UNIVERSITY OF KWAZULU – NATAL

ANALYSIS OF COGNITIVE LEVELS OF EXAMINATION QUESTIONS SET IN THE BACHELOR OF NURSING PROGRAMME AT UNIVERSITY OF KWAZULU – NATAL

A dissertation submitted to the department of Nursing at the University of KwaZulu-Natal in partial fulfillment of the requirements for the degree of Masters in Nursing Education

BY

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DECLARATION

I Masaitsiweng Garekwe declare that the work titled "ANALYSIS OF COGNITIVE LEVELS OF EXAMINATION QUESTIONS SET IN THE BACHELOR OF NURSING PROGRAMME AT UNIVERSITY OF KWAZULU – NATAL" is my own unaided work. It is being submitted for the degree of masters in Nursing Education at the University of KwaZulu-Natal, Durban. It has not been submitted for any other purpose. All sources have been acknowledged by means of referencing.

Garekwe 22/04/10

MASAITSIWENG GAREKWE **DATE**

22/04/2010.

DEDICATION

This dissertation is dedicated to my lovely children, Pearl Kaone and Prince Bakang Garekwe for their unconditional love, encouragement and support.

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ABSTRACT

Background: The literature reveals that a large percentage of teachers ask questions aimed at lower cognitive levels irrespective of the underpinning philosophy. They fail to set challenging questions at higher order levels when setting examination papers.

Purpose of the Study: This study is aimed at describing and analysing the examination questions set over a four year academic period, at the University of KwaZulu-Natal School of Nursing, in terms of Bloom's levels of cognitive domains.

Research Methodology: A quantitative approach and content analysis was used. A total of 1319 questions were examined, sourced from 39 examination papers, from 2003-2007. These questions were independently reviewed by two coders according to Bloom's taxonomy's template.

Research Results: The findings revealed that all six categories of the cognitive domains in Bloom's taxonomy were used across the four levels in the Bachelor of Nursing (BN) programme. Overall about 57 % of the questions were aimed at lower level (knowledge, recall and comprehension) whilst only 43.4% were aimed at higher levels (application, analysis, synthesis and evaluation). In the first year lower order questions averaged at 62% with higher order questions at 51%. In second year the lower order questions took up 51% of the paper with higher order questions at 49%. During third year there was an equal (50/50) split between higher order and lower order questions. In fourth year there was the highest percentage of lower level questions (66%) was seen, with only 34% of questions being of the higher order. Regarding the increase in the complexity of questions within the programme, a change of 13% was seen between first and second year. Whilst there was an increase of 1% reported between second and third year. However, there was a significant drop (16%) in the complexity of questions in the fourth year, with lower order questions clearly dominating.

Recommendations: The nursing education curriculum, and staff development programme, should pay special attention towards developing educators in the setting of questions ensuring appropriate examination criteria are met. Exercises during the capacity building initiatives should cover aspects such as how to plan an assessment for the whole programme ensuring the appropriate increases in complexity as the programme progresses, as well as setting, or critiquing, of examination papers and coming up with recommendations to improve the quality of questions. Special attention should be given to how to align teaching and assessment in such a way that the level of complexity increases as the students' progress through the programme. Lastly, further research should be conducted, using mixed methods, to explore the assessment of learning and in order to address certain questions which could not be answered quantitatively; for example questions regarding the construction of questions, because it impacts the nature of the question. Also it should be noted that there was a disjuncture between the scenario and the questions in some cases.

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CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE STUDY

Authors such as Ellis, (1993); Dillon, (1988); Blanchette, (2001) contend that questioning is the most common form of communication used in teaching. Ellis (1993) further asserts that teachers use questioning strategies to review, check on learning, probe thought processes, pose problems, seek out alternative solutions and challenge students to think critically and reflect on issues or values. Since the early 1990's questioning techniques for teachers have been a major concern for researchers (Edwards and Bowman, 1996; Ellner and Barnes, 1983; Graesser and Person, 1994;; Blanchette, 2001).

In an attempt to overcome shortcomings associated with the assessment of learning, Bloom (1956) devised taxonomy for educational objectives in order to measure different levels of learning (Ferris & Azizi, 2005; National Council of State Boards of Nursing, 2006). This system was created to improve testing by categorizing cognitive functioning into distinct levels, so that appropriate questions are developed to assess the desired level (Bloom, 1956; Pear, 2002). Bloom (1956) outlines six hierarchical domains of educational progress ranging from the simple to the highly complex: namely knowledge (memorizing and identifying facts or concepts), comprehension (understanding the meaning or intent of information), application (using new ideas and skills to solve problems), analysis (seeing the underlying ideas that make up a body of information), synthesis (putting information together in a new form), and evaluation (using knowledge to deal with new situations or problems). Bloom's taxonomy of educational objectives assists educators in formulating objectives at different levels and for different kinds of behaviors (Bloom, 1956; Pear, 2002). They further argue that test questions are categorized and organized into hierarchical levels of student learning, each

level being subsumed by the higher level. Thus a student functioning at the "application" level has also mastered the material at the "knowledge" and "comprehension" levels.

Ferris and Azizi (2005) in their study indicates the development of Bloom's taxonomy provides a different approach to the determination of educational objectives based on the behaviorists' perspective of identifying what the student is able to do with the education. They further emphasize that the competence of the student to do things is dependent on the educational process and development of capabilities, and not only providing knowledge.

Kim (1996) postulates that Bloom's Taxonomy has been found effective in improving students' cognitive skills. He notes that a mixture of questions from various levels of the taxonomy may result in most effective learning at higher levels. In addition, Kim (1996) states that the hierarchical levels of student learning can be used to determine the extent to which educators emphasize both lower and higher order thinking behaviors. For these reasons, curriculum designers and educators have extensively used the taxonomic model of learning to analyze the cognitive levels of questions.

