosted on a third party server. There were fewer expected server crashes on Netomat compared to the experimental Flash Communications

Server as used for the Wheel Spanner course. The chat was replaced with a basic text chat, which was intended to have fewer functionality issues compared to the video chat. These technology changes as well as thorough error-checking resulted in an improved expected rating for overall functionality. The first comment below shows that the site was not completely error-free, but also that the problem described seems more likely as an Internet connectivity issue. Furthermore, as mentioned above from the participants' point of view and the implementation log there were in fact several functionality issues. The second comment supports the perfect expert rating for this dimension (all three experts rated on the development goal).

- sss. "I had no luck with the [N]etomat option – seemed to time out when I tried – is it that nice mapping tool that you use..."
- ttt. "I found the site to be functional and easy to use. Once again, I liked the method of information presentation and found the flow of information on the site to be logical and easily understood. I feel that the appropriate inclusion of images and video also increased the functionality of the site in that it facilitated getting a clearer message across to the students concerning techniques."

Consistency in behaviour and standards

Care was taken to model the Belt course on the Wheel Spanner course standards used, such as the layout, navigation, the functionality and placement of media items. The result was satisfactory, as two experts rated the dimension on the development goal and the third expert rated the dimension one point away from the development goal. The expert comment supports the good rating for this dimension.

- uuu. "The use of links, headings and categories throughout this site has been consistent. There is no confusion on the part of the user as to what should be expected from the site."

Resources and documentation

The rating for resources and documentation improved in this evaluation. Two experts rated this dimension on the development goal and one expert one point away from the development goal. It is thought that the additional resources included as part of the

expanded example syllabus might have contributed to the improved rating. Furthermore the approach of providing clear instructions and media linked within context used in the Wheel Spanner course seems once again to have helped maintain a high rating. The expert feedback below supports the above reasons for the overall improved rating.

- vvv. “The resources and documentation that were included in this site were helpful in that they explained everything that was needed from the students in terms of tasks that needed to be completed. With reference to tools such as the Netomat tool and the task of creating a mind map, examples were given and it was explicitly stated what was required of the students. In my mind supporting documentation should be relevant in every aspect, appropriately chunked and easily accessible (embedded in the relevant content area). I found the supporting documentation to be all of these things.”

The overall impressions below provided by two of the experts illustrate that from their perspectives the Belt course was an effectively designed and implemented learning environment. Whereas as earlier it was difficult to draw useful conclusions with the minimal online questionnaire feedback, now taken together with the learner output, the learner feedback and the expert reviews a picture is emerging that the Belt course was an effective learning environment. I believe that as course designer of this type of learning environment the experience is helping me to make subtle but meaningful changes, such as including more learning resources (e.g. the example syllabus) at the right place within the flow of the course. I am satisfied with the overall user interface design of this type of course. Thus I will not include an expert review of the user interface in the next RAT Online course. These expert overall impressions serve as a useful conclusion to this part of the evaluation.

- www. “Overall in terms of the criteria given I think this has all the characteristics of a very useful and successful online course. The discussion forum entries would seem to support this view.”
- xxx. “I must admit that when I heard the concept of an online course for teaching something as practically oriented as a self-defence course, I had my doubts

about how appropriate the use of technology in a distance learning course would prove. Not knowing anything about the discipline I failed to recognize the huge philosophical component that underlies everything you do, and the scope for learning about the reasons for employing the techniques you use. From looking at the site, readings the posts, viewing the resources and demonstrations and reading the course content, I now think that this course was well executed, with the use of resources like flash animation, video animation and images closing the gap inherent in online course teaching. I believe the course work made for a firm grounding in the principles underlying the discipline and in conveying the different techniques to the students.

I was impressed by the discussion forum posts which, while a little thin in one or two areas, seemed to challenge the students to look beyond the obvious and delve a little deeper into the subject matter. [The facilitator] adopted the facilitative role well and this enhanced the quality of the online interactions. The use of tools such as mind maps was effective and in some cases produced excellent insight from the students about the topic as a whole.

All in all I was impressed by the site philosophy, the design component, the appropriate chunking of information, the resource integration and the contextualization of the course content. I get the impression that the students benefitted from the course and this is [the] ultimate aim of any online course.”

6.5.6 Expert evaluation: teaching evaluation

The three experts who evaluated the user interface of the Belt course also evaluated the teaching dimensions. In addition to the ratings, one of the experts provided minimal written feedback while another provided more extensive written feedback on each dimension.

Three of the dimensions (kinaesthetic/technical skill, martial application, and martial theory) were moved to the content expert evaluation form after the Wheel Spanner course.

The overall evaluation result was satisfactory (Fig. 6.28). Some dimensions (learning theory, teacher role, and metacognitive support) were rated more or less the same as they were in the Wheel Spanner course. The results for goal orientation and learning delivery are mixed with two results in each dimension showing an improvement and the third a regression. Source of motivation and pedagogical philosophy have lost some ground, while collaborative learning and cultural sensitivity have improved.

Each of the evaluation dimensions will be briefly discussed below with accompanying expert feedback supporting the findings.

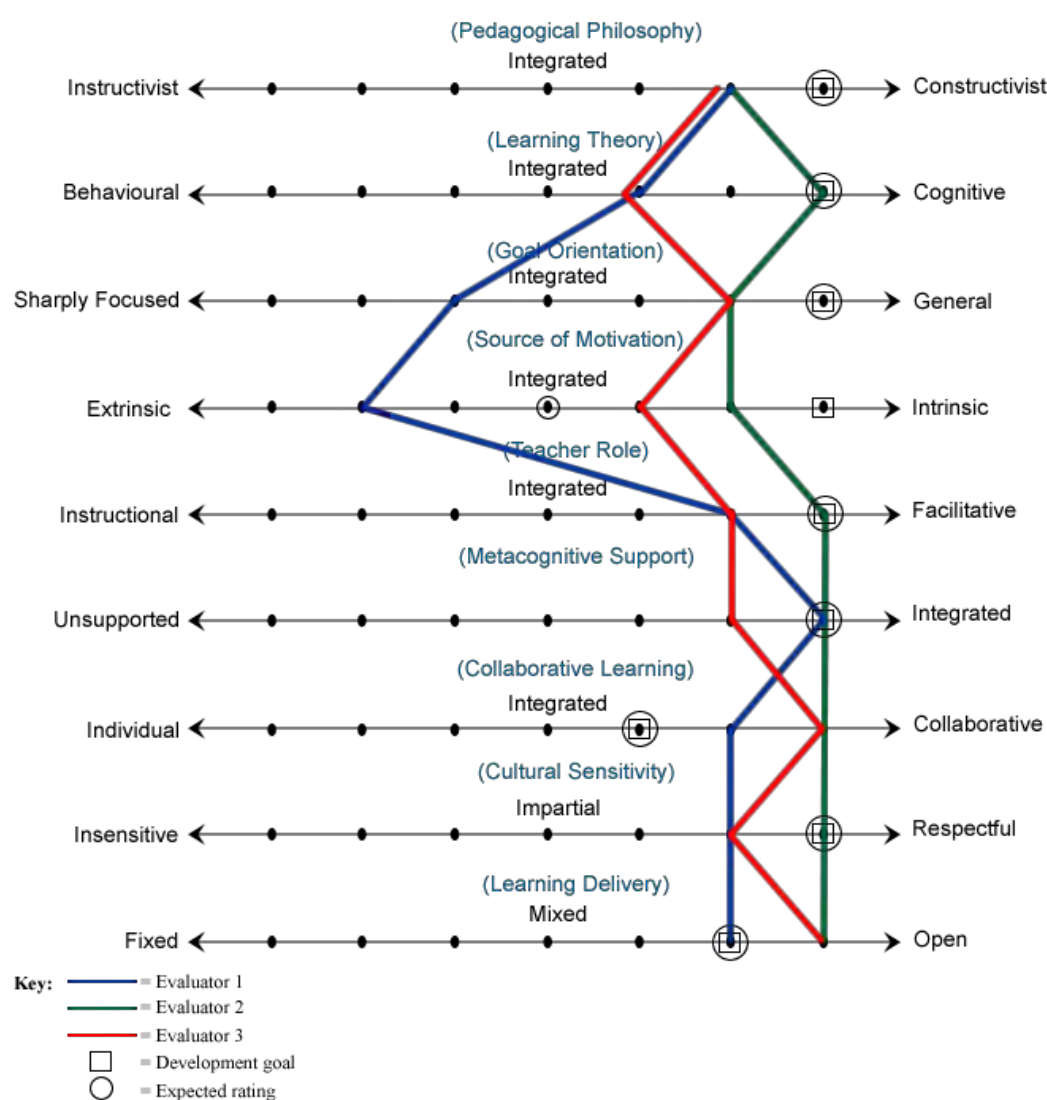


Fig. 6.28: Belt course teaching evaluation form

Pedagogical philosophy

The results for pedagogical philosophy are acceptable, even though there is a slight regression in one of the ratings compared to the Wheel Spanner course. All experts rated this dimension one point away from the development goal and the expected rating. Given the high reliance on creative and collaborative activities I had expected a fully constructivist rating, but in hindsight the structured nature of the earlier tasks in the course implies some slight degree of instructivism. Based on the learner output, learner feedback, and my own participant observations, the blend of constructivism and instructivism contributes to the effectiveness of RAT Online courses. The expert feedback below supports the stronger constructivist implementation of this course.

yyy. “I found the learning environment to be strongly constructivist in its implementation. I was impressed with the wide range of activities and the active use of the discussion and support materials. In particular I found the way the course content was contextualised in real-life situations to be excellent. The use of an everyday item traditionally not associated with weaponry (belt) further cements this contextualisation, thereby providing practical methods of self defence.

[The facilitator] also reinforced one of the central principles in that the past experiences and perceptions of those in the learning environment are relevant to the course, and convey a better understanding of the subject matter being studied to all participants.”

zzz. “It has also been helpful to see the videos that I did on the CD of the participants’ demos of what they had learnt and developed from the course etc.”

Learning theory

The learning theory dimension was rated as having elements of both poles (cognitive and behavioural) with a much stronger slant towards the cognitive pole (one expert on the development goal and the other two experts two points away from the development goal). The expected rating in the Wheel Spanner course was a more accurate prediction of the rating, which was also two points away from the development goal. In the Belt course I had expected this rating to move closer towards the cognitive pole due to the high

occurrence of thinking activities in the course. The nature of developing martial arts skills implies behaviourist style drill and practise. The difference in this course is that the development of these skills is complemented by cognitive learning activities. This is probably why the experts have rated the way they have and this seems to indicate that both the development goal and the expected rating should move over slightly to the left to more accurately reflect the aims of such a course. The expert feedback supports the more cognitively weighted result.

aaaa. “This course is quite plainly not just a drill and practice course with the emphasis being placed on the correct execution of previously defined and established manoeuvres. Instead, the course places a huge emphasis on why certain tools can be used in self defence and the importance of assessing the situation in which one of these tools would be used most effectively. The result is that students are required to think about an entire range of ideas and concepts before even progressing to the behavioural aspects of the course. This is most consistent with a cognitive learning approach and serves to provide the learners not only with the desired set of behavioural traits, but a comprehensive understanding of the repercussions of this area of self-defence.”

Goal orientation

Two experts rated this dimension one point away from the general pole (development goal and the expected rating) and the third expert provided a rating four points away from the general pole. This rating was closer to the development goal and expected rating of the Wheel Spanner course. I had, it seems wrongly, assumed that the creative tasks and generation of solutions to complex problems, followed by the generation and practise of specific techniques to deal with self-defence situations makes this course almost exclusively general. Upon reflection the ratings provided by the experts offer a better mix of general and sharply focused goals for this type of course, because the fact is that the drilling of skills is required to develop proficiency in martial arts, otherwise it is all just theory. The expert feedback below supports the blend of goal orientation elements. This feedback is also evidence of the higher order thinking skills as put forward in Bloom’s Taxonomy (Bloom et al., 1956).

- bbbb. “This course is focused in the sense that it still strives to teach students a range of manoeuvres that can be used in self-defence but, more importantly, it is general in that it promotes the principles underpinning this kind of self defence. Students are not simply taught a set of manoeuvres and then expected to recall this instruction, but are instead encouraged (and required) to engage in deep thinking and research activities to qualify their choice for using this weapon. They are required to further reflect on the best ways to use this weapon based on the characteristics of the weapon and the strengths and weaknesses it might bring into the confrontation.”

Source of motivation

Source of motivation seems to have lost some ground. One expert rated the dimension one point away from the development goal, another two points away and the third five points away. The expected rating remained unchanged from the Wheel Spanner course (at the integrated centre point) because the participants on this course required sustained encouragement and reminders about task deadlines by the course facilitator. The results seem to suggest that the development goal is perhaps more appropriately placed around the centre of the scale, because even though a course might be appealing for learners, it is still the role of the course facilitator to guide the course and keep tasks on track. Therefore bringing in an amount of extrinsic motivation is not a negative characteristic of a course. In fact, it might be worth considering that this element of extrinsic motivation is healthy for RAT and other martial arts learning environments, because it aligns itself with collaborative learning and developing a sense of community. Whether motivated by the facilitator or by other peers, if the result is the accomplishment of goals, then I am inclined to rethink my original development goal based on the good results of this course and the previous two courses. The expert comment below supports this more integrated rating for source of motivation.

- cccc. “I would say the course motivation is primarily intrinsic because, for instance in the chat groups, the learners motivated one another by entering into frequent conversation and constantly challenging one another’s views while building on them to form a coherent, holistic argument. This was generally done quite well. There was still, however, a need for the facilitator to provide motivation for the

students to discuss more topics. This is consistent with the normal role of facilitator in this type of environment.”

Teacher role

One expert rated teacher role on the development goal (and expected rating) which was on the extreme facilitative end of the scale. The other two experts rated this dimension two points away from the development goal. This is a satisfactory result and consistent with the underlying social constructivist learning approach used in the design of the course. After two evaluations, it would seem that the facilitative role is being carried out effectively. The expert feedback below supports this statement and also serves as further support for earlier findings about the usefulness of the self-introduction task and the intended design aims for this task. Furthermore, the participants agreed that the facilitator was flexible in his approach.

dddd. “[The facilitator] definitely played a facilitative role in this process. [The facilitator] was excellent at encouraging the students to think for themselves and for getting them to motivate for the use of the belt as a weapon. In addition, he was not too overbearing in the discussions, preferring to largely take a back seat and only to step in when the conversation needed more direction. [The facilitator] also fulfilled the role of facilitator well when welcoming the students individually to the course. Once again, the students were required to do something themselves (introduce themselves) whereas [the facilitator] could have just as easily made a class profile available instead. Self introduction was an effective strategy as it also served to familiarize the students with the chat interface.”

Metacognitive support

Two experts rated metacognitive support on the development goal (extreme end of integrated) and the third rated the dimension one point away from the development goal. While largely unchanged with the exception of an additional expert rating, this result is satisfactory and represents the effective integration of metacognitive support. The expert feedback below supports this claim.

eeee. “The site clearly lays out what is expected and what skills are necessary to achieve a favourable assessment in the course. This, I feel, lays the foundation for the tasks that follow and lets the students know what level of participation is required from them in this regard. Within this framework, the course then provides a number of tools that facilitate metacognition, for example mind maps, simulation situations, animations and chat discussions. With these tools students aren’t merely expected to provide the ‘correct’ answer, but to also motivate why they chose that answer, requiring them to examine and make explicit their thought processes.”

Collaborative learning

The ratings for collaborative learning indicate an improvement over the previous Wheel Spanner course. Two experts rated the dimension on the collaborative pole and the other expert rated this dimension one point away from the collaborative pole. There was a blend of individual learning activities, but the strength of the course was from the course group interactions and sharing of information, resources, and knowledge. Because of the incorporation of individual learning activities I had placed the development goal and expected rating three points away from the extreme collaborative end of the scale. Even though there were individual learning activities the construction of the knowledge for those activities was encouraged through the collaboration and sharing of the group. Based on the implementation of certain tasks in the previous course, such as the represent your knowledge and the practise and record your knowledge tasks, I observed that these tasks were more effectively implemented as individual learner submissions but with the individual having arrived at their final product through the negotiation of knowledge. This change seemed to be occurring due to logistical constraints, such as time differences over geographic time zones, different life circumstances, and technology limitations. This strongly collaborative learning result is aligned with social constructivist learning, as well as with learner output, learner feedback, and participant observation. The expert feedback reflects the collaborative and constructivist nature of the course as implemented, as well as the effective sequencing of tasks, which were based on cognitive flexibility theory (Spiro et al., 1992a).

ffff. “This course definitely draws its strength from its collaborative nature. While

certain aspects of the course require students to conduct their own research and reading, this stage simply helps learners to construct their own preliminary views on the subjects before they engage with the other students to collaboratively add value to their initial perceptions. The use of the discussion tool was effective at drawing understanding from individuals, while the collaborative group projects and presentations encouraged the students to work together and negotiate meaning from the course material together. This always results in a richer understanding of the subject matter.”

Cultural sensitivity

The work carried out to improve the tone of the language seems to have had a positive effect with the improved rating of cultural sensitivity. One of the experts rated cultural sensitivity on the development goal (extreme respectful pole) and the other two experts rated the dimension one point away from the development goal. The expert feedback shows that the course interactions were respectful and also adds an interesting insight with regard to the language used for course delivery.

gggg. “While I was not able to observe the practice sessions between members present at RAT, I have no reason to believe this course was in any way culturally prescriptive. The only cultural insensitivity could possibly be due to the language barrier, with some participants not speaking English as their first language. The facilitator did, however, bring this to the attention of the group prior to the course beginning. Unfortunately this issue is largely unavoidable and, given the majority of the students participating, English was the medium used.”

Learning delivery

Two experts rated learning delivery on the extreme open end, while the remaining expert rated the dimension one point away on the development goal and the expected rating. Above I have said that this is a slight regression compared to the Wheel Spanner course evaluation. I said this because it would be utopian to have a course that is fully open, but in reality this is not practical. The Belt course was by design slightly off the full open pole, because in order to keep the course running according to schedule deadlines had to be incorporated and there were minimal synchronous chat activities. These synchronous

activities meant that participants were required to meet at specified times. Therefore the course was not fully open. The expert comment below puts forward the view that the course was as open as is possible in a course of this nature.

hhhh. “The description of this evaluation criterion refers to the timing and situation of the delivery. In this regard I believe this delivery is as open as is possible. Asynchronous discussion postings and the use of Internet delivery allow for students across the globe to participate in the course at a location and time convenient to them. The use of a synchronous online chat was the only factor that was more prescriptive, but use of this tool was limited to 3 sessions across the entire course and was scheduled for a time when work pressures would not influence the chat participation. Students were also asked to agree on a time convenient to everyone making it that much more flexible.”

Next, the content evaluation is discussed.

6.5.7 Expert evaluation: content evaluation

Of the three experts contacted to evaluate the Belt course, only one agreed to take part in the evaluation. The reasons given were poor Internet connections and a lack of time. All content experts are busy people, but for some reason they agreed to evaluate the RAT CD-ROM.

The expert who did agree to evaluate the course is from a traditional martial arts background with over 30 years of martial arts experience and believes in ‘the learn by example’ approach. So in our initial telephone call he seemed quite uncomfortable about the whole idea of teaching martial arts online and said that he would have to think about it for a few days to ‘let it sink in’. He also added, “Well you certainly are a pioneer in this Steve.” Realising that it was a risk to open this project up to the scrutiny of experts interested in maintaining the traditional approach, I also thought that in order for the RAT Online project to gain any sort of recognition it is those traditional martial artists who should evaluate these types of courses. Thus the wait for the results was not without

consternation. This expert was also involved in evaluating the RAT CD-ROM in both evaluation rounds.

The content evaluation form was used to shed light on the appeal and effectiveness of the Belt course learning material.

Thirteen of the eighteen ratings were on the development goals for this course, so this is a satisfactory rating (Fig. 6.29). This good evaluation is surprising given the initial telephone response of the expert. The rating pattern generated is consistent with the design aims of an online course of this nature and when compared with the RAT CD-ROM content expert evaluations the Belt course seems like it achieved its design aims to a greater extent.

However, this claim can only be taken tentatively, as there were a greater number of evaluators in the RAT CD-ROM component of this study. Thus these two components cannot be validly compared in this way.

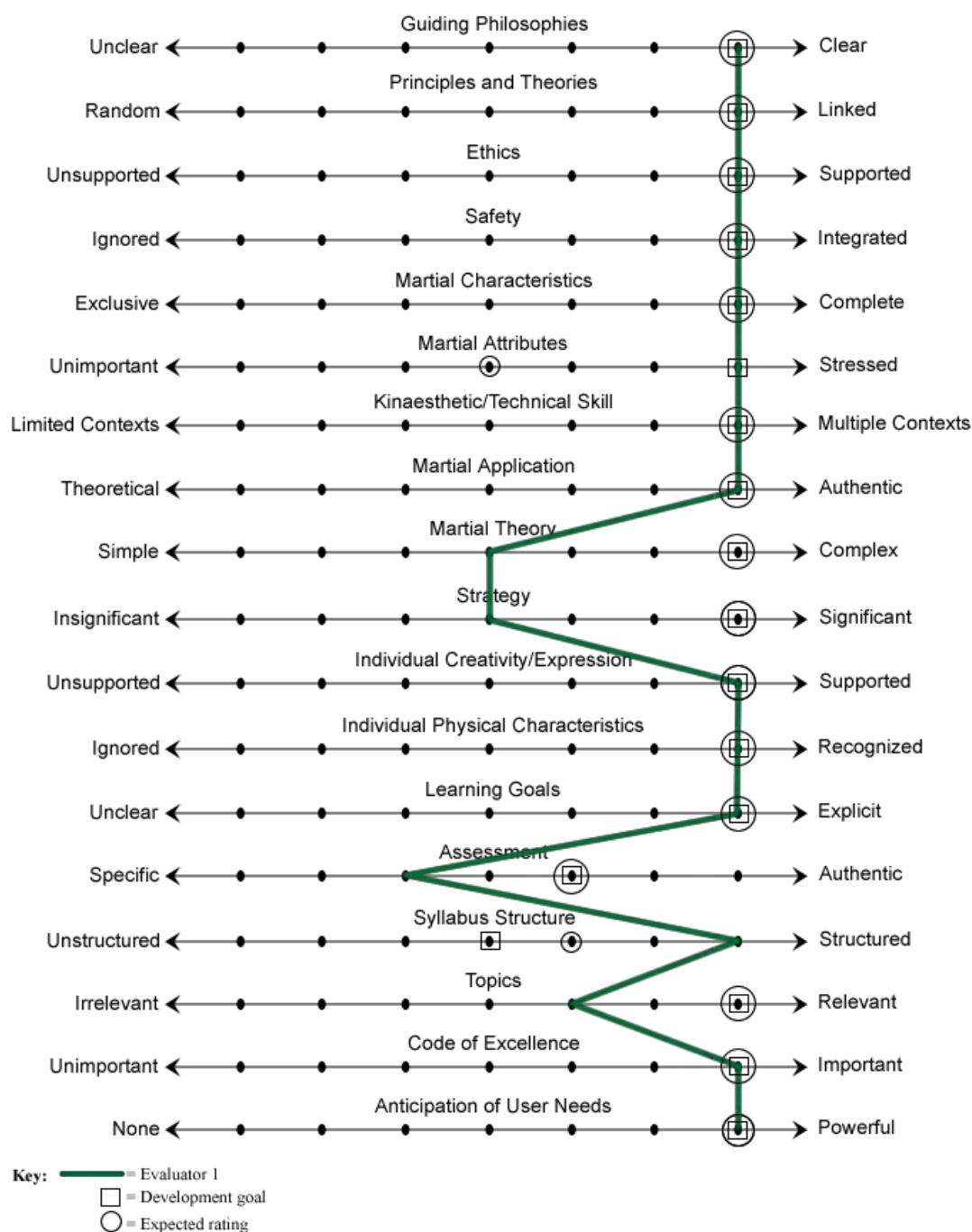


Fig. 6.29: Belt course content evaluation form

Even though the expert had this to say at the end of the form about teaching over the Internet: “Caution: Training or teaching over the Internet could lead to a dangerous situation as you are not getting to know the student i.e. attitude, morals etc”, he rated the guiding philosophies and ethics dimensions on the development goals. There was great emphasis placed on these attributes of RAT in the learning activities on the Belt course.

One could also argue that one might not necessarily get to know students in a face-to-face class.

The following dimensions were areas of concern: (1) martial theory (rated three points from the development goal), (2) strategy (also rated three points from the development goal), (3) assessment (rated two points from the development goal), (4) syllabus structure (rated three points from the development goal), and (5) topics (rated two points from the development goal).

The Netomat tool did not display a recorded log of the virtual self-defence chats. I believe that had the expert had the opportunity to observe the virtual self-defence chat or at least view a log of the chats in context the rating for martial theory and strategy might have been closer to the development goals.

For assessment I suspect that the word “ill-structured” being associated with authentic learning might have been misleading. Perhaps this is jargon associated with learning theory and should be made more reader-friendly to evaluators. This jargon might have influenced the assessment rating negatively. Of course this may not be the case either and the rating might be accurate. This uncertainty over this point implies two potential changes to the content evaluation tool: (1) improve the clarity of the wording, and (2) ensure that expert feedback becomes a part of the evaluation so that experts can qualify their ratings. This is in fact similar to requiring learners in a course to demonstrate their understanding of statements they make.

Like the RAT CD-ROM evaluations it is believed that the word ‘unstructured’ (in syllabus structure) might negatively affect the rating because it implies a level of disorganisation, a characteristic generally frowned upon in society. The logical layout of the website and tasks suggests a level of structure which is what appears to have been the main influence in the rating.

As revealed in the RAT CD-ROM the topics dimension is subjective and the relevance of topics is determined by the interests of the individual. While it is tempting to remove this dimension from the evaluation, it is nonetheless useful to know if one is aligning such

learning according to needs in society. This may increase the appeal of such courses. But by the same token, it is perhaps not ideal to follow only the fashions current in society.

I will now make some concluding remarks about the Belt course.

6.5.8 Belt course conclusion

The results of the Belt course contribute to mounting evidence that online learning is a viable means of teaching/learning RAT (and potentially other martial arts) when designed using a social constructivist approach. The discussion of the course, as well as the two previous RAT Online courses shows that conducting and evaluating courses and learning environments is every bit as complex as Reeves & Hedberg (2003, p. 34) alluded to. For me this experience has confirmed that the eclectic-mixed methods-pragmatic paradigm is an appropriate theoretical framework, as it has enabled a practical decision making process while at the same time allowing some interesting more generalised observations about online learning.

As in the Wheel Spanner course, the findings in this course have shown that the development of RAT knowledge, attitudes, and skills can be facilitated in computer supported environments. It has also shown that through evaluation and appropriate changes enhancements can be made to the design of such learning environments so as to improve the learning experience for course participants. Lastly, that appropriate tasks and tools may help to attain the purposes of the RAT Online courses, such as strategic thinking and learning, individual and group creation and representation of new RAT knowledge, collaborative learning and a value for others' opinions, and of course the development of RAT skills.

One last round of evaluation was conducted to determine the effectiveness of RAT Online courses. The Pen course, described next, was designed to be a learning environment matching the complexity and duration of the Wheel Spanner and Belt courses, however involving a smaller scale evaluation.

6.6 Part 4: The Pen course

The Pen course was designed using a purpose built online learning system, Open Learning System (OLS). This course was a final opportunity to evaluate the effectiveness of RAT Online courses from the learner's perspective. The expert evaluation results of the Wheel Spanner and Belt courses were deemed satisfactory. Therefore further expert evaluation was considered unnecessary. Furthermore, the system used to design and implement the course (OLS) had already been evaluated from a usability perspective in Amory, Gachie, Clarke and Yates (2004). The final evaluation of the learning and participant perceptions of the Pen course is intended as a final check before a RAT Online learning portal is released to the broader public.

Next the course and evaluation is described.

Course aims

In keeping with the theme of providing practical learning experiences for the learners, this course was designed to help them develop the knowledge, attitudes, and skills to defend themselves using a pen. Once again this topic was unfamiliar to all the course participants.

Like the Wheel Spanner and Belt courses, the Pen course was designed to run for a month, from 4 April 2005 – 2 May 2005. Learners who completed the course successfully were given certificates (five in total) as an incentive to take part and material generated by learners, such as mind maps, images or video clips would be added to the RAT CD-ROM as example material for use by other learners.

Development and course tools

Microsoft Word was used to create a design storyboard for the course so that any errors in design, grammar, spelling or otherwise could be determined before placing the content into the learning system. At this time the University of KwaZulu-Natal had developed a powerful open source online learning system called Open Learning System (OLS) and I was given permission to set up a course to test it out. This arrangement was better than the previous arrangement with the Bear Hug course because WebCT was a proprietary system and the only way I could continue to use it was through the university. This was not a sustainable approach. But because OLS is an open source product it meant that if the

system was useful for running this type of course, I could have it installed on the RAT Online server and use it to conduct future RAT Online courses. OLS had built in communication tools, such as discussion forums, chats, file repositories and a number of others which made the course development process a lot easier than in the previous two courses.

A digital camera was used for photos for the course material and these were manipulated in Adobe Photoshop. Adobe (previously Macromedia) Fireworks was used to create images of objects and 3D images of people were created in Poser, all for the self-defence scenarios. Netomat was once again used for shared workspaces, as well as for the self-defence scenario chats. Netomat is now unfortunately a defunct personal computing tool and moved its focus to mobile phone applications. An animation depicting a concept was created in Adobe (previously Macromedia) Flash. Participants were once again encouraged to use Freemind for their “represent your knowledge” task.

Participants

In this course there were two participant groups, the learners and myself as participant observer.

There were 25 people registered in the Pen course, but the vast majority were registered only for curiosity’s sake and an interest in online learning and OLS itself. Twelve all male participants completed the first task, but effectively only six actually took it seriously. One participant stated that he was interested in taking part as an observer, as his interest was more in exploring online learning in his company rather than because of an interest in martial arts. He did not complete most of the tasks and those that he did complete were not with a level of seriousness.

The six member participant group ranged in age between 22 and 35 years and all had trained previously in other martial arts with three of them having trained in RAT. The total number of martial arts represented was ten with many participants, including RAT practitioners, having trained in more than one martial art. None had trained in using a pen for self-defence or taken part in training using a device with similar attributes for the purposes of self-defence. Five of the participants took part in the course remotely from Durban, South Africa, while the remaining participant took part from London, England.

Two members of this group also attended RAT face-to-face classes during the time the course was conducted.

Evaluation instruments

Six evaluation instruments were used to gather information about the functionality, usability, appeal, and effectiveness of the Pen course (Table 6.12). The instruments included learner contributions, online questionnaire, post course interview, incomplete course interview, participant observation, and a development and implementation log. The small participant groups in each of the courses mean that it is difficult to draw solid conclusions about the participant learning. Thus it was deemed necessary to conduct this type of course several times to observe the similarities and differences in their learning and whether the chosen underlying theories have supported learning and how.

Table 6.12: The pen course evaluation matrix

Methods	Instruments	Functionality	Usability	Appeal	Effectiveness
Learner output	Learner contributions				X
Learner feedback	Questionnaire	X	X	X	X
	Post course interview	X	X	X	X
	Incomplete course interview			X	X
Observation	Participant observation	X	X	X	X
Records	Development and implementation log	X	X	X	X

Course description and tasks

The full name of the Pen course was “Using Your Pen for Self-Defence: An Introduction”.

Due to the Pen course being hosted on OLS the home page was different to the previous two courses. In OLS the learner sees all the courses that they are subscribed to. In this case, the learners only saw one link to the Pen course (Fig. 6.30).