Studies undertaken by Combs (1998); Kim (1996); Cross (2000) and Azer (2003) reveal that despite the methods of assessment being developed to incorporate the taxonomy into test specifications to ensure that higher order cognitive processes are assessed, approximately 80 to 90 percent of teachers still ask questions aimed at lower cognitive levels. According to these authors, teachers should be setting more challenging questions at higher order levels when setting examination papers. Combs (1998) indicates that in some instances, the students are being taught at lower levels but tested at an inappropriately high level on a specific subject, or visa versa. This may result in the students' higher order thinking skills being compromised. Furthermore, questions usually designed to test the memory (or recall of

knowledge) are mostly used whilst questions requiring the application of knowledge to case studies are kept to a minimum (Milton, Pollio, and Eison, 1986; Combs, 1998). The higher levels of testing would appear to be the more appropriate, with the introduction of problem-based learning in the bachelor of nursing programme and a full shift from a traditional lecture-based curriculum to a student-centered program. This, however, requires greater depth of study in the science and a broader general education as it deals with human lives (Cross, 2000; Combs, 1998; Kim 1996).

Although questioning plays an important role in classroom interaction, some researchers argue that teachers' questions, especially those at the lower cognitive levels, have negative outcomes (Ellis, 1993; Crighton, Arian and Bethel, 1995; Blanchette, 2001). This is because lower level questions neither promote higher order thinking skills, such as critical thinking nor encourage participation (Dillon, 1994). Thus, they measure only the student's surface learning, that is, activities of an inappropriately low cognitive level (Entwistle, 1995; Smith and Campbell, 1999). Mukarugwiza (2003) pointed out that examinations as a tool used in assessment lack depth as an approach to learning since they measure very little of the students' true potential.

1.1.Statement of the problem

According to Neufield (1982) and Azer, (2003) assessment needs to match the philosophy of the curriculum and reflect its educational outcomes. In 1994, the UKZN, School of Nursing adopted a problem-based approach to teaching. The school changed from a content-driven traditional curriculum, in which according to Davis (1999) the students are expected to memorize the content and duplicate the information during examinations. Assessment in the PBL programme, however, should measure complex outcomes, not just the ability of the examinees to recall information (Neufield, 1982; Azer, 2003). Research by Aaron, Crocket,

Morrish, Basualdo, Kovithavongs, Mielke, and Cook (1998), however, showed that many of the examinations that students face in the PBL programme did not measure what they were supposed to. The students were asked to generate lists of facts and respond to multiple-choice questions, which were testing lower levels of the cognitive domain. These authors indicate that if a problem-based curriculum does help students achieve a higher level of information processing, then the use of examinations that require this level of knowledge should reveal a clear advantage for problem-based learning (Aaron, et al, 1998).

Azer, (2003) argues that examinations in a problem-based learning program should focus on testing the higher order cognitive functioning, or the five domains of competence, which include: analytical skills (the ability to interpret the significance of key words, clinical data, or laboratory findings provided in the stem of the question), problem-solving skills (the ability to use knowledge acquired to solve problems), integration of knowledge (the ability to understand the basic scientific principles and concepts related to the question) and thinking holistically (the ability to evaluate the whole picture as well as the parts). The researcher noted that since the adoption of a PBL curriculum, the school has never conducted a study measuring the cognitive level of questions used in the BN programme. Hence, in this particular study intends to describe the cognitive level of the questions used in a Bachelor of Nursing (BN) programme and establish whether the complexity of questions increases as the students' progress, as was proposed by Handingham (2005).

1.2. Purpose of the study

The purpose of the study is to describe and analyze the examination questions set over the four-year academic period, at the UKZN, School of Nursing, in terms of the levels of cognitive domain and their level of complexity as the programme progress.

1.3. Objectives of the study

The objectives of this study are: -

i. To describe the cognitive levels at which examination questions are set in the Bachelor of Nursing (BN) programme.

ii. To establish if the levels in the cognitive domain increase in complexity as the level in the programme becomes higher.

1.4.Research Questions

The following questions were directed at addressing the study objectives: -

i. Ask which cognitive levels in the Bloom's taxonomy are the BN programme examination questions pegged?

ii. Does the complexity of examination questions increase as the level in the programme becomes higher?

iii. Find out which cognitive domains are frequently used in questions at a given level in the BN programme?

iv. Which cognitive domains are less frequently used in questions at a particular level in the BN programme?

v. Which cognitive domains are commonly used in examination questions in the BN programme over the five years?

vi. Which cognitive domains are less commonly used in examination questions in the BN programme over the five years?

1.5. Significance of the study

This study is significant in that it is the first study to investigate the cognitive levels of examination questions at the UKZN School of Nursing. Therefore the knowledge may serve as baseline data or documentation for future reference by educators, examiners, researchers as