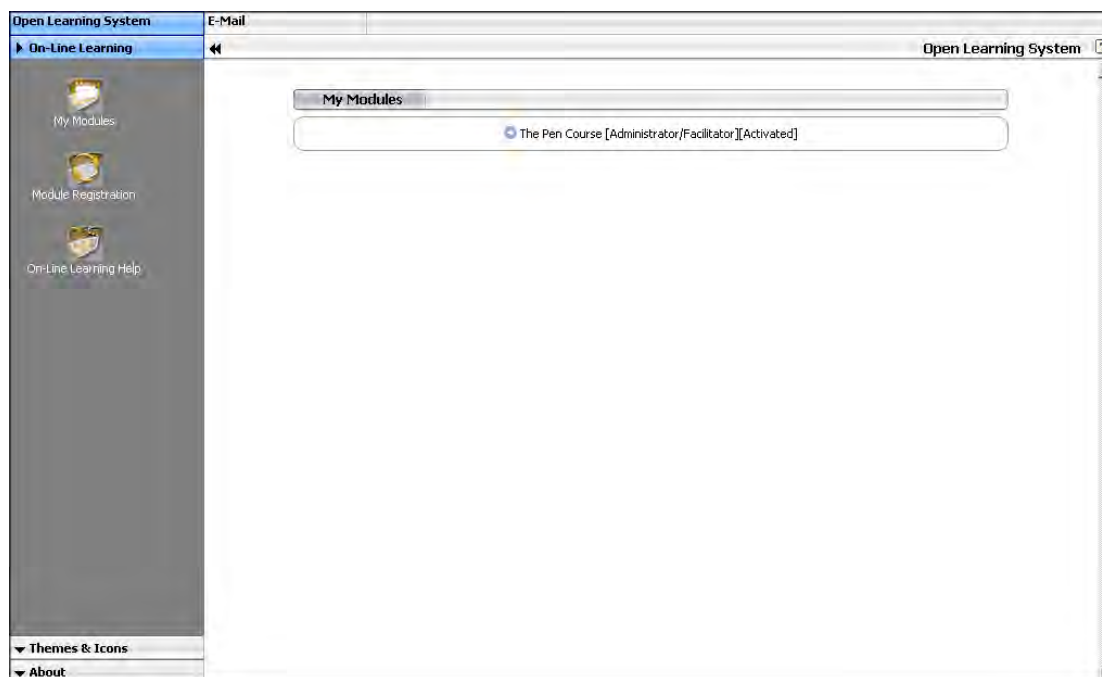


Fig. 6.30: OLS home page

After clicking the link a welcome page would open (Fig. 6.31). The welcome page was the equivalent of the home page in the Wheel Spanner and Belt courses. Like the previous courses a safety message was placed in a prominent position and colour on the welcome (home) page of the course. There was also as a safety menu item containing a link to the safety pages. The navigation of OLS is arranged in an accordion style on the left. When clicking the menu items, the clicked item moves to the top of the screen revealing the links and tools within that menu. The administration menu item is always available for easy access by the designer of the courses (Fig. 6.31). The top menu contains links to OLS, university email, and the main course page (i.e., the Pen course). The left menu contains all the sections of the course. The course was divided into the following main sections: course information, safety, resources, course tasks, course tools, and course completion.

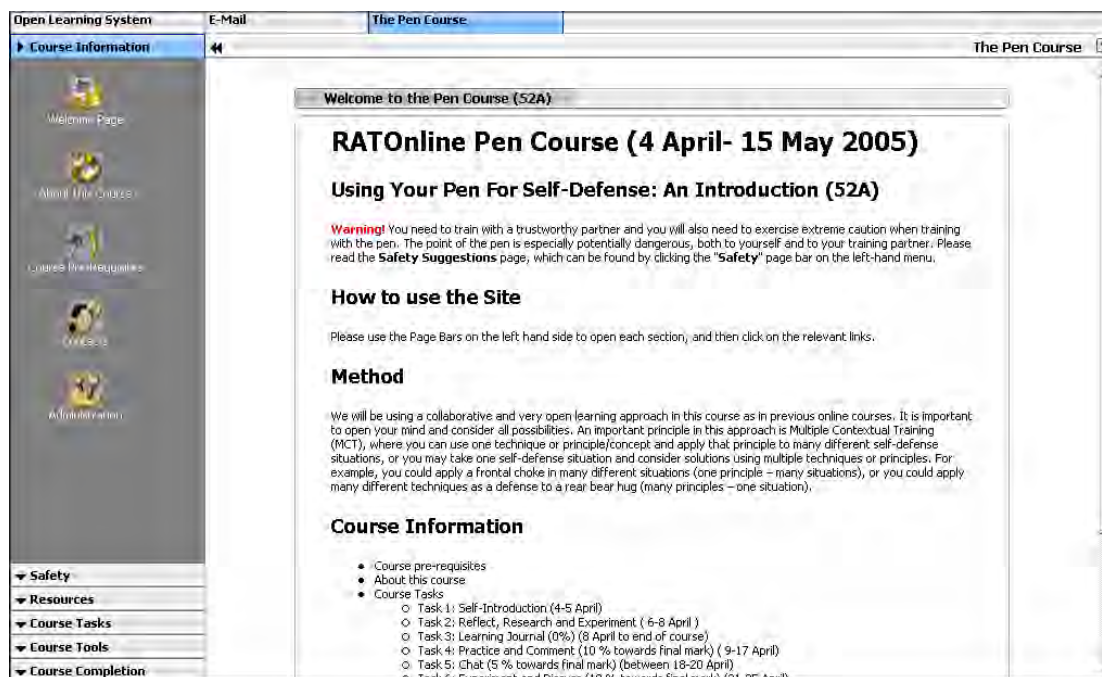


Fig. 6.31: Welcome page showing navigation menu on left hand side

The course information page contained links to the welcome page (home of this course), about this course, course pre-requisites, and contacts. The safety menu contained a link to a page with additional advice on safety. The resources item contained a page with links to all the resources used within the course (Fig. 6.32). This page proved useful from a course facilitator point of view, as OLS allows for the addition of folders and files, making it easy to categorise information and resources. OLS also has the capability to add an images folder, which meant that useful images could be displayed directly in the folder as a linear film strip. The page also included links to useful software for the course tasks.

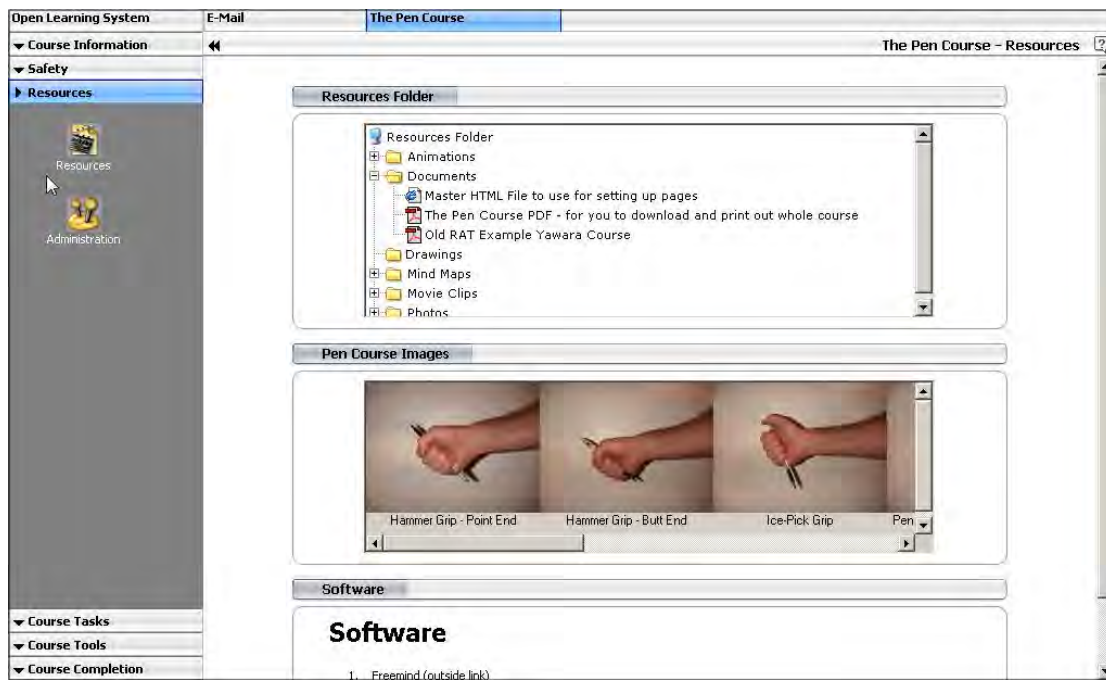


Fig. 6.32: Pen course resources page

The course tasks menu contained links directly to all the course tasks (Fig. 6.33).

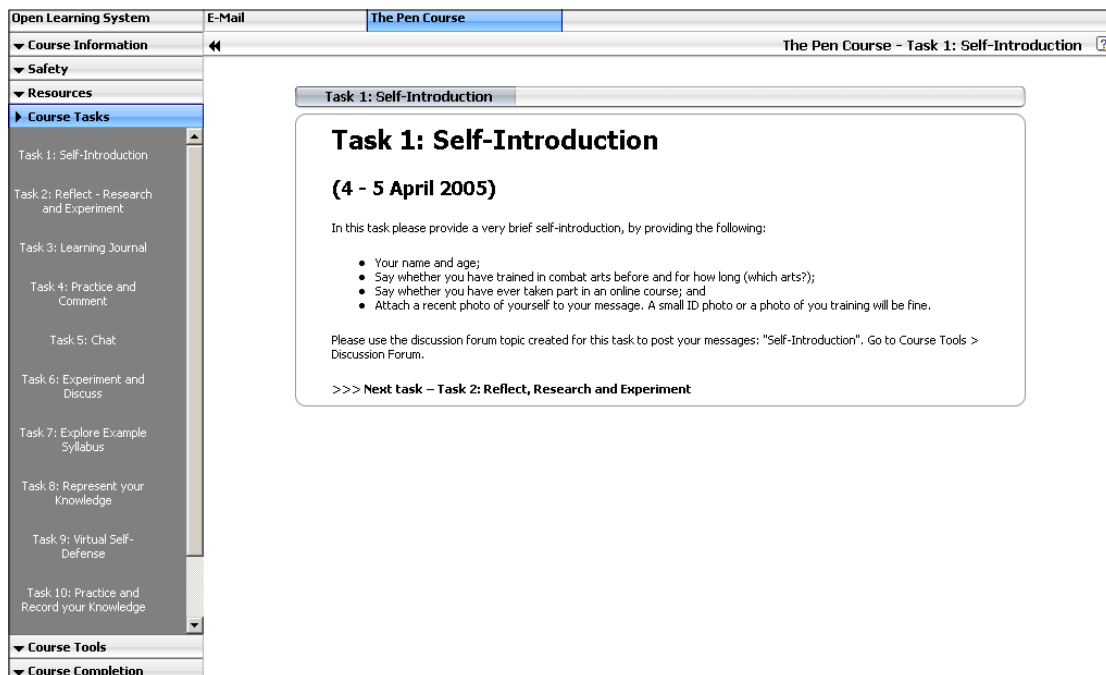


Fig. 6.33: Course tasks menu

The course tools menu contained links to the main discussion forum, the course chat, Netomat (created for the Pen course), and a link to download Freemind. Lastly the course

completion page contained links to the certification information and the course completion questionnaire.

As with the Belt course, the ‘about this course’ page contained a list of the learning topics covered in the course. These included: learning to use the pen as a self-defence tool, increasing knowledge of self-defence, gaining new or improving existing skills in self-defence (in particular using the pen for self-defence), new ways of thinking about martial arts and online learning, and being assessed for increased knowledge and technical expertise. The course duration was also provided on this page.

As with the Wheel Spanner and Belt courses, assessment in the course was continuous, with most tasks carrying a mark weighting. Again an appropriate marking rubric was created for each task and made available to participants under the marking criteria for each task. There were ten tasks in the course, including: (1) Task 1: Self-introduction (0%), (2) Task 2: Reflect, research and experiment (0%), (3) Task 3: Learning journal (0%), (4) Task 4: Practise and comment (10%), (5) Task 5: Chat (5%), (6) Task 6: Experiment and discuss (10%), (7) Task 7: Explore example syllabus (0%), (8) Task 8: Represent your knowledge (20%), (9) Task 9: Virtual self-defence – discussion and simulation (15%), and (10) Task 10: Practise and record your knowledge (40%).

The following is an overview of each task:

1. Task 1: Self-introduction

This task seemed to work well in the Belt course so that participants could get to know each other better before the other course tasks commenced. Using the discussion forum participants were asked to state their name and age, describe their previous martial arts training and experience, state whether they have ever taken part in an online course before, and they were also asked to attach a small recent photo of themselves (Fig. 6.34).

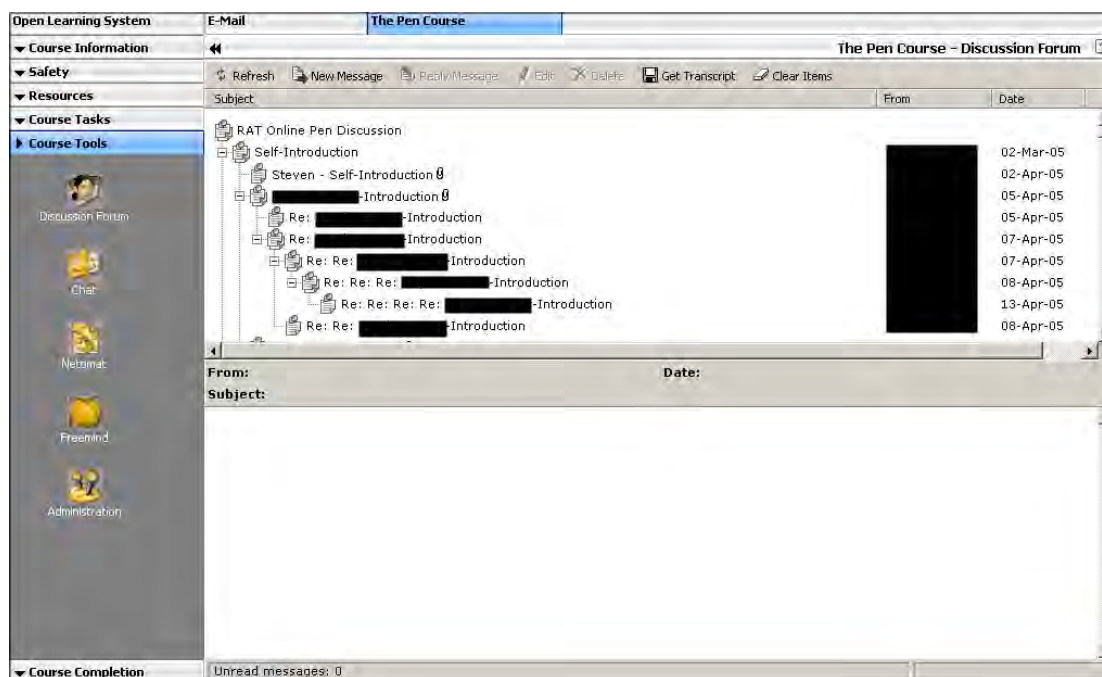


Fig. 6.34: Self-introduction discussion forum

2. Task 2: Reflect, research and experiment

This task was designed to initiate the learning process and was not a mark-bearing activity. This task was the same as the Belt course. Participants were asked to begin thinking about what a weapon is, perform independent research about weapons, and begin experimenting with the pen as a self-defence implement (with and/or without a partner). Participants were also provided with links to complement this task.

These links included a link to the example Pen course, the safety page, as well as seven additional outside links to information about other weapons with similar characteristics to a pen.

3. Task 3: Learning journal

The learning journal was intended to replace the collaborative part of the 'represent your knowledge' task. It was intended that by initiating an early start and by documenting the growing body of individual knowledge that the task of creating the mind map later in the course might be easier. It was also intended to help simplify the 'represent our knowledge' task. Participants could use the discussion forum topic set up for this task or use the more graphical Netomat set up for each participant. There were no marks awarded for this task.

4. Task 4: Practise and comment

This task was the same as the 'practise and comment' task in the Belt course. The task was divided into two parts: (1) to practise the techniques learned during task 2,

and then (2) to post a discussion message in the forum topic set up for this task stating the attributes of the pen, the weapons that it is similar to, and finally to list the categories of self-defence techniques possible providing reasons why the techniques might be useful.

5. Task 5: Chat

Like the Belt course a text based chat was used. This time the built in OLS chat tool was used (Fig. 6.35). The chat was scheduled to last for 90 minutes. Participants were asked to discuss the positive and negative attributes of the pen as a self-defence weapon, discuss specific techniques, and to share experiences training with the pen. The facilitator was to play the role of guide and to keep the chat on track, as well as to ensure that all participants have an opportunity to participate.



Fig. 6.35: OLS chat tool

6. Task 6: Experiment and discuss

In this task participants were encouraged to build on their knowledge and skills gained in earlier tasks by continuing to experiment with the pen, but also using the shared experiences of others in the course. They were asked to cover techniques from all the major categories of techniques, such as strikes, defences, locks, etc. Participants were given a few days to experiment and then were required to submit a message in the discussion forum topic set up for this task. They were encouraged

to upload images, photos, drawings, animations, video clips or any media that would help explain their submissions.

7. Task 7: Explore example syllabus

In this task an example syllabus was provided for learners. This syllabus was a fully developed syllabus containing examples from all major categories. It was intended to extend the participants' learning and possibly encourage more ideas. In this example syllabus the images were stored in the resources area, because in OLS one could not link to the images from the syllabus page, and placing the larger images on the syllabus page would have made the page too long. Thus keeping them separate made sense.

8. Task 8: Represent your knowledge

Several attempts had been made in previous RAT Online courses to include a collaborative mind-mapping task, but with disappointing results. The lack of success with this part of the task seemed mainly to be a result of the technology, but also because the instructions for the task seemed too complex. Therefore in this course, participants were only asked to submit their individual mind map. However, they were encouraged to use their learning journal from task 3 to begin building their maps and various options were provided. They could use a whiteboard area created in Netomat (see Fig. 6.19 in the Belt course section), they could use Freemind, a Word document, an image, or any other method to represent their knowledge, as long as it was legible. They were then asked to post a message in the forum topic created for this task with an attached file containing their mind map or other method of representing their knowledge.