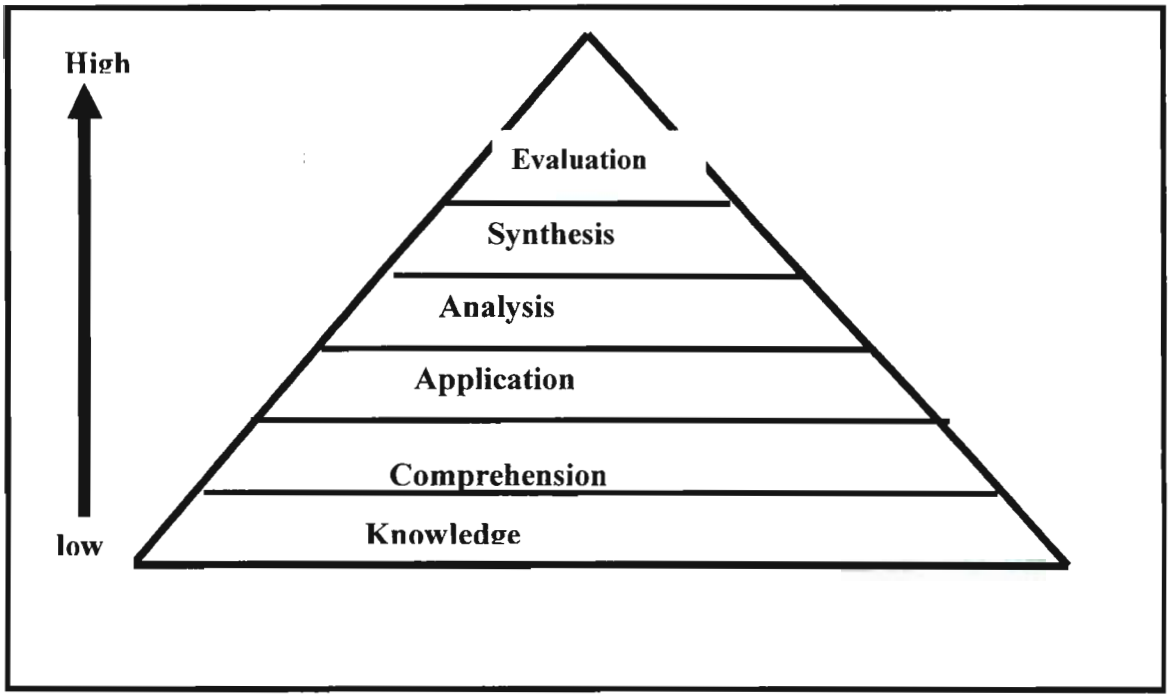
well as policy makers. Furthermore this study has a potential to contribute to the existing body of knowledge on the cognitive level of examination questions. This is important as there is a worldwide concern that examinations used in the assessment of learning lacks a deep approach to learning, and measure only a very little of the students' potential (Hadingham, 2003).

The school of nursing may also seek to improve the standard of examinations by utilizing the different cognitive domains to ensure that the students' critical thinking skills are properly assessed by using the findings of the study. This consequently may benefit the society overall by offering graduates with higher order thinking skills. Furthermore the findings may assist the school in improving its curriculum. Finally, the findings may be shared with academic staff and recommendations made regarding the construction of higher order examination questions.

1.6. Conceptual framework

Hierarchical cognitive domains in Bloom's taxonomy will be used as a conceptual framework in this study. Bloom's taxonomy is a system created to improve testing precision by categorizing intellectual behavior into desired levels (Bloom, 1956; Shaw, 2005). In the context of this study, levels of questions will be analyzed in a hierarchical fashion as outlined in figure 1 (a) below. In an ascending order of complexity, the cognitive levels of questions are: knowledge, comprehension, application, analysis, synthesis and evaluation. This scheme orders the six categories into a hierarchy such that cognition at each level encompasses, builds on, and is richer than the levels below. In turn, these categories provide a framework for classifying questions that prompt students to engage in these different thinking behaviors, and is thus a tool for reflecting on questioning strategies used in teaching (Uno, 1998; and Granello, 2000).

Figure 1 (a): Conceptual Framework showing hierarchical cognitive domains



Source: (Shaw, 2005)

According to Hadingham (2003) the levels in the cognitive domain increase in complexity, moving from the less complicated to the more complex. As one progresses to the higher levels in the nursing programme, the complexity should increase likewise. In David's (1999) view, this taxonomy permits recourse to mental processes. The questions should therefore be balanced to cater for each level as determined by the programme.

Knowledge Level

The knowledge level in this conceptual model requires students to remember facts they have already learned. Additionally, the student is made to recall things like specific facts, terminology, or basic concepts and answer questions as they have learned them (Colletta and Chiappetta, 1989; Gronlund, 1995; Cepni and Azar, 1998). It is based on mental processes,

like: memory, associations, logical thinking, the transfer/organization or re-organization of problems, and the localization of necessary elements to use. Although some of these terms may apply at other levels, the typical words used in questions here are: define, describe, identify, label, name, state, list, etc (Davis, 1999; Mellish, Brink and Paton, 1998; Quinn, 1995). For example, "Define the term Anatomy"

Comprehension Level

This level tests the understanding of facts, principles and ideas as well as their interaction (David, 1999). It requires students be able to rephrase information using their own words and translate knowledge into new contexts, as well as interpret graphs, tables, charts and cartoons (Colletta and Chiappetta, 1989; Gronlund, 1995). Typical words used at this level include: compare, contrast, demonstrate, paraphrase, translate, convert, explain, give examples, etc (Bloom, 1956; Clark, 2000; Combs, 1998; Davis, 1999). For example, "explain the process of food digestion"

Bloom (1956) further divides the comprehension level into three sublevels. The lowest order is *translation* where the concept, message or statement is put in different words. The second order is *interpretation* where a person may be asked to interpret the given information, diagram or statement. The student may also be requested to translate a diagram and interpret the relationship amongst its different parts. The final level is *extrapolation* here one is expected to go beyond literal communication and make inferences about consequences. The students should be expected to go beyond what is seen on the graph and give meaning of the information on the graph. If the student can translate, interpret and extrapolate from messages which are used as input, then she/he has gone beyond verbalization of knowledge stage.

Application Level

This level requires students to identify the relevant information and rules to arrive at a solution and solve problems by applying acquired knowledge, facts, techniques and rules in a different way (Combs, 1998; Davis, 1999; Pear, 2002). David (1999) further asserts that this level also measures problem-solving skills. Moreover, authors such as Davis (1999) and Quinn (1995) state that situations should be sufficiently unfamiliar to avoid the mere recall of previous behaviors. Typical terms used at this level are: demonstrate, discover, prepare, produce, relate, use, solve, show, etc (Davis, 1999; Mellish, Brink and Paton, 1998; Quinn, 1995). For example, "demonstrate how you would give intramuscular injection."

Analysis Level

This level requires students to separate or break down information (ideas) into its component parts, which may be elements of information, relationships between elements, or organization and structure of information. This demonstrates an understanding of the relationship of the parts to the whole (Davis, 1999; Mellish, Brink and Paton, 1998; Quinn 1995). Clark (1999); Davis, (1999) and Pear (2002), postulate that its purpose is to separate more important aspects of information from less important, thus clarifying meaning so that organizational structure may be understood. Typical terms used to ask questions are: categorize, classify, discover, divide, differentiate, discriminate, distinguish, examine, inspect, simplify survey etc (David, 1999; Mellish, Brink and Paton, 1998; Quinn, 1995). For example, "differentiate between quantitative and qualitative research approaches"

According to Bloom Hastings and Madaus (1971), analysis makes use of knowledge, comprehension and application but goes beyond them. Analysis is divided into three levels. The first is the *analysis of elements*; the second is the *analysis of relationships*; and the third is the *analysis of organizational principles.* The analysis of elements is primarily concerned

with the identification of the underlying elements in a communication, such as: assumptions, values and views being used by its author. The analysis of elements may also be used to determine the nature and function of particular statements in the communication (Bloom, et al, 1971). The analysis of relationships is primarily concerned with the relationships of elements and parts of communication, such as: relationships of hypotheses of evidence, assumptions to arguments, causal relationships and sequential relationships. They include the logical or necessary relationships among the elements or parts (Bloom, et al, 1971). The analysis of organisational principles, according to Bloom, eta al (1971) involves ability to deal with the organization, systematic arrangement and structure which holds an entire work together. This taxonomic subcategory includes analyses of the way in which the entire work is **predicted** on a particular form, point of view, or conception of the author's (Bloom, et al, 1971).

Synthesis Level

This level requires students to be able to compile information together in different ways by re-combining various parts, or elements, into a new pattern, and/or propose alternative solutions. The student here has to be creative and produce something unique, such as a plan or design. Synthesis is viewed as a kind of self-expression in which the student is urged (or helped) to produce something novel or different, with his/her personal stamp. Synthesis appears to be a type of divergent thinking in that it is unlikely that the right solution to a problem can be set in advance. Each person may be expected or desired to produce their own answer. Unlike in convergent thinking where the correct answer to a problem or question may be known in advance ((Bloom, et al, 1971). Students may also be required to write a paper or report in which ideas are synthesized or problems solved (Colletta and Chiappetta, 1989; Gronlund, 1995). Typical words used are: compile, compose, create device, plan, etc (Davis, 1999;

Mellish, Brink and Paton, 1998; Quinn, 1995). For example, "describe an experiment in order to find the formulas of organic compounds."

Bloom, et al (1971) divides synthesis into three further subcategories: the first is the *production of a unique communication*; the second level of synthesis requires a *production of a plan, or proposed set of operations*, and the third requires the *derivation of a set of abstract relations*. The production of a unique communication is concerned with development of a communication in which the author or speaker attempts to convey ideas, feelings, relationships or experiences to others. The production of a plan, or proposed set of operations, is concerned with the development of a plan of action, or the proposal of a plan of operations. According to Bloom, et al (1971) the plan should satisfy the requirements of the task which may be given to the student or which she/he may select or develop for himself. Derivation of a set of abstract relations is concerned with development of set of abstract relations to classify or explain particular data or phenomena. Bloom, et al (1971) indicates that they may also deduce propositions and relationships from a set of basic propositions or symbolic representations.

Evaluation Level

This level requires students to judge the value, or merits, of an idea, material, purpose, solution to a problem, procedure, method and/or product (Clark 1999). It also requires students use the other five levels of the taxonomy to varying degrees (Colletta and Chiappetta, 1989; Gronlund, 1995). Quinn (1995) asserts that it involves the use of **criteria**. Learners are expected provide reasoned arguments for, or against, a given position. Typical words are: compare, contrast, criticize, justify, appraise, judge, etc (Davis, 1999; Mellish, Brink & Paton, 1998; Quinn, 1995). For example, "describe the effects of radioactivity on human health and environment. Explain your answer."

According to Haddingham (2003), the complexity of questions should increase as the level in the programme progresses. This study proposes that questions at higher levels (that is application, analysis, synthesis and evaluation) in the BN programme should be more complex than those set at lower levels (knowledge recall and comprehension) in the programme. The majority of questions at higher levels should address higher order thinking skills. According to Bloom, et al (1971) the domains of comprehension, analysis and synthesis all have three subcategories. Accordingly one expects that questions at higher level in the programme should address mostly the second and third level subcategories of these domains.

1.8 Operational definitions:

Cognitive levels: In the context of this study, cognitive level refers to six hierarchical levels of educational objectives that progress from the most simple to the highly complex, namely: knowledge (memorizing and identifying facts or concepts), comprehension (understanding the meaning or intent of information), application (using new ideas and skills to solve problems), analysis (seeing the underlying ideas that make up a body of information), synthesis (putting information together in a new form), and evaluation (using knowledge to deal with new situations or problems) (Bloom, 1956).

Examination questions: These are complex linguistic structures designed to engage learners cognitively in processing particular contents. It is an expressed request for information. They may take a variety of forms and can fall into a number of categories (Banchette, 2001).

Bachelor of Nursing (BN) Programme: - A degree programme where students undergo four years of comprehensive education and training in a CBE/ PBL programme and exit with nursing (midwifery, psychiatric and community) and midwifery qualification.