9. Task 9: Virtual self-defence – discussion and simulation

There were four self-defence scenarios in this task designed to challenge the participants' knowledge about self-defence strategy (especially as related to the pen), ethics, legal issues, and avoiding dangerous situations. Once again the Netomat tool was used (Fig. 6.36).

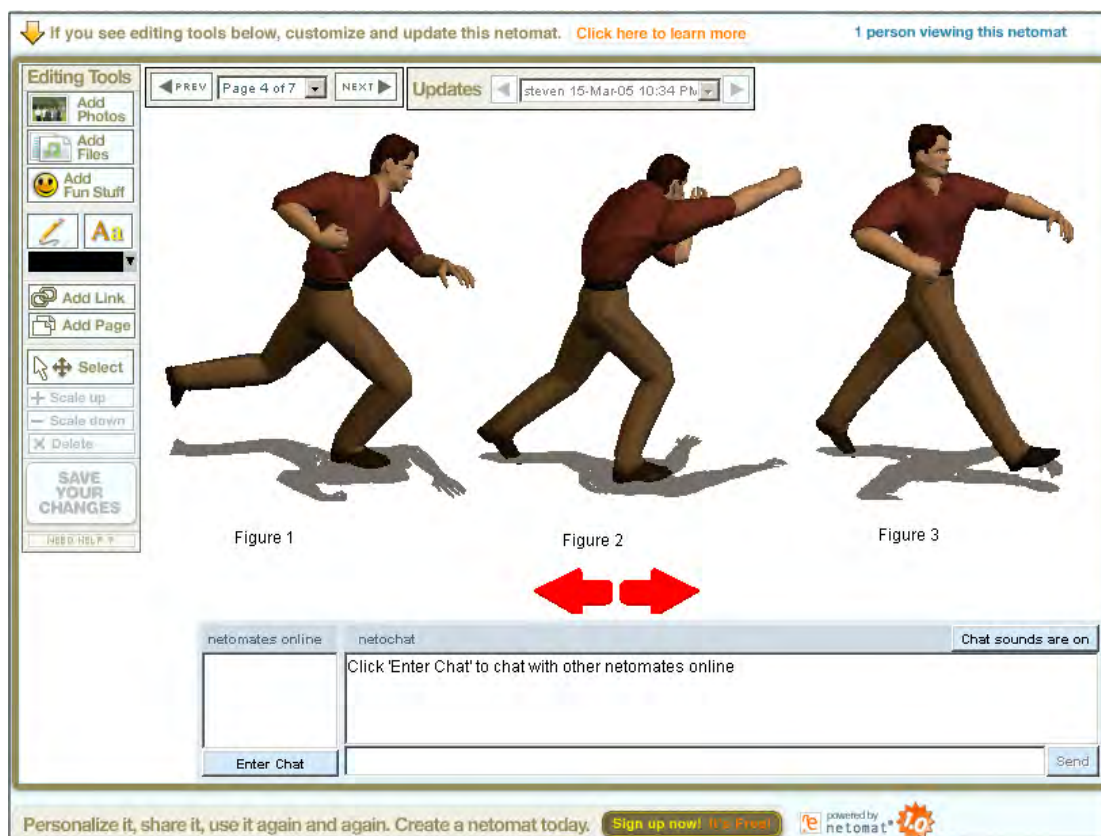


Fig. 6.36: Virtual self-defence scenario 4

10. Task 10: Practise and record your knowledge

In this task participants were asked to prepare an unedited video showing them performing pen self-defence techniques with and without a partner. They were asked to prepare a syllabus covering 20 techniques, a fight scene, and sparring. They were given a number of days to practise for the video grading. Once complete, they could post the recording to me. Once this task was complete, participants were asked to complete the course questionnaire and some participants were asked to take part in a follow up interview.

The Pen course evaluation is discussed under the following headings: (1) learner contributions, (2) online questionnaire, (3) post course interview, and (4) incomplete course interview, with supporting participant observations, and development and implementation log information.

6.6.1 **Learner output: learner contributions**

The learner contributions discussed below relate to the tasks carrying a mark weighting for the successful completion of the course even though there was a significant amount of discussion in task 1: self introduction. 12 participants posted forum messages for task 1 and many posted more than one message, in many cases multiple messages. My observation is that this task was very useful to develop rapport amongst participants and provide an opportunity for them to collaborate on the tasks discussed below. There were minimal posts in the task 2: reflect, research and experiment, and the task 3: learning journal forums. Participation in these two forums was optional and these tools were set up for task support purposes.

The learner contributions add to an understanding of the effectiveness of the course and how it serves to answer the research questions in this project, as well as to determine how closely the underlying theories have supported the course tasks.

As was done in previous course evaluations in this study, the forum posts and chat messages were exported from the learning management system and converted to Microsoft Word format. Thereafter the documents were added to QSR NVivo and coded according to the tasks and participant names.

Next, each task carrying a mark is discussed.

Task 4: Practise and comment (10%)

Seven participants contributed to the practise and comment task, although one of them posted his message in the experiment and discuss forum as he had a late start to this task. Five of the participants addressed all of the marking criteria and added further insights beyond what they were expected to provide. The two participants who did not address all of the marking criteria also contributed high quality posts. Aside from the slow start to this task, it was a successful learning activity with all participants being successful.

As in the Belt course, the learners seemed engaged in the subject matter. There was minimal interaction between participants in this task, which makes it difficult to argue that

the social constructivist nature of the course contributed to the task's success. There was some evidence that participants were reading each other's posts in some of the posts. All participants demonstrated that they had well formed ideas about how the pen can be used for self-defence and this is a satisfactory result.

Task 5: Chat (5%)

Ten participants took part in the online text chat over three separate chat sessions on three different days. In order to have more than one course participant in the last two chats two participants took part in more than one chat session. I had originally intended to have one chat session for the pen course to encourage more interaction between course participants, but not everyone could make it in the first scheduled session.

The chat implementation log reveals far fewer technology issues compared to previous RAT Online courses. One of the participants seemed to have had difficulty accessing the chat because it did not seem to be working in the Mozilla Internet browser, which is what he was using at the time. After switching to the Microsoft Internet Explorer browser his problem was resolved. The other issue was not so much with the chat tool itself, but with the chat transcript tool. OLS was under development at this time and the chat transcript had not been fully implemented yet. However shortly after alerting the developers of OLS about the issue it was rectified. Some participants were late to arrive at the chat which delayed things slightly and the implementation log shows that one of the participants seemed more interested in talking about the technology used in the course. Given the issues, the chats still seemed to generate some useful knowledge and summaries of each session were posted in the discussion forum for other participants to read.

As with two of the previous courses the chat transcripts were copied and pasted into Microsoft Word, which were then coded in QSR NVivo for analysis.

At first glance of the chat transcript one could be led to believe that the task was not useful because of the disjointed nature of the chat and the multiple threads of concurrent conversation. However when all the knowledge was collated into the chat summaries, it is clear that participants addressed all of the task requirements and more. The chat sessions generated knowledge about the positive and negative aspects of using the pen as a self-defence implement, categories of techniques, specific techniques, strategy and tactics,

recognition of knowledge and skills that could be transferred to other self-defence situations, as well as ethics, safety and legal implications. The participants also engaged with each other by evaluating each others' comments showing the collaborative nature of the task.

This task was an effective learning activity in my view.

Task 6: Experiment and discuss (10%)

Seven participants took part in the experiment and discuss task. One of the participants created two video clips to illustrate his point, which were added to the RAT CD-ROM for future reference and learning. Another of the participants also devised a safe training tool that could be used in place of the pen. Again the submission of the video clips (as in the belt course) was tangible evidence of the participant's emerging level of skill. The posts submitted by the other participants also suggests that they had all been experimenting with the pen as a self-defence implement or had been thinking deeply about it given the level of insight demonstrated in their discussion posts.

Even though there was not much discussion, the participants seemed to acknowledge and respond to others' comments. Most participants only submitted one comprehensive post, but in that post they acknowledged each others' contributions. Like the same task in the belt course, participants seemed more focused on the goals of the task rather than engaging in additional conversation. Perhaps the discussion in previous tasks was sufficient to complete this task successfully.

Five of the participants addressed all of the requirements for this task and the remaining two, while they did not address all of the task requirements still contributed valuable information. Not only did participants demonstrate that they had been experimenting with the pen as a self-defence implement and covered techniques from the major self-defence categories, but some had undertaken their own independent research and shared this information as well as their interpretation and application to this course. This demonstrates both collaboration and higher order thinking, which seems to suggest that the social constructivist course design is supported.

Task 8: Represent your knowledge (20%)

Six participants submitted their individual mind maps representing their knowledge of the pen as a self-defence tool. Participants used a range of methods and software to create the mind maps. One participant used Mind Manager, another used Microsoft Visio, three used Free Mind, and one used an image editing program.

A workspace was provided in Netomat so that participants could begin their mind maps early in the course and build on them as time went on. This part of the task was not used at all and participants seemed to prefer working on their mind maps in their own time and space. A learning journal task was also created and listed early in the course (task 3), which was only used by one participant. It has become clear through the various RAT Online courses that the “represent your knowledge” task could be simplified even further by making it an asynchronous task only and removing any online support tools and activities leading up to the final submission of the artefacts. Links to mind mapping software, as well as links to techniques of representing knowledge will be retained. Furthermore, the learning journal can be removed which will reduce the complexity of the course and number of tasks slightly.

The individual submissions were high in quality and each mind map addressed all of the task criteria. On completion of the task all of the mind maps were added to the RAT CD-ROM for reference purposes.

Even though each mind map was different, they all seemed to include important themes discussed in the course and they seemed to be drawing on each other’s work to produce their own interpretations. This demonstrates that the social constructivist approach has been useful to generate individual representation of knowledge. In my view, these mind maps suggest that participants have engaged in higher order thinking, such as analysis, application, synthesis and evaluation.

Part of one of the mind maps was quite ingenious, as it represented various target areas on the body and was also represented as an abstract human figure (Fig. 6.37).

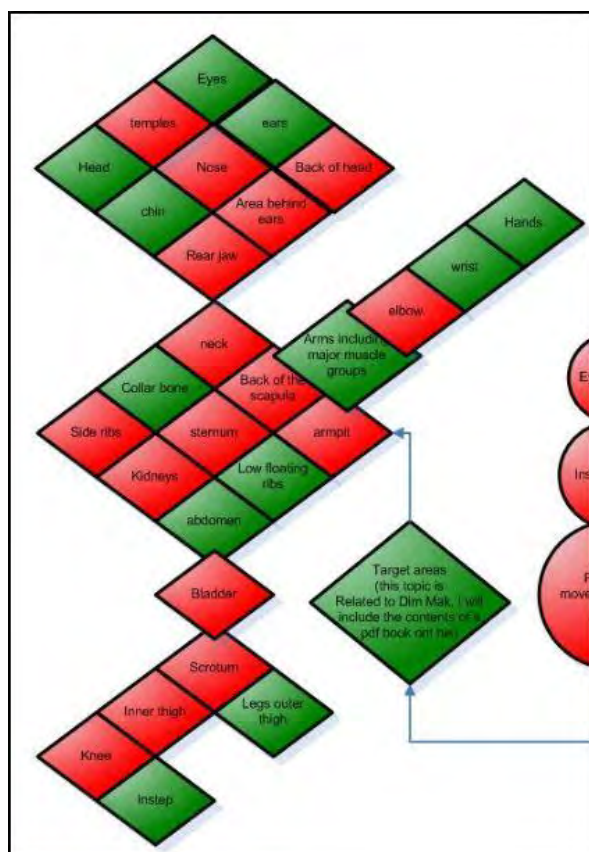


Fig. 6.37: Example mind map

Task 9: Virtual self-defence – discussion and simulation (15%)

Five participants completed task 9, with four taking part in the first virtual self-defence discussion and one in the second. Two participants had attempted to take part in the second session, but the Netomat software kept on disconnecting. Participants had difficulty logging in the first session too. A contingency plan was carried out for the second session and we decided to meet in the text chat area of OLS. Only one participant managed to login.

As with the previous experience of the Netomat software in the Belt course, there was no facility to record the chats. Thus a hand-written implementation log was maintained recording any issues. The log reveals that several participants were logged out and in several times. Their persistence to complete the task enabled a successful attempt. Persistence is a positive affective trait highly valued in RAT. However, as with the Belt course I feel that these technology issues impeded the effectiveness of the task.

Four participants submitted a summary of at least one of the four scenarios discussed in the task. The remaining participant did not post a summary because he was getting married on the Sunday of that week and had to prepare.

Again, even though there were several frustrations both from the participants' point of view, as well as from my own, the experience and the summaries provided illustrated that the participants had engaged in a reflective discussion demonstrating a broad and deep understanding of self-defence issues with the pen. These summaries were copied and pasted into Microsoft Word and then added to QSR NVivo for coding.

Participants discussed a range of topics, including careful consideration of the actual and perceived threat in a self-defence situation, using objects in one's surroundings as obstacles, specific techniques to deal with specific situations, strategy, using means other than violence to escape a self-defence situation, and dealing with more than one assailant. Although I remember ethics and laws being discussed, neither of these two topics is reflected in the summaries.

The ill-structured, but guided nature of this task was a success as it was in the Wheel Spanner and Belt courses. However, the technology used was still not optimum. The web Netomat software is now obsolete. The idea of this task will be retained, but different and more efficient software will have to be found. I am considering tools such as Second Life and Active Worlds for the virtual self-defence tasks in the future.

Task 10: Practise and Record your Knowledge (40%)

Five participants submitted video gradings in this course and like previous courses the videos were added to the RAT CD-ROM to share with other RAT practitioners. All five participants received course completion certificates. The videos adequately represented the eclectic nature of RAT as the underlying martial arts approach.

This was the third time this task was included in a RAT Online course and the successful completion and satisfactory level of skills demonstrated in the videos confirms at least for me that RAT skills can be facilitated in computer supported learning environments. Participants also demonstrated their development of knowledge by the creation of a syllabus to record. They demonstrated a persistent attitude by making the effort to

complete the task and they showed that they could work together in a safe and respectful way. These three outcome areas (knowledge, skills and attitudes) cover the three main domains of Bloom's Taxonomy (Bloom et al., 1956; Harrow, 1972; Krathwohl et al., 1964).

The online questionnaire is discussed next.

6.6.2 Learner feedback: online questionnaire

After the course was complete, participants were requested to complete the online questionnaire. Laid out very similarly to the Belt course questionnaire, there were 30 statements grouped into the same categories as previously with changes to the statements in accordance with changes to the course tasks and tools. Once more the statements were to be rated on a likert scale of 1-5, where 1=Strongly Disagree 2=Disagree 3=Agree 4=Strongly Agree 5=Other.

There were seven respondents, three of whom had never done an online martial arts course before and four who had. One of the questionnaire respondents did not complete most of the tasks; however his responses are included here for those items that he could rate. He did not rate the tasks or tools that he did not partake in.

The first section covered below is the course environment.

Course environment

Similar to the Belt course, this part of the questionnaire consisted of the following statements to gather data about the appeal, functionality, and usability of the course:

1. The course environment (i.e. the website) looked professional.
2. The technical components of the course operated flawlessly.
3. It was difficult to find my way around the site.

Table 6.13: Pen course environment

Course Environment	Strongly Disagree	Disagree	Agree	Strongly Agree	Other	Missing	Total
(1) Course environment professional			1	5	1		7
(2) Technical components flawless		3	3		1		7
(3) Difficult navigation	2	2	1	2			7

“The course environment (i.e. the website) looked professional” was rated highly once again with most respondents strongly agreeing with the statement (Table 6.13). The OLS course environment was radically different to the previous two courses which I had created myself. Previously, I was able to make subtle interface changes based on the course evaluations, but this was not possible this time. Given I did not have the same control over the look and feel this was a good result, also implying that the OLS system has a professional appearance. “The technical components of the course operated flawlessly” showed a slight improvement whereas the navigation regressed compared to the Belt course (Table 6.8). I suspect that this regression might be due to the difficulty to include links from the task pages to the course tools associated with that task. This difficulty was as a result of the dynamic databases running in the background of the OLS system in which certain kinds of hyperlinking are not possible. It was a different way of working. I would need to rethink how to place the course tools in subsequent courses if using the OLS system. Also participants experienced problems with the Netomat tool. The following comments illustrate that the site was professional looking and for the most part seemed to work well, but was not without issues.

- iiii. “Everything was laid out in an easy manner to follow. The only problem was with the Chat as it timed out often (although I suspect [Phone Company] regarding this).”
- jjjj. “The Netomat site was problematic and slow. The course itself worked without issue.”
- kkkk. “The forum was not totally intuitive. I found myself browsing and looking for my threads because of its tendency to open all threads. Also the chat was not operating smoothly.”