Academic period: - In this study, academic period can be understood as a length of study period. This could be semesterized, or yearly, and is undertaken by Bachelor of Nursing students in their training to become nurses. In this particular study it refers to a four year academic period undertaken in a BN programme.

1.9 Conclusion

In this chapter, the background to the study and the meaning of cognitive levels and examination questions were explained. The problems, purpose and the research objectives of the study were identified. Also an explanation of the rationale for, significance of the study, and the benefits it may have, for the nursing profession and ultimately the recipient of care were also provided.

CHAPTER 2

2. LITERATURE REVIEW

2.1. Introduction

This chapter covers the relevant literature in the area of the cognitive levels of examination questions that support this study. The reviewed literature covers the following areas: the assessment of learning in general, assessment through the use of multiple-choice questions, and assessment through the use of Essay questions. Attention will also be give to Bloom's Taxonomy and cognitive domains, Merrill's Taxonomy and assessment in problem-based learning (PBL).

2.2. Assessment of learning

Assessment of a student's learning and their performance is a crucial but neglected area of quality assurance (Mukarugwiza, 2003; Entwistle, 1995; Hendricks, 2003; Imrie, 1995). Yet, assessment of students' cognitive level (knowledge), development of intellectual abilities and skills, such as: self-directed learning, critical thinking, problem solving, communication, decision making, leadership skills and collaborative or team work; all generally measured by means of examinations (Imrie, 1995; Hadingham, 2003; Mukarugwiza, 2003; Azer, 2003). These examinations are arguably flawed, as indicated by Imrie (1995) in his study on the assessment of learning. According to Boud (1990) and Imrie (1995), successful performance in examinations does not indicate that students have a good grasp of the concepts which teachers believed the examinations to be testing. In other words, it is not a true indication of the students' level of learning or understanding (Hadingham, 2003; Mukarugwiza, 2003).

Imrie (1995) further asserts that, although, it is now customary to write educational objectives as outcomes, the lack of a systematic framework (taxonomy) means that quality is not evident, or verifiable, and there could be a mismatch between the stated (intended) outcomes and actual behavior of students. Biggs (1992) argues that this results in students attempting to understand the material according to their perceptions of the assessment requirements. Many students focus on the demands of the evaluation system instead of mastering essential content. This conflicts with obtaining a deep understanding of the content and becoming more creative (Crooks, 1988; Entwistle and Entwistle, (1998); Hadingham, 2003; Azer, 2003).

Moreover, several studies have shown that previous educational programmes in health professions have been subject-centered and traditional in their approach, where the students were expected to memorize the content and duplicate the information during examinations (Davis, 1999; Zheng, Lawhom, Lumley, and Freeman, 2008). On the other hand, poor content coverage and selective study may commonly affect the quality of education. Shah and Afzaal (2004) in their evaluation paper postulate that there has been an increased repetition of questions and only selected contents are repeatedly tested. No one seems to take serious note of this phenomenon, which leads to selective study (Azer, 2003).

In reviewing the overall picture of examinations, Helmick (1974) asserts, "The present examinations provide the only gateway, and a very limited one through which individuals must pass if they wish to progress economically and socially. Presently, the students function to certify completion of one level of education and also to be admitted to a higher level or to qualify for a certain job." This observation still holds true, although tests are used for instructional and diagnostic purposes as well as for assigning grades, McMorris and Boothroyd (1992); Oescher and Kirby (1990); Davis, (1999); Cross, (2000) found that classroom test scores provide the basis for a variety of educational decisions. For nursing

students, success or failure in completing the program, and entering the profession may depend heavily on written tests and examinations (Flynn & Reese, 1988; National Council of State Boards of Nursing, 2006). Individual who achieve passing grades on written examinations in nursing programs and later on the standardized licensure examination, are allowed to practice nursing (Flynn & Reese, 1988; Cross, 2000).

Nevertheless, the practice of nursing requires the application of knowledge, skills and abilities. Since it deals with human lives, nursing needs personnel who can think fast and critically solve problems (Combs 1998; Kim 1996; Howe and Jones, 1998; National Council of State Boards of Nursing, 2006). In addition, these "higher level" skills require more complex thought processing and problem solving (National Council of State Boards of Nursing, 2006). For example, a pediatric client undergoing a medical procedure may additionally have a mental illness and therefore dynamic factors must be considered in order to prepare the client for the procedure and to correctly answer the item. This cannot be achieved, unless the bachelor of nursing programme aims for higher levels of learning, and learners are taught how to think critically and assessed using similar levels (de Tornyay, 1990; Palmer and Devitt, 2007). Of corse, critical thinking and higher levels of teaching and learning have been emphasized in nursing education for several years. Indeed, critical thinking is one of the standard outcomes that should be demonstrated (Wright, Millar, Kosciuk, Penberthy, Williams and Wampold, 1998; Azer, 2003; Cheaney and Ingebritsen, 2005).

Manuel and Sorenson (1995) surveyed agencies employing personal with bachelor of nursing degrees in Massachusetts and recommended that curricula be redesigned to emphasize critical thinking, independent decision-making, and encourage integration of basic and clinical sciences throughout nursing programs (Azer, 2003). When higher levels of thinking are to be

different levels for different kinds of behaviors (Bloom, 1956; Pear, 2002). They further argue that test questions are categorized and organized into hierarchical levels of student learning, each level being subsumed by the higher level. Thus a student functioning at the "application" level must have also mastered the material at the "knowledge" and "comprehension" levels.

Ferris and Azizi (2005) in their study also indicate that the development of Bloom's taxonomy provided a different approach to the determination of educational objectives based on the behaviorists' perspective of identifying what the student is able to do as a result of the education. These authors further emphasize that the competence of the student to do things is dependent on the educational process, developing certain capabilities, and not only providing knowledge about things.

Kim (1996) postulates that Bloom's Taxonomy has been found effective in improving students' cognitive skills. He suggests that a mixture of questions at various levels of the taxonomy might result in the greatest learning at higher levels (Kim, 1996; Darwarzeh, 2004). In addition, Kim attests that the hierarchical levels of student learning could be used to determine the extent to which educators emphasize both lower and higher order thinking behaviors. For these reasons, curriculum designers and educators have extensively used the taxonomic model of learning.

Although Bloom's Taxonomy is a widely accepted classification system, it has its share of critics. Some have questioned its validity because of its behaviorally specified goals, that is, because it requires individuals to demonstrate mental processes in observable ways, including task performance (Pring, 1971). Many suggest that although research supports the basic hierarchical structure of the classification system, the hierarchy falls down at the synthesis and evaluation levels, and that these are instead two divergent processes that operate at the same

level of complexity (Seddon, 1978). Other critics have pointed out that Bloom's Taxonomy fails to acknowledge history or context. For example, if a sophisticated appraisal of a research paper emerges from a student discussion, an examination question that then asks students to evaluate these same research findings will require them to function at the lower knowledge or comprehension level, to simply recall and restate the outcomes of an evaluative discussion. Finally, as Nordvall and Braxton (1996) have pointed out, the knowledge and comprehension levels of Bloom's Taxonomy do not acknowledge that some types of information are more difficult to remember and understand. For example, most students find it easier to briefly describe three major functional types of RNA than to explain the details of how RNA is transcribed or translated. However, most educators agree that although the research on the validity of Bloom's Taxonomy is not necessarily conclusive, this taxonomy is a useful tool for making a distinction between lower-level and higher-order knowing and thinking (commonly referred to as critical thinking) and for improving our teaching.

Furthermore, according to the studies undertaken by Combs (1998); Kim (1996) despite the methods of assessment having been developed to incorporate the taxonomy into test specifications to ensure that higher order cognitive processes are assessed. Approximately 80 to 90 percent of teachers tend to ask questions at the lower cognitive levels, rather than setting more challenging questions at higher order levels when setting examination papers (Cross, 2000; Gage and Berliner, 1992; Evans, 1999). Combs (1998) indicated that in some instances, the students are taught at lower cognitive levels and tested at higher cognitive levels on a specific subject, or vice versa. This implies that students' higher order thinking skills are compromised. Furthermore, questions usually designed to test the memory are mostly used whilst questions requiring the application of knowledge to case studies are kept to a minimum (Milton, Pollio, and Eison, 1986; Combs, 1998). Yet higher levels of testing would appear to be more appropriate, since the bachelor of nursing programme requires greater depth in the

sciences and a broader general education as it deals with human life (Cross, 2000; Combs, 1998; Kim 1996).

In Oescher and Kirbly's (1990) study, teachers reported that only one-fourth of test question were written at the application, analysis, synthesis or evaluation levels. The researchers' review of these tests revealed less than 8% of question at these levels with virtually none at the synthesis or evaluation levels (Combs, 1998; Cross, 2000; Hadingham, 2003). This suggests that teachers may not accurately judge the cognitive levels of their own test subject (Cross, 2000). Hadingham (2003) also found that over 95% of the test questions students encounter require them to think only at the lowest possible level - the recall of information.

Although there are times when lower level questions are needed, particularly at the start of a unit or lessons, when the students only have a limited knowledge of the subject matter, the use of the lower level questions though should not be extensively used. If the teaching is geared around examination questions that focus more on the lower cognitive levels as when students are simply asked to recall information, then students may be less inclined to be actively involved in the learning process (Combs, 1998; Çepni, and Azar, 1998). Furthermore, questions that have one specific answer, as is generally the case with the lower levels of questions, may inhibit the generation of class discussions and the ability of students to verbally express themselves (Combs, 1998; Cepni, and Azar, 1998). This may consequently hinder students' intellectual development (Cepni and Azar, 1998).

Another study in Kentucky, by Sultana and Klecker (1999), indicates that the teachers were aiming their questioning primarily at the lowest cognitive level of the taxonomy throughout the year. The questions that require recall of specific information or facts may produce low levels of learning from questions, which require students to apply or transfer the learned idea

to new situations (Darwazeh, 1992, 1995). However, a number of studies have been conducted to investigate the levels of questions teachers use in evaluating students achievement. In the measurement of reading students' achievement, Hoeppel (1981) conducted a study aiming at categorizing questions via the "Bloom Taxonomy of Educational Objectives Domain." He selected a random sample of questions, analyzed and classified them according to Bloom's Taxonomy. The classification revealed that 26% of questions were for knowledge, 74% were comprehensive, whilst only 0.0035% was for application and no questions were for analysis, synthesis and evaluation. The results show 99% of the questions were categorized within two lower levels, knowledge and comprehensive (Hoeppel, 1981; Combs, 1998; Kim, 1996).

Al-Makhzoomy (1986) agreed with Hoeppel's results when they analyzed the teachers' responses on the levels of questions used in teaching reading comprehension. The results showed that 68% of teachers usually place more emphasis on literal-type questions (remembrance) than on inferential-type questions (application) (Al-Makhzoomy, 1986; Combs, 1998; Kim, 1996; Davis, 1999). This was further supported by Rinser (1987), when he studied the cognitive levels of questions demonstrated by test items. Based on Bloom's taxonomy, results showed that about 95% of the test questions were devoted to knowledge or comprehension, but only 5% were used for application, and 0.2% for evaluation and analysis, whilst synthesis questions completely neglected (Rinser, 1987; Combs, 1998; Kim, 1996).