- IIII. “The appearance, design and usability of the site are very professional and add greatly to the learning experience.”

The course tasks section is discussed next.

Course tasks

The course tasks section of the questionnaire consisted of the following statements:

1. There was sufficient safety advice.
2. The course tasks were logically structured.
3. The instructions for each task were **unclear**.
4. “Task 1: Self-Introduction” was a useful learning activity.
5. "Task 2: Reflect, Research and Experiment" was a useful learning activity.
6. "Task 3: Learning Journal" was a **useless** learning activity.
7. "Task 4: Practice and Comment" was a useful learning activity.
8. "Task 5: Chat" was a useful learning activity.
9. "Task 6: Experiment and Discuss" was a **useless** learning activity.
10. "Task 7: Explore Example Syllabus" was a useful learning activity.
11. "Task 8: Represent your Knowledge" was a useful learning activity.
12. "Task 9: Virtual Self-Defence" was a useful learning activity.
13. "Task 10: Practice and Record Knowledge" was a useful learning activity.

Table 6.14: Pen course tasks

Task	Strongly Disagree	Disagree	Agree	Strongly Agree	Other	Missing	Total
(1) Sufficient safety advice				6		1	7
(2) Logical structure			1	5		1	7
(3) Instructions unclear	3	2		1		1	7
(4) Self-introduction useful			2	4		1	7
(5) Reflect, research, experiment useful				6		1	7
(6) Learning journal useless		5	1			1	7
(7) Practise and comment useful				6		1	7
(8) Chat useful			3	3		1	7
(9) Experiment and discuss useless	4	2				1	7
(10) Explore example syllabus useful			2	4		1	7
(11) Represent your knowledge useful			1	5		1	7
(12) Virtual self-defence useful			3	3		1	7
(13) Practise and record knowledge useful			1	5		1	7

The rating for safety advice improved once again compared to previous courses with all but the missing response strongly agreeing with the “There was sufficient safety advice” statement (Table 6.14). Logical structure and clarity of instructions also improved.

The self-introduction activity was rated around the same as in the Belt course (Table 6.14).

Apart from one missing response, the reflect, research and experiment task improved with a greater number of strongly agree responses compared to the Belt course (Table 6.14).

Although the learning journal activity was rated highly, I observed that it was not well used during the course either (Table 6.14).

“Task 4: practice and comment was a useful learning activity” was rated higher than the Belt course (Table 6.14).

The chat and “experiment and discuss” tasks were rated satisfactorily and about the same as in the Belt course (Table 6.14).

“Task 7: explore example syllabus was a useful learning activity” was rated higher than in the Belt course (Table 6.14). It is not clear why this is the case because the syllabus was structured in a similar way to the way it was structured in the Belt course. Perhaps the resources page in the OLS system provided a more user-friendly and visual way of displaying the images representing techniques than was possible previously.

Represent your knowledge and virtual self-defence both showed slight improvements, whereas practise and record knowledge was rated the same (Table 6.14).

The following comments about the learning tasks demonstrate an appreciation for the example syllabus, the collaborative tasks (virtual self-defence), the tasks requiring the creation of new knowledge (such as the mind maps), and the practical task (the video recording).

- mmmm. “The example syllabus gave me a lot of ideas and practical application that I could use in my learning and ultimately video grading.”
- nnnn. “My mind opened up to more new techniques after each phase of the course.”
- oooo. “Enjoyed the mind map and video grading with 20 tasks the most.”
- pppp. “I enjoyed the virtual self-defence. Aside from the technical problems encountered, it has some SERIOUS potential for online learning. Was very enjoyable as well. I am sure it helped positively with facilitating the learning process.”
- qqqq. “Personally reality based training is when I learn the most so I enjoyed the discussions and the virtual self-defence exercises.”

Next the course tools and learning aids are discussed.

Course tools and learning aids

The course tools and learning aids section of the questionnaire consisted of the following statements:

1. The “discussion forum” was a valuable learning tool.
2. The “chat tool” was a valuable learning tool.
3. Netomat was a valuable learning tool for developing the mind map (refer to learning journal task).
4. Netomat was a valuable learning tool for the virtual self-defense task.
5. Freemind (the mind mapping software) was a **useless** learning tool.
6. The media resources (i.e. images, movies, animations and pdf's) were useful learning aids.
7. The grading criteria information under relevant tasks helped me understand what was required of me for each task.

Table 6.15: Pen course tools and learning aids

Course tools and learning aids	Strongly Disagree	Disagree	Agree	Strongly Agree	Other	Missing	Total
(1) Discussion forum valuable			1	5	1		7
(2) Chat tool valuable			3	3	1		7
(3) Netomat mind map valuable	1	2		1	2	1	7
(4) Netomat virtual self-defence	1		1	4		1	7
(5) Freemind useless	4	1		1	1		7
(6) Media resources useful			1	5	1		7
(7) Grading criteria helped understand requirements			1	5		1	7

Both the discussion forum tool and the chat tool were rated slightly higher compared with the Belt course, again demonstrating a high regard for tools that facilitate collaboration (Table 6.15). With such small respondent numbers it is difficult to tell if the improvement is valid, but the better rating could be a result of the more stable OLS platform which is purpose-built for social constructivist learning environments.

In this evaluation the two uses of the Netomat tool were rated separately: (1) “Netomat was a valuable learning tool for developing the mind map” charting emerging knowledge along the way in the course (refer to learning journal task), and (2) “Netomat was a valuable learning tool for the virtual self-defense task”. As the results show, participants seemed to value the Netomat tool for the virtual self-defence task much more highly than they did for the planning part of their mind map (Table 6.15). I observed that not many participants actually used Netomat to plan their mind map. One of the participant comments supports this observation: “Learning journal was probably the least useful course component – probably because most people did not use it though.”

Freemind was valued by most participants as a useful learning tool, although many did not actually use it (Table 6.15).

Both the usefulness of the media resources and the grading criteria were rated better than in the Belt course (Table 6.15). I think that the enhanced media display features of the OLS system contributed to the improved rating for the usefulness of media resources. The improved rating for grading criteria might be attributed to the simplified task structure and effort invested in improving the clarity of the language.

The learning section of the questionnaire is discussed next.

Learning

The learning section of the questionnaire consisted of the following statements:

1. The topic of the course (i.e. the pen as a weapon) was useful.
2. The course helped me gain new knowledge.
3. The course helped me gain new skills.
4. The course facilitator's approach was **inflexible**.
5. Before the "Online Pen" course I did not think that martial arts could be learned online.
6. After taking part in the "Online Pen" course I feel that martial arts can be learned online.
7. The course was what I expected an online martial arts course would be like. **Please give a reason for your answer in the section comments below.**

Table 6.16: Pen course learning evaluation

Tools and Learning Aids	Strongly Disagree	Disagree	Agree	Strongly Agree	Other	Missing	Total
(1) Topic useful			1	6			7
(2) New knowledge				6	1		7
(3) New skills			1	6			7
(4) Facilitator inflexible	7						7
(5) Before did not think can learn MA online	2	1	2		2		7
(6) After think can learn MA online				6	1		7
(7) Course met expectations	2	2		3			7

The ratings for statements 1-4 all showed an improvement compared with the Belt course (Table 6.16). The difference between the ratings of statements “Before the Online Pen course I did not think that martial arts could be learned online” and “After taking part in the Online Pen course I feel that martial arts can be learned online” shows once again that participants have a greater confidence in the potential to learning martial arts online after having gone through the experience of a RAT Online course (Table 6.16). These results are pleasing and demonstrate at least some degree of reliability to answer the question “Can RAT practitioners facilitate the learning of RAT martial arts knowledge, skills and attitudes (KSAs) in computer supported learning environments?” by the consistent results achieved through the latter three RAT Online courses. The results also show that changes incorporated in each course are helping to improve the effectiveness of the courses. The following participant comments support these observations.

rrrr. “I have now developed additional skills which can help my present skills should a situation require it.”

“...It was very useful and one can walk away with extra skills and also the ability to communicate those skills.”

ssss. “I enjoyed the course and managed to learn some very interesting things about a pen. I am one of the converted few who now see a pen as a weapon. When thinking outside of the box, you often surprise yourself.”

- tttt. “No it was even better than the last RAT Online course. I can see major improvements with each course. [Facilitator name] really takes on board the feedback and works hard to make the improvements.”
- uuuu. “I did not think it truly possible to expand and learn martial arts skills though [the] online medium and prompting. It engaged my mind appropriately and allowed me to think and develop my own strategem.”
- vvvv. “I had my reservations, but had already experienced a bit of the belt course. Being able to see this one through to the completion of the course has helped me learn some new skills. So in short, some reservations were had, but after the first two weeks, I realised that I was actually learning something, without having ‘instructions’ for absolutely everything.”

Compared with the Belt course, participants in the Pen course seemed to disagree more strongly with the statement “The course was what I expected an online martial arts course would be like” (Table 6.16). These results taken together with participant feedback indicate a positive affect towards the potential of learning martial arts online, as well as a value for learning collaboratively. Once again this demonstrates the effective implementation of the social constructivist design and even prompting new ways of thinking, which is in tune with developing affective traits discussed in Bloom’s Taxonomy (Krathwohl et al., 1964). One participant commented that the knowledge gained on this course has contributed to his life-long learning agenda. Other comments illustrate the value for learning collaboratively and the quality of the course.

- www. “I could not picture what an online martial arts course would be like or that it would be possible. Now I think differently.”
- xxxx. “There was more interaction and feedback between people involved than I expected which improved the results tremendously for me.”
“...A very good learning experience I would be eager to do again.”
- yyyy. “It is more of a collaborative effort than I expected. Which is MUCH better than the old-school thought of instructor led training. Facilitation is the key. People are not stupid. And, with some time, effort, thought and practise, anything is possible. After all, somebody had to teach themselves martial arts while ‘inventing’ it...”

zzzz. “Even though I spend some time searching the Web for MA [martial arts] information and discussion forums I have never seen anything of this quality offered before. Despite the fact that I did not complete the final task, because I do not have a video camera or suitable people to demonstrate on, I still have my final mind map which has been very useful. Subsequently I have gone on to add to it with additional information. These I keep as my personal profile, in this case improvised weapons, which I treat as working documents and review/update as I learn...”

Next the tasks and activities are discussed.

Tasks and activities rating

The tasks and activities were rated using the following questions:

1. What was the most useful learning task?

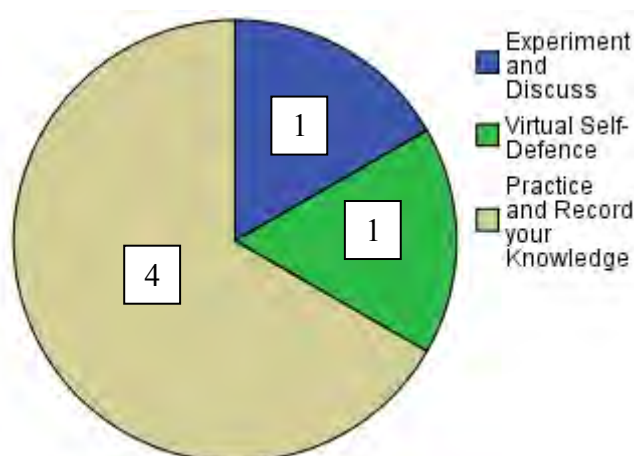


Fig. 6.38: Pen course most useful learning task

It is interesting to observe that as with the Belt course, the practise and record your knowledge task was rated as the most useful learning task, but this time showing a widening gap between the next highest rated tasks (Fig. 6.38). This task was only rated by one participant in the Wheel Spanner course. I suspect that as more people were able to complete the task, more could see the inherent value in the task and the appropriate application of the design in developing martial arts skills. These results help to show that practical tasks of this nature contribute to the effective design of martial arts computer supported learning environments, as well as the appropriateness of well-selected learning activities. Even though participants provided ratings for the most useful learning task, it

seems from the following two comments that some people feel that all the course tasks as a collective contributed to the course success.

aaaaa. “It is difficult to say exactly which task was best – I learnt new things at most stages, from reading resources to practicing, seeing what other people had thought of and then developing it through practice. The framework expanded and principles became clear as I documented techniques.”

bbbbb. “Netomat for represent your knowledge was a foundation or eye-opener as it always is for the basis of our or should I say [my] mind map and subsequently the video technique grading. It makes you think or change your narrow rigid ways of thinking to thinking “that way”...as a martial artist. The most fulfilling part of the course is the second you finish the video grading...”

2. What was the least useful learning task?



Fig. 6.39: Pen course least useful learning task

The self-introduction task was once again rated as the least useful learning task, but this time it shared this low ranking with the learning journal (Fig. 6.39). Even though these two tasks were rated equally, it was my observation that the self-introduction was the more valuable of the two, because it set the tone for the rest of the course and served as a functional ice-breaker. The learning journal, on the other hand, was not really used by the participants. The post questionnaire interview sheds more light on the usefulness of the self-introduction task.

3. What was the most useful learning tool?



Fig. 6.40: Pen course most useful learning tool

The discussion forum was once again rated the most useful learning tool, but this time shared the number one position with Netomat for virtual self-defence (Fig. 6.40). The value for the discussion forum seems to be a constant in these courses as a way of being able to share information and discuss topics, but the varying rating per course of virtual self-defence is interesting. It seems very much just how well the tool performs in the course. If there are relatively few functionality issues, the rating seems to go up. This in some way implies that the tool itself is an appropriate tool for the task and that the task offers some real potential for developing advanced martial arts strategy skills. Freemind has also once again found its way onto the list of most useful learning tools.

4. What was the least useful learning tool?



Fig. 6.41: Pen course least useful learning tool

Not surprisingly Netomat for represent your knowledge was rated the least useful learning tool (Fig. 6.41). This result is linked to the learning journal being ranked one of the least

useful tasks. While Freemind found its way onto the list of most useful learning tools, it also found its way onto the list of least useful learning tools. The chat and Netomat for virtual self-defence also had one vote each, but this too was not surprising as some people had connectivity issues.

The post course interview is discussed next.

6.6.3 Learner feedback: post course interview

A post course interview was conducted with five interviewees (two of the interviewees attended the same interview session) in four interviews once analysis of the questionnaire had been conducted. The interview was carried out for the same reasons as the Belt course, except that the interview questions were modified and the interview was expanded this time and grouped into four sections: (1) tasks and skills, (2) attitudes, (3) course environment and tools, and (4) learning, knowledge and general. Each section consisted of four questions, except for the tasks and skills section which contained five questions.

As was done in the Belt course section, a summary of the results is provided rather than a detailed account, as there is too much detail to provide here (twelve pages of A4 written feedback was gathered). QSR NVivo was used to code the feedback into their respective sections.

Tasks and skills

The tasks and skills section covered the following topics: (1) course and task duration, (2) task ordering, (3) practise and record your knowledge task, (4) compulsory syllabus versus explores example syllabus, and (5) learning journal.

There was some concern that the course continued for longer than it should have, but as I observed this was as a result of some participants not sticking to all the task deadlines. This observation was supported by interviewees with some saying that often time, due to work commitments impacted on their course progress. These results are not at all dissimilar to previous RAT Online courses. This problem is an area of concern. One interviewee mentioned elsewhere in this interview that perhaps because the course is free people do not

attach the same value to it as they would to a paid for course. Furthermore, another interviewee mentioned that perhaps to curb this problem in the future there should be penalties, such as a mark deduction, for late task submissions.

Even though participants agreed that the course was logically structured, I wanted to find out if the tasks as structured helped participants to proceed from task to task and whether the placement of the example syllabus component around the middle of the course was appropriate or would be better placed at the beginning. The placement of the example syllabus in this course was as a result of a participant comment that placing example material near the beginning hindered creativity. There were mixed responses, but most seemed to think that placement of the syllabus at the beginning would in fact hinder their creativity. However they also said that they did look at the material early in the course anyway because of the open nature of the course, saying “I think it helped for thinking about what was possible” and “For me it prepared me for the whole course. I looked at it right at the beginning. After that I never looked at it”. There was a suggestion made to perhaps rename the task/section to “examples” instead of “example syllabus”, so that people do not simply copy the syllabus. It would seem that this part of the course is well-placed within the course structure, so no change will be made in the next RAT Online course.

The question of whether the practise and record your knowledge task was essential to test for martial arts skills development and if non-edited video was an effective means of carrying out this task was met with agreement by all participants. The requirement for participants to submit non-edited video was seen as a way of preventing cheating by course participants, as one would have to demonstrate one’s skills in a similar way to a face-to-face grading assessment as the following comment explains: “Otherwise you could just practise a piece then record and then practise the next piece and record without actually having to know it.”