Harder (1991) also agreed with Al-Makhzoomy's results when he reviewed the levels of classroom oral questions asked by teachers. The results, classified according to Bloom's taxonomy, showed that the questions aimed at the level of knowledge was 47.5%, with 32.4% for comprehension questions, 13.1% for application questions, 5.6% for analytic questions, only 1% for synthetic, and finally, 7% for evaluation questions. Martin et al. (1994),

reinforces Harder's results, stating that teachers usually use questions, which require factual answers and low levels of thinking (i.e. knowledge and comprehension questions). At 70% of the questions were aimed at knowledge and comprehension, while questions that require application, analysis, synthesis, or evaluation were less often used (Martin et al. 1994; Combs, 1998; Kim, 1996).

Royer and Konold (1984) further examined Hunkin's study in which he investigated the effect of two levels of questions, knowledge (low level) and evaluation (high level) on students' achievement in two groups. In analyzing the results of an examination, consisting of all six levels of Bloom's Taxonomy, written by the students, it showed that the two groups did not differ on results from the lower taxonomic levels, but differed on evaluative questions. This shows that students receiving higher-level questioning perform better on high level tests (Brualdi, 1998). Al- Nayef (1989) supported Hunkin's results and conducted a study to investigate the effect of questions levels on the reading comprehension of students. He used two levels of questions: low levels questions (knowledge, comprehension), and high levels ones (application, analysis, synthesis, and evaluation). His study revealed that students exposed to high level questions (application, analysis, synthesis, evaluation) performed better on the same levels of questions (Al- Nayef, 1989; Shavelson and Huang, 2003; Oermann and Gaberson, 1998; Brualdi, 1998; Zheng, Lawhom, Lumley, and Freeman, 2008).

Continuing, Felker and Dapra (1975) found that low-level questions have a great effect on students' achievement. They investigated the effect of different levels of questions on students' learning. Their study revealed that students who received comprehensive questions requiring them to recall (remember) the text performed significantly better than those who received application level questions requiring them to identify new examples of learned concepts or principles on an application level. In support of Felker and Dapra, Samson et al.

(1987) conducted an analytical study with the main aim to test the effects of question levels on students' achievement. In analyzing their results, it was evident that higher-level questions have a small positive effect on learning, hence contradicting the previous results, which indicate the opposite. Perkins (1990) agreed with Samson's analysis and investigated the effects of question levels on English as a second language reading comprehension. The results showed that there were significant differences for factual questions, but no significant differences among the generalization, and inference levels of questions.

2.4. Merrill's Taxonomy

Although the focus of this study is Bloom's taxonomy, we will cover Merrill's taxonomy briefly. Merrill (1983) proposed different kinds of taxonomies based on two dimensions: a) the type of instructional content, and b) the level of instructional performance. The instructional content type is defined as all knowledge and information that are required by students to learn during their studies and is been classified into four types: (1) concepts, (2) principles, (3) procedures, and (4) facts (Darwazeh, 1997; Merrill, 1983).

The level of instructional performance is defined as the student's behavior, which he or she displays after the instructional process has taken place (Merrill (1983). She also classified the performance levels into four levels of learning:

i. Remember-an-instance level (RI) in which students are required to recall or recognize specific information, such as: names, dates, symbols, labels, etc. (e.g. who was the winner of the 2001 Nobel prize for Anatomy and Physiology?)
ii. Remember-a-Generality level (RG) in which students are requested to remember general information and basic ideas, such as: definitions of principles, concepts, and/or procedures (e.g. what is the main difference between classification of objectives and taxonomy?)

iii. Use-a-Generality level (UG) in which students are required to apply a generality to a new instance (e.g. is cancer a contagious disease?)

iv. Find-a-Generality level (FG) in which students are required to derive or invent a new generality from instances that students have not seen before (e.g. derive the principle of lightening by manipulating these new phenomena) (Darwazeh, 1997; Hill, 1984).

Educators, such as Darwazeh (1996), believe that presenting different levels of questions during instruction would induce different levels of student learning. He asserts that questions could be presented on different levels according to the cognitive processes they need. These levels usually vary from simple (Remember-an-Instance RI and Remember-a-Generality RG) to complex (Use-a-Generality UG and Find-a-Generality FG). Simple level questions such as RI and RG usually require low cognitive processing, whereas complex level questions, such as UG, usually require high cognitive abilities (Oermann and Gaberson, 1998). Shavelson and Huang (2003); Oermann and Gaberson (1998) support this hypothesis, and found that the learners who received high level questions in which they were asked to apply certain principles to new instances during instruction performed significantly better post test evaluation than the learners who received low level questions requiring them to recall specific information. de Tornyay (1990); Oermann and Gaberson (1998) further emphasize that asking different levels of questions may promote different levels of learning. They contend that high-level questions might have a greater effectiveness than low levels on learning. Winne (1979), however, could not find a significant difference between the effects of high versus low-level questions on learning. His study showed that there was a positive relationship between higher-level questions and higher-level students' ability.

Watts and Anderson (1971) investigated the effect of questions that require students to apply what they have read to new situations (UG). Following the analysis of this study, the results

showed that students who received questions requiring them to apply (UG) principles to new examples, performed better on the posttest (which measured questions of application) than students who received questions requiring them to recall (remember) previous examples. Rickards and Vista (1974) found similar results to Watts and Anderson when they studied the effect of question levels on learning. The students were asked to respond to one of the four types of questions: rote learning of facts, rote learning of ideas (RI, RG), meaningful learning, or task – irrelevant questions (UG). The results revealed that the students who received questions on meaningful learning (UG), which required organization of facts under given ideas, performed better than those who received questions requiring them simply to recall specific facts or ideas (RI or RG) (Al- Nayef, 1989; Shavelson and Huang, 2003; Oermann and Gaberson1998).