Up until the end of the Pen course the RAT Online courses have mostly depended on an individualised learning experience. I wanted to find out whether participants thought that there should be a compulsory syllabus of basic techniques that all participants should know and become skilful in or whether the example syllabus was sufficient. There were mixed responses with participants saying that a compulsory syllabus might hinder creativity,

whereas other comments claim that a few compulsory techniques (maybe one technique from each main category) would lay a good foundation. This suggestion will be given serious consideration for the next RAT Online course, as it might provide learners with the opportunity to develop a higher level of physical skills, as two or more practise and record knowledge/skills tasks could be incorporated, one with compulsory techniques providing an opportunity for other participants to evaluate each others' techniques and the final task for the more creative tasks.

Again there were mixed response for the usefulness of the learning journal activity. It was not that people did not think this was a valuable activity; it was more a case that participants took control of their own learning and stored their notes and thoughts on paper saying that access to a computer and the Internet was not convenient at the times that they had ideas. So perhaps the idea of a learning journal will be incorporated more as a recommended activity, but not included in the course task structure. This will be a way of simplifying the structure further.

Attitudes

The attitudes section covered the following four topics: (1) motivation, (2) attitudes, (3) opinions about learning martial arts online before the course, and (4) course expectations.

A number of participants dropped off the course for various reasons. I was interested for any course participant observations as to why this might be the case. The main reasons given were that people are generally busy and time is an issue. Another main issue was that it might be too easy to just give up and that the active learning approach might have put people off who were expecting to sit back and absorb content as the following comment explains, "People might have thought they were just going to sit back and receive all the learning material. Quite a bit of input is required. I also thought I would be able to just fit [it] in, but you do have to schedule the time. Also because it is free. Their motivation would be completely different if they were paying for it." And finally the latter part of the last comment alludes to the course being undervalued because it is free as mentioned previously.

Participants had commented that they started to view martial arts and everyday implements in new ways, ways which enhanced their understanding of self-defence and the ways that

they thought about learning martial arts. I wanted to gather further insights about these observations. These observations were confirmed in the interviews as a few of the interviewee comments show.

- cccc. “It is a love of self-development...I helped me to actually evaluate my martial arts and respect for martial arts and self-development...The mind map makes me evaluate how I do things. It is structured, but it is not in a way. It is much more flowing. I can constantly keep progressing.”
- dddd. “I think it has developed new attitudes and techniques, because you’ve got other people with different attitudes and techniques and you open to sharing.”
- eeee. “It definitely teaches you that martial arts are not as structured as you might be led to believe. Just the knowledge that you can use anything around you as a weapon – a mindset, way of thinking. More often things that are easily attainable.”
- ffff. “It was empowering. This was the first time that I have created a syllabus and discovered principles myself.
...I can look at other objects and think of them with a view to possible self-defence. It has taken the idea of self-defence beyond just hands.
...I think in a way it forced you to participate. It is easier in a class to be quiet. It re-awakened self-defence for me.”

There were a variety of responses about what people expected out of an online martial arts course in the online questionnaire with the general impression that it was not what they expected. The main themes derived from the interview were that the guidance provided in the course was good, people had few expectations initially and might have even been a little apprehensive, but the experience enhanced their expectation and extended their knowledge.

Course environment and tools

The following topics were covered in the course environment and tools section: (1) instructions, (2) discussion forum, (3) Netomat mind map, and (4) navigation.

The clarity of instructions is always important in these courses to reduce ambiguity. All interviewees thought that the instructions were clear, but one interviewee suggested that

the instructions could be formatted better with less text per page. This suggestion will be seriously considered for future RAT Online courses.

Even though the discussion forum was rated as the most useful learning tool I had concerns that because of the way I had structured the course in OLS that the discussion threads might be difficult to find. So I had asked participants to also compare to previous RAT Online courses. It seems that some participants would have preferred a separate discussion forum attached to each task instead of a single discussion forum with multiple threads related to each task. Another participant said that he preferred the discussion forum in the Belt course because of the way that text could be formatted. However another participant claimed that the discussion forum in OLS was much more user-friendly compared to previous courses and looked more business-like.

The Netomat mind map tool was provided as a way for participants to chart their developing knowledge as a type of learning journal to help with their represent your knowledge task. However, as previously mentioned participants kept their own offline notes. I had also thought it would be a good way to observe their developing knowledge, but this was only possible in a very limited way if hardly anyone used the tool for its intended purpose. It seems there is limited value in retaining this activity and unnecessary complexity including the tool, so it will be removed in future courses. This solution ties in with the removal of the learning journal activity in future courses.

There were varying responses in the online questionnaire about how easy the navigation around the course site was. Everyone in the interview agreed that the course site was easy to navigate. However, one participant did say that it was not intuitive at first, but then it became easy for him once he had “worked it out”. Another participant said that the names for sections were a little confusing at first. For example, renaming “resources” to “media” would resolve this confusion.

Learning, knowledge and general

The final section of the interview, learning, knowledge and general covered the following topics: (1) learning, (2) knowledge, (3) course comparison, and (4) general discussion.

Respondents had acknowledged in the online questionnaire that they had developed new ways of learning and now viewed martial arts and self-defence in different ways (in this course as well as previous RAT Online courses). I was interested in inquiring more explicitly about this aspect of the course (and this type of learning), as it relates to the broader area of online learning and indeed of learning more generally. A few themes were derived from participant feedback, such as that the course encourages individualised learning, using imagery to enhance and extend one's training and learning beyond the class, new ways of thinking about learning martial arts and questioning knowledge learned previously, the courses are collaborative in nature, there is more 'doing', more creativity is required than conventional learning contexts, and at least one method of learning, namely, using mind maps were extended beyond the course to university courses. These themes all add support for this mode of learning RAT, martial arts, and the potential to learn other topics involving kinaesthetic knowledge, attitudes, and skills. These findings also provide further evidence of the effectiveness of the various theoretical approaches used to design and carry out this course, such as the overall eclectic-mixed methods-pragmatic paradigm, the learning approaches, as well RAT as a martial arts approach. Below are two comments from which some of the themes above were derived.

ggggg. "...I would say that I have changed my way of learning martial arts. Even though I did Judo and Taekwondo I am now questioning things I did then. Before I was the student and that's it. I think more about it now. I think cos this is a lot more collaborative, because you're allowed to be a bit more creative and think out of the box."

hhhhh. "I think for me, this being my first course generating stuff it has opened my mind to new ways of looking at stuff...
...The difference with school and this is that you are doing stuff. This is more creative and mind maps help."

I was interested to know whether participants thought that this method of teaching and learning in the Pen course had increased the participants' knowledge. They were asked to compare their learning experience with other learning environments or classes that they had participated in previously whether face-to-face or online. All participants acknowledged that they had gained new knowledge and attributed their learning to the onus of learning and creating knowledge on themselves, as opposed to a teacher dictating

what is to be learned. They also thought the visual media (images and video clips) encouraging self-reflection and being supported by other participants' explanations helped learning. Additionally, listening to others and then analysing the information helped memory. And lastly the active learning approach seemed to help. One participant commented thus: "...I think by forcing [you] to become involved and active yourself definitely helps. It doesn't really engage your brain by learning parrot fashion...The collaborative aspect was more useful than expected."

If participants had taken part in a previous RAT Online course they were asked to make any comparisons between the Pen course and the previous courses. Only two of the participants could respond to this question, but again there was a comment about the course duration being longer and a suggestion was again made to include intermediate deadlines. The issue of the course timing and dropouts has been discussed previously. One interviewee felt that the OLS environment was more user-friendly because it required fewer clicks to open the discussion forum and the participant impression of me as course facilitator seems to have improved, as it was commented that I was more capable of handling crises and providing alternative tasks for participants who could not make it to any of the synchronous activities.

The last part of the interview was a general discussion about any aspect of the course. Once again one of the participants attested to this mode of learning being an effective way to learn, but another participant claimed that the most difficult part of the course was finding someone to practise the techniques with, a problem experienced by participants in previous courses. The following participant comment sums up some of the aims of this project and is further evidence of the effectiveness and success of the course and project: "I just think that it is an effective way to learn. We have got martial artists and they are learning. It is not as if you have just a beginner saying they are learning. It is also staying with the times. It is also international. You cut out boundaries straight away. Also getting cross-cultural views would be great...Just helping one person from a coaching perspective is a success. You have helped me. It is a pity there were only six [participants], but it means a lot."

I thought that it would be interesting to once again find out why people did not complete the course. The feedback provided by those who responded is discussed next.

6.6.4 Learner feedback: incomplete course interview

Only two out of the six participants contacted responded to an email request to provide feedback about why they did not complete the course. They were informed that they were not obliged to provide detailed or personal information, only information that can add to an understanding of the course as designed and implemented.

Both participants had become very busy with their work, as they were both running their own businesses. Furthermore one of the participants claimed that the only reason he took part was to gain a better understanding of how online courses work, as he was implementing an e-learning initiative in his business. Besides his being too busy to complete the course, his lack of engagement in the topic is perhaps useful information about the potential effectiveness of online courses. If participants are not actively engaged in the topic, the chances of an effective learning experience might be somewhat reduced.

Next a conclusion for the pen course is provided.

6.6.5 Pen course conclusion

The Pen course was akin to the three previous RAT Online courses with its underlying social constructivist design, practical and complex self-defence problems to solve, emphasis on the development of RAT skills, and value in developing multiple and individualised representations of knowledge.

Based on the evaluation including an analysis of the learner contributions, an online questionnaire, post and incomplete course interviews, as well as participant observations, and the development and implementation log, the Pen course was a success showing once again the potential of teaching and learning RAT (and other martial arts) online. This finding implies interesting overlaps with teaching and learning other types of kinaesthetic knowledge and skills online.

Even though much of the evaluation occurred after the course was completed, some participant feedback hints at the formative nature of the evaluation with the readiness to

make changes as crises occurred. This facilitator flexibility contributed to the course success.

The course results have demonstrated that RAT knowledge, attitudes, and skills can be facilitated online, a course design supported by appropriate learning approaches and software design contribute to a successful outcome. There were a number of issues experienced in the course which helped to identify and determine the future direction of RAT Online course design with respect to the inclusion of certain learning tasks and use of tools. Some tasks and their associated tools will be removed from the task structure of these courses, such as the learning journal and synchronous mind mapping, and included only as recommended tasks. This means that the number of tasks can be reduced, as well as simplified. It might also mean that an additional video activity can be included to further develop physical skills in RAT.

The final section is a summary of the four RAT Online courses which provides a number of conclusions about the courses and the evaluations.

6.7 Conclusion

This chapter was a detailed overview of the evaluation of the RAT Online courses component of the RAT Online project.

While this practical account of the design, development, and implementation of the RAT Online courses has exposed problems and difficulties inherent in attempting to teach and learn a kinaesthetic topic with its complex theoretical considerations in the online mode, in my view it has every bit as much shown that with the appropriate design, flexible attitude, and careful consideration of multiple factors that it is possible to accomplish successful learning of RAT in the online environment. Furthermore, the iterative design depicted in the development research diagram (Fig. 3.1) contributed to the continuous re-evaluation of the design and has contributed to the improved course designs and implementations. There were four iterative cycles consisting of the evaluation of four online courses. Each cycle resulted contributed to more effective decision-making resulting in changes and improvements to the course design and delivery.

The four courses have shown that learners gained in knowledge, attitudes, and in skills (in the final three courses). The design, based on social constructivism (Vygotsky, 1978), cognitive flexibility theory (Spiro et al., 1992a), Bloom's Taxonomy (Bloom et al., 1956; Harrow, 1972; Krathwohl et al., 1964), and RAT, informed by an appropriate overarching evaluation approach, the eclectic-mixed methods-pragmatic paradigm (Reeves & Hedberg, 2003), supports the effective implementation of RAT (martial arts) computer supported learning environments. And finally, when appropriate learning tasks are chosen, suitable software tools can be implemented supporting the underlying theories and pedagogies, resulting in effective online learning experiences.

The RAT Online courses, like the RAT CD-ROM, have also fulfilled their purpose. These include: (1) support the learning of RAT in an increasingly geographically separated RAT community, (2) effectively teach and learn theoretical topics online and increase time for physical practise in face-to-face classes, (3) the provision of an online environment independent of time and place to discuss and contribute to RAT theory, (4) the creation of a shared knowledge repository, and (5) a contribution to research of online learning involving physical skills and knowledge.

The final discussion chapter provides a summary of the RAT Online project and offers insights into how the two components of this study will be implemented as a part of a publicly available RAT Online learning environment.

Chapter 7: Discussion

In this chapter the RAT Online project will first be summarised reviewing the background to this study and restating the research questions. Then the main findings and conclusions will be presented discussing how the evaluation of the RAT CD-ROM and the RAT Online courses have contributed to answering this project's research questions and to what degree the aims of the project have been fulfilled. Any implications of the evaluation findings will then be discussed, followed by an insight into the limitations of this research project. This chapter will conclude with recommendations for the future direction of the RAT Online project.

7.1 Summary of the project

In the introduction chapter the RAT Online project was introduced as a pragmatic evaluation of the design, development and delivery of constructivist computer supported online learning environments created to support the learning of the South African martial art, RAT. In the background to the study section several reasons for undertaking this project were provided, the main ones being: the geographic dispersion of the learner community and the need to provide a solution to this problem, as well as the need to provide and store more meaningful learning material which could be generated by learners/practitioners in collaborative online learning environments. Furthermore there was sparse research about collaborative martial arts computer supported learning environments and none pointing to the unique RAT learning needs, which was a crucial consideration for undertaking this research. A solution was developed consisting of two main components: the RAT CD-ROM and RAT Online courses (four courses in total for this project). The main research questions for this project were then introduced, which included:

- a. Can RAT practitioners facilitate the learning of RAT martial arts knowledge, skills and attitudes (KSAs) in computer supported learning environments?
- b. What design would constitute effective martial arts computer supported learning environments?
- c. What kinds of learning activities and technical tools are effective in martial arts computer supported learning environments?

The literature review chapter covered a number of topics, including various learning approaches, a description and the characteristics of martial arts, computers and learning, and the shortcomings and advantages of different evaluation approaches.

The learning approaches section described three major learning paradigms: behaviourism, cognitivism, and constructivism. The behaviourist approach to learning presented opportunities for the training of automatic physical skills (Singer, 1982) and could be applied to develop martial arts skills, such as reactions to self-defence situations developed through drill and practice activities typical of operant conditioning. Nye (1979, p. 25) pointed out that operant conditioning could be used to modify a wide variety of behaviours, such as playing sports. Positive and negative reinforcement (Skinner, 1974) could play a role in developing skills and the value of the “drill technique” (Singer, 1982, p. 24) to develop skills of large groups of participants did not go unnoticed. The development of automatic martial arts skills are important in order to respond without thinking and free up the mind to focus on strategy, which is what Singer (1982, p. 88) contends is possible with extended practise.

However, as Harrow (1972) mentioned, developing psychomotor skills can be a complex activity. Self-defence situations, especially those practised in the RAT classes require practitioners to respond to novel situations. It was felt that behaviourism was not well-developed enough to cope with the learning demands of RAT classes. Moreover, Chomsky’s (Blackburn, 2005; Chomsky, 1967; Cook, 1988; Cook & Newson, 1996) criticisms of behaviourism in language learning highlighted flaws in behaviourist theory, especially with regard to the poverty of the stimulus argument, and that children produce novel sentences all the time. So it seems questionable that they learned these sentences through reinforcement alone. The example of child language errors was also used to illustrate that children seem to possess knowledge of the rules of grammar existing within the brain. Cognitivism was advanced as an alternative to behaviourism. The example of rats finding their way through a maze was used to show that rats seem to form a mental picture or map when moving through the maze and avoid taking the wrong turns (Tolman, 1948) and Piaget’s (1929) influential research showed that human brains undergo mental processes when learning. Piaget’s proposed mental processes of assimilation, accommodation, adaptation, and equilibrium imply some sort of restructuring of the brain

during learning. Piaget's views of learning were influential antecedents to constructivist learning approaches.

Constructivism was thought to provide a valuable alternative to behaviourism for learning theory and for this study because of the view that learners construct knowledge and place value on the past experiences of learners in the learning process (Cunningham, 1992, p. 36), discovery learning (Bruner, 1973), going 'beyond the information given' and 'with the information given' (Perkins, 1992, pp. 49-50), social constructivism (Vygotsky, 1978) or learning collaboratively (described further in the theoretical foundations chapter as the main pedagogical approach in this project), situated (Brown et al., 1989) and authentic learning (Herrington et al., 2006), and cognitive flexibility theory (Spiro et al., 1992a).

A brief introduction to computer supported learning environments was then provided with the observation of Reeves & Hedberg (Reeves & Hedberg, 2003, p. 3) that computer supported learning is a complex field with numerous technology options. Yet much computer supported learning is strongly influenced by behaviourism (Reeves & Hedberg, 2003, p. 12) and the assumption that learners are passive psychologically (Bigge & Shermis, 1999, p. 306). This approach to computer supported learning emphasises reinforcement (Levy, 1997, p. 50) and drill and practice activities (Bigge & Shermis, 1999, p. 307). A behaviourist approach to the RAT Online study was considered too simplistic and would not be able to account for the complex activities and knowledge required for learning RAT. An underlying constructivist learning approach for the RAT Online learning environments was considered an appropriate theoretical base. Thus software tools that support multiple representations of knowledge and expert performances (Herrington & Oliver, 2000), communication and simulation (Barab et al., 2000; Dickey, 2005) to safely discuss and collaborate in complex learning environments, tools for thinking (Jonassen, 2003; Jonassen et al., 1998) were considered important to support constructivist learning activities.

The term 'martial arts' was then discussed and explained that it would be used in its broadest sense in this study. That is, it would encompass all fighting arts and sports, as well as the use of weapons.

The final section of the literature review chapter compared four computer supported learning environment paradigms: (1) analytic-empirical-positivist-quantitative paradigm, (2) constructivist-hermeneutic-interpretivist-qualitative paradigm, (3) critical theory-neomaxist-postmodern-praxis paradigm, and (4) eclectic-mixed methods-pragmatic paradigm (Reeves & Hedberg, 2003, pp. 30-36) in which it was established that the first three paradigms could not by themselves provide a comprehensive enough research framework for this study. The eclectic-mixed methods-pragmatic paradigm was advanced as the only approach that could account for the complex nature of this study and was discussed further in the theoretical foundations chapter.

The theoretical foundations chapter was divided into a discussion about the three main theory categories underlying this project. These included the eclectic-mixed methods-pragmatic paradigm (Reeves & Hedberg, 2003, pp. 34-36), RAT, and learning.

The eclectic-mixed methods-pragmatic paradigm was used as the main theoretical underpinning for the RAT Online project, because of its practical nature, its flexibility to incorporate several theoretical approaches, and its emphasis on using mixed methods (Johnson & Onwuegbuzie, 2004) of data collection and analysis, formative research (Nieveen & van den Akker, 1999; Reeves & Hedberg, 2003, p. 272; van den Akker, 1999), and effectiveness evaluation (Reeves & Hedberg, 2003, p. 178), all of which were required in the complex RAT Online project. The concept of 'design experiments' (Brown, 1992) was adopted mainly because this approach enables one to work with pragmatic research goals as well as to uncover theoretical research aims (Cobb et al., 2003). A rapid solution was required for RAT practitioners and design experiments provided that synergy between a practical need as well as a contribution to a body of knowledge and practice.

RAT was then presented as an eclectic martial art, which has borrowed ideas from Chomsky's Universal Grammar (Cook, 1988) and prototype theory (Taylor, 1989) to derive multiple contextual training (MCT). MCT was used to guide facilitation and learner thinking in the RAT Online courses.

Finally the learning section included three approaches to learning which influenced the design of the RAT CD-ROM and the RAT Online courses. These approaches included

social constructivism (Vygotsky, 1978), cognitive flexibility theory (Spiro et al., 1992a), and Bloom's Taxonomy (Bloom et al., 1956; Krathwohl et al., 1964).

The social constructivist approach embodied all the elements of constructivism with a prominence placed on the social aspect of learning and learning from more knowledgeable peers and the learning facilitator/teacher. This approach to learning guided the development of the learning environments, especially with regard to creating tasks involving collaboration and software tools to enable collaboration, such as discussion fora, chats, and simulation chats.

Cognitive flexibility theory guided the design and facilitation of the courses with the value placed on multiple perspectives (Spiro et al., 1992b, pp. 122-123), providing ill-structured activities to encourage deep thinking for real world related tasks (Xun & Land, 2004). In addition, the Spiro et al. (1992b, p. 125) claim that ill-structured tasks are more suited to complex learning, but not necessarily suited to less complex activities guided the development of the RAT Online courses, as well as forming a comfortable fit with the RAT syllabus where earlier tasks and ranks are more structured, while later tasks and ranks are more ill-structured.

Bloom's Taxonomy, including the cognitive (knowledge), psychomotor (skills), and affective (attitudes) domains (Bloom et al., 1956; Krathwohl et al., 1964) was influential in the designs in this study, because it provided a practical way to determine what learning outcomes were required and helped to guide the creation of suitable tasks. These could then be assessed in various ways.

In the methodology chapter the mixed methods research approach (Johnson & Onwuegbuzie, 2004) was described in greater detail and this study was introduced as being an example of a design experiment. Design experiments aim to provide both practical and theoretical outcomes (Cobb et al., 2003). To answer the research questions a mixed methods research design was adopted and designed using four evaluation themes suggested in Reeves & Hedberg (2003, p. 143) to conduct evaluations of online learning environments: effectiveness, usability, functionality, and appeal. The methodology included the participation of several groups of people, including learners, experts, and participant observer. Multiple tools were used to gather data from participants, which

included expert reviews, observation, learner feedback, learner output, and records. Although the expert review rating forms described in Reeves (1997b) and Reeves & Hedberg (2003, p. 148) formed the basis for the expert review forms in this research, these were extended in this study to include the ratings provided by more than one expert for a single rating form, as is illustrated in Fig. 4.1: Blank teaching evaluation form, instead of for the comparison of two learning systems. Appropriate evaluation dimensions were borrowed from Reeves (1997b) and Reeves & Hedberg (2003) to create a teaching evaluation form and a user interface rating form, including additional dimensions derived from Nielsen (1994b) and Tognazzini (2003). These forms were adapted accordingly for the RAT learning environment. Furthermore the idea of expert rating forms was extended to incorporate a content expert review.

The RAT CD-ROM chapter was a detailed account of the design, development, implementation, and the two rounds of evaluation of a multimedia martial arts resource created for RAT practitioners. The second round of evaluation showed evidence of the resource becoming increasingly constructivist in nature (Fig. 5.13: Teaching evaluation form – round 2), which was believed to be as a result of the addition of learner output created during the RAT Online courses.

The RAT Online courses chapter described the design, development, implementation, and evaluation of four online constructivist courses designed to teach a variety of martial arts topics. The first course, the Bear Hug course was a small scale pilot course which did not adequately address the development of martial arts skills, but the satisfactory results were motivation to continue the project and offer more RAT Online courses. The following three courses: the Wheel Spanner course, the Belt course, and the Pen courses were larger in scope and addressed the deficiencies of the Bear Hug course.

In the next section, the main findings of the RAT Online project will be discussed.

7.2 RAT Online project findings

In this section each research question will be restated followed by a discussion of the degree to which each has been answered by the evaluations. The purposes for undertaking

this research will also be revisited to determine if and to what degree the original problems identified for the RAT learning environment have been solved.

7.2.1 Research question 1

Can RAT practitioners facilitate the learning of RAT martial arts knowledge, skills and attitudes (KSAs) in computer supported learning environments?

The results of effectiveness evaluations demonstrate that the learning of RAT martial arts knowledge, skills, and attitudes can be facilitated in computer supported learning environments due to the evidence of knowledge constructed by learners such as mind maps, discussion forum messages, and RAT syllabus material that participants claimed they learned from the RAT CD-ROM, the physical demonstrations of skills in learner created videos and face-to-face grading assessments, and an appreciation of collaborative learning and respectful, yet critical, interaction by participants in the learning environments. Furthermore expert reviews support the RAT CD-ROM as being an effective learning resource and the RAT Online courses as effective learning environments. This evidence showed that learners had engaged in and demonstrated Bloom's Taxonomy (Bloom et al., 1956) higher order cognitive abilities, such as analysis, synthesis, and evaluation, as well as lower order abilities, such as knowledge, comprehension, and application. The evaluation also revealed that the social constructivist learning (Vygotsky, 1978) approach, cognitive flexibility theory (Spiro et al., 1992a) and complexity, the RAT approach and MCT contributed to the development of an ethos of sharing and constructive criticism, open-mindedness to learn and consider others' ideas, as well as the effective engagement in complex and authentic learning tasks.

While much more research can be carried out to develop and evaluate martial arts learning, especially physical skills, the degree to which this research question has been answered by this research is satisfactory, especially as evaluated by expert martial artists.

The design, discussed next, is critical to develop effective martial arts computer supported learning environments.

7.2.2 Research question 2

What design would constitute effective martial arts computer supported learning environments?

A design supporting the development and implementation of effective martial arts computer supported learning environments includes two main elements: (1) the purpose (i.e., teaching and learning - therefore requiring an underlying learning approach), and (2) the user interface (i.e., the visual design, functions and layout).

The learning approach supporting the online teaching and learning of RAT includes: (1) social constructivism so that learners can become co-constructors of RAT knowledge coinciding with the requirement of the RAT syllabus for learners to be creative contributors of knowledge, (2) cognitive flexibility theory to develop progression in the RAT syllabus and courses from structured learning at beginner phases with a steady progression to more complex and ill-structured tasks to help practitioners create solutions to self-defence problems as experienced in real life, and (3) Bloom's Taxonomy to guide the development of tasks requiring higher order thinking, RAT skills, and attitudes. It is recognised that many other combinations of learning approaches might work with equally beneficial results, but from a pragmatic perspective; these are the approaches that have worked effectively in this project. The successive rounds of evaluation have contributed to the conclusion that the design proposed here is an effective learning design for learning RAT online. Although not part of this study the personal experience of applying these generalised design principles to guide the development of other courses in the workplace with equal success adds further support for these findings. Furthermore, one could question whether in fact an underlying constructivist approach was evident at all, but the expert reviews, repeated several times serves to support the use of the social constructivist approach. The learner feedback, expressing value for collaboration, sharing of ideas, knowledge construction, and real world tasks contributes to evidence of the underlying constructivist design.

For educational technology theory, these results suggest that combining theories in this way to achieve different aims in a project could well be worth further investigation, but also supports the eclectic-mixed methods-pragmatic paradigm (Reeves & Hedberg, 2003)

as being an effective evaluation approach, allowing for the more complex amalgamation of approaches.

The minimalist visual design and layout focusing on function, including the scrupulous integration of multi-media such as video clips, photos, animations, and diagrams used in the RAT CD-ROM and the RAT Online courses contributed to satisfactorily functional and appealing and authentic learning environments, as was evidenced through two rounds of cognitive walkthroughs and learner feedback. These designs were cross-checked by user interface experts. However the evaluation revealed that the designs were not without their problems, but the eclectic-mixed methods-pragmatic paradigm enabled effective problem-solving and decision-making using multiple methods of data collection and analysis. The careful consideration of the categorisation of information (especially in navigation menus) produced usable learning environments and learner feedback suggesting that this categorisation of information contributed to participants learning from the RAT CD-ROM, as learners could familiarise themselves with the structure of RAT categories and techniques within the menu structure.

These general design principles guide what types of learning activities to include in RAT learning environments, which in turn determine what technical tools (software) are effective in martial arts computer supported learning environments. Question 3 is discussed next which addresses effective learning activities and tools.

7.2.3 Research question 3

What kinds of learning activities and technical tools are effective in martial arts computer supported learning environments?

The RAT Online courses component of this project is most relevant to answering question 3, as the courses were designed so that the learning interactions between participants take place online, whereas the RAT CD-ROM was designed as a learning resource to **supplement** face-to-face and online classes. Even though there is evidence of learning taking place as a result of using the RAT CD-ROM there were no tools provided for participants to interact with each other, although the learning activities in the syllabus

require interaction and the creation of learner artefacts too. The RAT CD-ROM also included tools, such as Freemind for the representation of knowledge and multimedia items, but these were also included in the RAT Online courses. The tasks on the RAT CD-ROM could well have been carried out online, but this type of evaluation was too large a task and beyond the scope of this project, as it relates more to the entire RAT syllabus. Therefore the learning activities and technical tools mentioned below relate to the RAT Online courses.

This study has shown through multiple evaluation methods that the following learning activities contribute to an effective online learning experience for participants in RAT Online courses: (1) self-introduction, (2) reflect, research and experiment, (3) practise and comment, (4) chat, (5) experiment and discuss, (6) explore example syllabus, (7) represent your knowledge, (8) virtual self-defence, and (9) practise and record your knowledge. These activities require the following technical (software) tools: (1) discussion forum, (2) synchronous chat, and (3) virtual self-defence environments. The online learning system also requires mechanisms to store multimedia, such as images and video clips, as well as allow participants to upload files, and might also require the provision of other software to create representations of knowledge, such as mind mapping software.

The “self-introduction” activity is a discussion activity which requires a discussion forum tool. Even though the self-introduction task was rated as the least useful activity, it was nonetheless valued by course participants as an effective ice-breaker and for developing rapport amongst participants. It also serves the purpose of providing background information about participants’ current levels of knowledge, which is useful for the course facilitator and other participants to gauge how to respond to each other. Participants and participant observer felt that this task should be retained.

The “reflect, research and experiment” task uses a discussion forum tool and is a structured task to initiate the learning process in RAT courses. Participants are guided, but are required to conduct their own research and begin exploring their physical skills in RAT. Participant feedback suggested a appreciation of this task and the learner output was of a sufficiently high standard.

The “practise and comment” activity also uses the discussion forum tool and builds on the skills component of the “reflect, research and experiment” activity. The discussion forum is used to share experiences and to delve deeper into the principles underlying the topic (i.e., by uncovering categories in a taxonomy). The participant ratings in the online questionnaires were high for this task and participants’ work was of a high standard.

The “chat” task uses either an online video chat or plain text chat and is a useful activity to discuss the current level of learning developed up to this point in the courses and to focus on particular aspects (e.g. in the Pen course participants were required to discuss the positive and negative attributes of the pen as a self-defence weapon amongst other requirements). The chat activity is also useful as participants are required to create a summary of each chat session to share with other participants. This becomes a useful activity as it brings together all the topic strands and participants can start to make more sense of the content discussed. Researchers are advised that online chat tools are unstable and this can affect the course effectiveness.

The “experiment and discuss” task uses the discussion forum tool and is designed to further develop skills and knowledge. Participants are required to cover techniques from all major categories (in this case the categories of a specific weapon, such as different types of strikes, throws, chokes, etc). It is important that the participants actually experiment further with the weapon so that they can share their experiences as well as provide feedback to other participants’ discussion posts. This task is a significant step towards the construction of participants’ own syllabus for the weapon. The upload of participant created media, such as images and video clips adds value and facilitates the easier explanation of techniques. This use of video clips to facilitate easier explanation of techniques is an effective use of learning media on the RAT CD-ROM, which resulted in learning experts rating the second version of the RAT CD-ROM as much more of a constructivist learning environment than the first version. The learner feedback and output was also satisfactory.

The “explore example syllabus” requires mechanisms to upload and link syllabus content (text) and multimedia, such as the image display tool in the Open Learning System. This activity is useful for participants to compare the example syllabus with their own findings to determine if the major categories and principles constructed thus far are covered. The placement of this task within the course structure provides an opportunity for participants

to be creative, while at the same time giving them the benefit of guidance if they have not included an important element. One participant claimed that the example syllabus gave him a lot of ideas that he could use. Participants also rated this task highly.

The “represent your knowledge” activity requires a discussion forum tool so that participants can upload and discuss their learner artefacts. They also require software to represent their knowledge, e.g., to create a mind map, diagram, or document and then upload the file into the discussion forum. All attempts to provide online collaborative mind mapping tools were not as successful as anticipated and the simplest option (i.e., using the discussion forum) seemed the most effective method. Also the decision to allow the freedom for participants to choose how they will represent their knowledge seems advisable, as most participants chose methods that were easiest for them. The high standard of work submitted by participants, the high participant ratings of this task and learner feedback shows this task as being effective and supportive of the underlying cognitive flexibility approach taken.

The “virtual self-defence” activity used two tools, which are now defunct: Flash Communications Server and Netomat. This learning activity offers potential and provides a safe and cost effective method for participants to develop their self-defence strategy skills and apply their knowledge to complex problems. There is much scope to improve this task in newer 3D virtual worlds software, such as Active Worlds or Second Life. When this task was not impeded by technology failures, it proved to be an effective activity engaging learners in deep thinking. Participants seemed to enjoy this task with one participant commenting that he enjoys reality based training.

The “practise and record your knowledge” activity requires participants to have access to a video recorder to record a syllabus that they have constructed following a set of guidelines. The video recording must show no signs of editing, as this reduces the risk of participants simply practising a RAT technique and then recording it and repeating this procedure for each technique in the syllabus. This would not demonstrate a satisfactory level of martial arts skills development. The procedure chosen (i.e., unedited video) was an effective approach, as it was a way of assessing and evidencing that RAT learning had occurred and especially that RAT skills had been developed. Furthermore the online questionnaires revealed a growing appreciation of the task after each iteration of the RAT Online courses.

Participants commented favourably on the task and claimed that it changed their more rigid ways of thinking as a martial artist.

This study has answered the research questions, but have the initial problems of this study described in the introduction been addressed? These problems were reformulated into purposes for the RAT CD-ROM and the RAT Online courses. These purposes are revisited next and determined whether they have been fulfilled satisfactorily by this study.

Purposes of this study

RAT CD-ROM

The RAT CD-ROM chapter listed the following purposes for the development of the resource, to address the: (1) geographic dispersion of learners and no access to the face-to-face classes, (2) ineffective text-based learning material that is not conducive to representing RAT movements, and (3) lack of a medium for RAT practitioners to store new knowledge about RAT.

The satisfactory results of the RAT CD-ROM evaluation show that the resource is a useful supplement to face-to-face and/or online learning. In addition the RAT CD-ROM is a useful resource to learn new knowledge and skills. Therefore the RAT CD-ROM addresses the problem of geographic dispersion of learners and their lack of access to RAT face-to-face classes. Learners are able to use the RAT CD-ROM as an expert knowledge learning resource in order to reference known knowledge and skills, as well as to learn new knowledge and skills.

The text based syllabus was significantly expanded in the RAT CD-ROM with the inclusion of multiple multimedia files, such as images and video clips. This media, especially the video clips were highly valued as useful learning and reference material. Thus the second purpose of the RAT CD-ROM has been addressed.

The addition of learner generated material after each RAT Online course addresses purpose (3) above. The addition of learner content generated during courses provides an opportunity for multiple representations of learner knowledge.

RAT Online courses

The following purposes for the RAT Online courses were listed to address the: (1) increasingly geographically separated RAT learning community, (2) the potential to cover RAT theory topics online and increase the time in face-to-face classes for the perfection of physical skills, (3) the provision of a centralised online location across intra- and international boundaries to discuss and contribute to RAT theory, (4) the creation of a growing knowledge repository to store and share learning artefacts, and finally (5) to contribute to sparse research in the area of physical knowledge and skills in the online learning sphere.

The evaluation of the RAT Online courses had participants from various geographic locations, both nationally within South Africa, as well as internationally. The effective implementation of the courses across these boundaries satisfactorily addresses item (1), (3) and (4) purposes for the RAT Online courses listed above, however more can be done to improve the knowledge repository listed in item (4). A wiki has been installed with the view to serve this purpose.

The evaluations of the RAT Online courses showed through learner output, learner feedback, expert reviews, and participant observation that RAT theory or knowledge can be effectively facilitated online in constructivist learning environments. These findings showed that the development of RAT skills could also be developed. This finding suggests that offering RAT theory online learning is a feasible and an effective means of increasing time in face-to-face classes for the perfection of physical skills.

This study is a contribution to the area of online learning and physical knowledge and skills, addressing item (5) above. The study demonstrated through the use of design experiments how constructivist learning can be applied in computer supported learning environments for the teaching and learning of RAT, a type of martial art. This is an uncommon application of online learning and shows that even subjects that are traditionally thought of as being established and fixed sets of knowledge can be enhanced through the application of an underlying constructivist learning approach. Furthermore, this study has shown that the learning approaches, as well as MCT, if applied with the appropriate sorts of learning activities can facilitate the learning and development of physical skills online.

In the next section, the findings of this project will be presented in light of what they imply for online martial arts learning environments and other skills based online learning environments, and online learning more generally.

7.3 Evaluation implications

The following design principles result from the RAT Online project evaluations:

Declarative principles

- Social constructivism supports effective learning design both for collaborative online learning environments and more static computer supported learning resources such as the RAT CD-ROM;
- Cognitive flexibility theory promotes creative problem solving and rich learning experiences;
- Bloom's Taxonomy facilitates the identification of appropriate learning outcomes and relevant assessments;
- Multiple contextual training supports creativity; and
- Computer supported learning conceived of as knowledge construction and 'mind tools' contributes to effective learning design.

Below are a number of resulting procedural principles.

Procedural principles

- Design computer supported learning environments incorporating communication and collaboration tools;
- Use the mentor facilitation approach and treat course participants as equally knowledgeable as the course facilitator;
- Use tools to represent knowledge in various formats;
- Provide mechanisms for learners to submit and share their own learning artefacts;
- Design learning environments with appropriate levels of complexity, structured for less complex learning tasks, and more ill-structured for complex tasks;

- Identify knowledge and task requirements to design appropriate activities and real world assessments;
- Promote opportunities for learners to think broadly, as well as narrowly about topics and solving problems; and
- Provide computer software tools for various cognitive activities.

Potential applications

The findings of the RAT Online project imply several potential applications and a need for further research into: (1) online martial arts learning environments, (2) online learning involving other kinaesthetic knowledge and skills, such a vocational training and higher education subjects with an emphasis on practical knowledge and skills, such as engineering, medicine, and woodwork (3) the effect of social constructivist learning environments in the workplace where knowledge and skills are kinaesthetically orientated, and the potential of situating learners within the context of where learning might be required (4) the study of strategy in sports and other applications, (5) the cost-effective sharing of expert knowledge, and (6) mixed methods research.

The transfer of findings in this research translates naturally to applications for other martial arts online learning environments. This might however also imply changes to the underlying teaching philosophy if the martial art under investigation has a more rigid teaching and learning ethos than has been described about RAT. However, it would be an interesting study to determine how effective learning could be achieved with martial arts of this more rigid nature, as they have also proven to be efficient self-defence systems. Not only does the RAT Online project have implications for online martial arts learning, but also for martial arts learning and teaching more generally. The use of (1) social constructivism so that participants can share and develop new knowledge, (2) cognitive flexibility theory so that authentic and complex tasks can be designed providing a more realistic alignment with self-defence situations, (3) Bloom's Taxonomy so that teachers can ensure tasks require learners to engage with higher order thinking, develop suitable affective attributes, and a high level of martial arts skills, and (4) MCT so that learners can think broadly and in a focused way to develop new knowledge could all positively influence traditional face-to-face martial arts learning environments for the more effective teaching and learning of martial arts.

If martial arts can be learned and taught online, it begs the question of whether these findings can be applied in other disciplines involving kinaesthetic knowledge and skills. These results imply the potential for effective applications in subjects such as woodwork and other crafts, security training, engineering, certain medicine subjects and numerous others. The designs proposed in this study could be used as a basic template for the types of topics mentioned here. If the RAT Online approach was adopted it could have implications both for practice and the way that certain subject knowledge is explained. For example, woodwork is usually considered as being a skill based subject. If an online woodwork course was designed, it might mean that instead of simply showing learners how to create certain joints, that instead one gives learners a task to explore and then discuss different types of joints, indicating which ones are useful for different structures. This makes woodwork less of a rigidly structured learning experience.

The effective social construction of knowledge to be shared amongst the RAT community could be applied in the workplace where solutions to complex problems are required, which might then result in the creation of standard procedures for other colleagues. For example, the outcomes of a course designed around specific safety hazards in a workplace might be the generation of a set of safety procedures for the workplace for everyone in the business to follow. Furthermore, the effect of social constructivist courses could be applied in the workplace to develop a sense of value amongst employees. Examples of this application include three online courses I have designed in the workplace, including an induction, an online poker course, and an online e-learning course, where staff have reported feeling empowered and valued because they were given the opportunity to share their views. The potential for these applications cannot be overlooked given the value of a motivated workforce. All of these courses contained authentic learning activities, sharing the notion with constructivism that the successful completion of tasks is in fact the assessment of the knowledge and skills required for those tasks.

The applications of the virtual self-defence rooms “has some SERIOUS potential for online learning” as one course participant claimed. This approach can be used in online sports courses, even team sports to develop strategy knowledge and skills. This applies to a multitude of other disciplines too, such as police and security training, search and rescue techniques, advanced driver training and many others. Indeed the use of 3D virtual

environments is not new in learning, but integrated with constructivist designed courses such as the RAT Online courses offers a rich and complex learning experience. This observation is consistent with findings by Barab, Thomas, Dodge, Carteaux, and Tuzun (2005).

It is perhaps not so much a result of the satisfactory findings of the RAT Online project that this type of learning can be a cost effective means of sharing expert knowledge and skills with communities in geographically dispersed communities, as it is a result of the benefits of online learning more generally. However, this study serves to add support to this benefit of online learning because of the new potential to share RAT (specialist knowledge and skills) across the world, whereas before it was restricted to one small geographic location. I think of the possibilities especially in medicine and improving the human condition in places that have little access to specialist knowledge and skills.

Finally, while there is already a vast body of work out there about mixed methods research, this project has demonstrated that a mixed methods approach serves the purpose of inquiry well when there are pragmatic demands and restrictions, such as technology and small participant numbers. It shows that research does not always have to be rigidly defined in order to produce useful results, but flexibility and appropriate choice of instruments and various viewpoints contributes to effective decision-making.

Multiple methods were used in this study to provide a comprehensive multi-faceted evaluation. Even so, there are several limitations of this project, which are discussed next.

7.4 Limitations of this project

The small learner participant groups in this project limit the potential to draw conclusions based on statistically significant data. This limitation was in part alleviated by the successive rounds of evaluation adding to a cumulative body of data to support or refute the previous evaluation rounds, as well with the use of multiple data collection instruments and various participant sources of information adding credibility to the findings. These approaches help to make the project more reliable and credible in the presentation of its findings. However, a greater number of course participants would have made the analysis

of data collected from learner output and online questionnaires in each evaluation simpler. For example, statistically significant questionnaire results would have provided easier decision-making, because the results would have been more reliable statistically. Instead, while very useful, these results had to be used as indicators prompting more questions and the collection of additional data to cross-check the results and produce a greater range of ‘truths’. This contributed to a more well-developed understanding of the evaluation findings, which had an impact on design decisions, which I believe were improved as a result.

A more heterogeneous learner group, consisting of both participants with no martial arts experience as well as those with experience, and a greater representation of both genders might add value to this research. The absence of complete novices and females being actively involved in the courses as learners is viewed as a limitation in this study as these variables could affect the results, although it is acknowledged that all learners were novices in the topics of each course.

While the type of evaluation in this project is pragmatic and dynamic in nature and even though the use of various evaluation instruments evolved in each round, a more prescribed set of tools and protocols would make this type of research easier to manage. On the other hand this research has facilitated the creation of such a prescribed set of instruments for future RAT Online evaluations. These tools can be used as a basis to improve the instruments, keeping in mind that in creative projects of this nature one needs to avoid being too prescriptive to as to stifle creativity.

The lack of reliable Internet connectivity was also a limitation in this research, as it limited the types of technology that could be used (e.g., greater use of video clips), as well as impeding some of the learning activities, such as the synchronous activities (video chat and virtual self-defence). Many times participants could not take part in certain activities simply because their dial-up Internet connections were too slow or would not work at all. This finding results in a paradoxical observation, that is, that the effectiveness of this type of learning to improve learning opportunities for people in geographic locations could be impeded due to the lack of sufficient infrastructure, such as Internet connectivity, which is essential to support such learning. Often it is in remote places in the world where there

might be a lack of expert knowledge and as such are the types of places where one would want to deliver such learning environments.

Poor Internet connectivity was also the reason that the RAT CD-ROM was delivered on a CD-ROM and not online. This meant that the RAT CD-ROM and the RAT Online courses were kept separate. It would have been interesting to evaluate how well the two components worked as an integrated RAT Online learning environment, even though that for the purposes of this project keeping the two components separate did make the evaluation easier to manage in my view.

The RAT CD-ROM resource contains learning content from the entire RAT syllabus including full syllabus ranks and shorter courses, whereas the RAT Online courses only covered the evaluation of shorter RAT courses. This project did not cover the teaching of full RAT ranks online given the significant time investment required for such an undertaking. However, the deliberate exclusion of full RAT ranks as part of the RAT Online courses evaluation is a limitation because the larger scale of the ranks compared to the courses might impact the design. Therefore the design principles derived from this study are effectively used for the design and delivery of RAT Online courses and the RAT CD-ROM (computer supported RAT learning resource). These designs may also inform the design of learning opportunities for full RAT ranks too.

In the RAT Online component of this project the learning was largely based on knowledge constructed by the learners, which they also had to demonstrate in a video grading. Example syllabus material was provided for course participants to guide them in the creation of their own techniques. However, during the evaluation the question was asked of participants whether it would be beneficial to include compulsory skills (RAT techniques) for learners to become skilled in and then demonstrate. This is a requirement in many martial arts. Some participants agreed that a few foundation techniques would be beneficial. The exclusion of a set of compulsory techniques is a limitation of this study, as the learning and assessment of these skills would impact the design of the RAT Online courses. This would imply the inclusion of additional tasks and affect the course duration.

Finally, a few recommendations about the future direction of the RAT Online project will be provided.

7.5 Future direction of the RAT Online project

This project was carried out with the eventual practical aim of implementing a full scale RAT Online learning environment. Several of the limitations of this research project provide opportunities to expand the RAT Online project in the future.

Improved Internet connectivity, a wider range of Web based software available, and easier access to open source learning platforms imply that it might be easier to implement a full scale RAT Online learning environment, integrating the content on the RAT CD-ROM, the RAT Online courses, as well as the full RAT syllabus and ranks. This has already been initiated with the transfer of the RAT Online domain to a web host that provides tools for the easy installation of software. The Moodle learning management system (LMS) has been installed, which will enable the incorporation of the RAT CD-ROM content, supplemented by the inclusion of collaborative tools, such as discussion fora about the content, as well as software tools to enable the facilitation of constructivist RAT Online courses as described in this project. Mediawiki has also been installed, which is the wiki software platform that powers the large online collaboratively created encyclopaedia, Wikipedia. This wiki is called the RATwiki and is intended to provide the opportunity for RAT practitioners to contribute to a growing body of knowledge of martial arts techniques and principles. This content can then be referenced from within the Moodle LMS. A RAT Youtube channel has also been created to serve as a video repository, as the Moodle LMS allows the easy searching and integration of Youtube video clips. There has been limited investigation of the potential of 3D virtual worlds such as Second Life to become the platform for future virtual self-defence tasks. All of these new tools will mean more evaluations, but will take the RAT Online project into the wider world of the Web and future research opportunities.

The increased exposure on the Web offers the prospect of facilitating courses with a larger number of participants that are perhaps more heterogeneous and international in nature and might add to an interesting social dynamic which will be worth further investigation. There is a view to offer the courses for a fee, but this might impact on the ethics of conducting this type of research. The inclusion of a fee might impact positively, or not, on the

motivation of course participants and their willingness to complete task deadlines on time. Again this is worthy of further investigation.

The next stage of the RAT Online project is to design appropriate learning experiences for each of the full RAT ranks, which will require further evaluations of the type described in this project. This will be a significant advancement on the RAT Online project and because of several similarities to other martial arts might have additional experiences that can be shared with other martial arts practitioners wishing to attempt online learning.

The RAT CD-ROM contains the syllabi of other martial arts trained in the RAT club. A future challenge will be to design effective constructivist learning environments for these martial arts. This challenge can be extended to other researchers and martial artists. Other martial arts (and the RAT syllabus) include prescribed and compulsory techniques which practitioners are usually assessed on for advancement in rank. This aspect of martial arts skill development was not covered in the RAT Online project and represents yet another opportunity to add to an understanding of learning martial arts online, but more generally to learning any kind of skill online. The inclusion of a Youtube channel is expected to contribute to the ability of practitioners to upload, share and evaluate each others' development of martial arts skills.

It is to be acknowledged that although the RAT Online project has been a considerable investment in energy, people resources, knowledge, and skills spanning several years, this point is only the beginning. The tip of the ice-berg so to speak, as there is much work to be done to develop a fuller understanding of the types of learning described in this project.

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Other research resulting from this study

CITTE

(Durban, South Africa 25-27 September 2002) - RATs on the Web. Plague or blessing? (<http://citte.nu.ac.za/papers/id24.pdf> - no longer available).

WEB 2003

(Durban, South Africa 10-12 September 2003) – 2nd Prize poster– RATOnline: Teaching a South African Martial Art Online.

AFRICAN SCHOLARSHIP

(Durban, South Africa 2-4 December 2003) – Poster presentation. RATOnline: Teaching a South African Martial Art Online.

WWW 2004

(Johannesburg, South Africa 1-3 September 2004) – Poster presentation. Wheel spanners, computers and RATs: An online martial arts course and resources.

WWW 2005

(Cape Town, South Africa 29–31 August 2005) – RAT Online: Towards Effective Delivery of Online Martial Arts Web Resources (Paper). (<http://www.uj.ac.za/www2005/documents/Yates,%20S.pdf> - no longer available).

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