Again, Kneip and Grossman (1979) report that some studies indicate that students' achievement were significantly, and positively, affected by teachers' use of high level questions. Rayan (1973) compared the effects of high and low level questions on the social studies achievement of 5^{th} and 6^{th} grade students. The results indicated that questions which demand high cognitive levels (UG), beyond the recall level, were superior to the low level (RI, RG) questions in producing not only the high level understanding but also producing high levels of achievement. However, Redfield (1981) asserts that higher cognitive questions require the students to manipulate information, to create and supply a response, whereas lower cognitive questions are all for verbatim recall, or recognition, of factual information. This shows that the use of higher cognitive questions have a positive effect on a student's general achievement and retention of learning.

However, Andre et al. (1980) did not find a significant effect with respect to the effect of adjunct question levels on students' achievement. They have done seven experiments to

explore the effect of application (UG) questions and factual ones (RI, RG) on students' academic achievement. In each experiment, students were asked to read a short passage of three concepts and answer two levels of questions, remembrance (RI, RG) and application (UG). The results showed that five studies revealed no significant differences between question levels (remembrance and application), while only two studies found that remembrance levels (RI, RG) of adjunct questions were superior to application (UG) ones.

Nevertheless, Darwazeh and Reigeluth (1982) in their study on the level and position of questions and their effects on memory and application learning found that there were no significant effects with respect to the question levels. Darwazeh (2000), also, did not find any significant difference among the performance of the experimental groups who received either a remember-an-instance (RI), or a remember-a-generality (RG) question and those who received use-a-generality questions (UG). Though the direction of the groups' mean indicated that RI level had a higher effect on students' performance than RG and UG.

2.5. Assessment using Multiple-choice questions (MCQ)

Schuwirth and van der Vlueten (1996); Schultheis (1998); Mukarugwiza (2003), and Azer (2003) indicate that in the past, multiple-choice questions have been widely used to test the competences of health professionals. Multiple-choice questions consists of three parts: the 'stem' containing the problem statement, the 'key', or correct response, and 'distracters', or incorrect responses. There are at least three or more options given, to reduce the chances of guessing (Quinn, 1995). The multiple-choice questions can assess a variety of higher levels of functioning (Quinn, 1995; Aaron, Crocket, Morrish, Basualdo, Kovithavongs, Mielke, and Cook, 1998; Davis, 1999; Woolfolk, 2001; Chen, Kuo, Chang, Liu, and Heh, 2008). Although, it is much more difficult to write multiple-choice questions at the application and analysis levels of Bloom's taxonomy than at knowledge and comprehension levels (Quinn,

1995; Davis, 1999; Woolfolk, 2001; Azer, 2003; Chen, Kuo, Chang, Liu, and Heh, 2008). Writing and taking examination questions that test memorization is much faster and easier for both students and teachers, than writing and taking examination questions that test higher-order thinking (Zheng, Lawhorn, Lumley and Freeman, 2008). In addition, well-constructed multiple-choice questions could assess more than recall and recognition if they require the student to deal with new material by applying or analyzing the concept or principle being tested (Quinn, 1995; Aaron, Crocket, Morrish, Basualdo, Kovithavongs, Mielke, and Cook, 1998; Davis, 1999; Woolfolk, 2001; Azer, 2003; Chen, Kuo, Chang, Liu, and Heh, 2008). Furthermore, Azer, (2003), asserts that scenario-based multiple-choice questions encourage students to combine the learning of facts with understanding of a number of skills, such as analytical skills, problem solving skills, integration and application of knowledge. The questions are free from grammatical clues, and less susceptible to guessing and cueing as there is only one in four chance of getting the answer correct (Davis, 1999; Quinn, 1995). Therefore, more likely to assess knowledge rather than wisdom (Azer, 2003),

However, in the 1970's dissatisfaction with multiple-choice questions was raised and Azer (2003) viewed multiple-choice questions as having limited value for problem-based learning programs. This is because: (a) multiple-choice questions interfere with the students' learning process and force them to focus on details in lectures and textbooks rather than the desired skills imbedded in problem-based learning; (b) traditional multiple-choice questions do not match with the philosophy of the course; and (c) traditional multiple-choice questions have limited validity in measuring the application of knowledge, and mostly ignore the whole picture. Although there have been several suggestions to improve the quality of multiple-choice questions, none of these suggestions have enhanced the power of multiple-choice questions to test cognitive skills or assess competence.

Moreover, Hettiaratchi (1978) suggests that open-ended questions are thought to be superior to multiple-choice questions. This is because open-ended questions (essay questions) require the learners to give answers in their own words (Davis, 1999), presented in their own style and handwriting, with few restrictions imposed and no single correct answer (Quinn, 1995; Woolfolk, 2001; Mellish, Brink and Paton, 1996). Multiple-choice questions encourage students to learn lists of facts that are easily and quickly recognized and recalled, rather than learn the underlying principles and develop the habit of thinking through information (Ewan and White, 1996; Aaron, Crocket, Morrish, Basualdo, Kovithavongs, Mielke, and Cook, 1998). Mckeachie, as cited in Davis (1999), indicates that students study more efficiently for open-ended examination questions than for selection (multiple-choice) questions. They tend to focus on broad issues, general concepts, and interrelationships rather than on specific details, and this type of studying results in somewhat better student performance, regardless of the type of examinations they are given (Davis, 1999).

2.4.1. Assessment using Essay Questions

The cognitive level of open ended questions (essay questions) was also viewed as that of higher order level than that of multiple-choice questions and hence inducing high levels of learning such as application, analysis, synthesis and evaluation (Hancock, 1994, Zheng, Lawhorn, Lumley and Freeman, 2008). In contrast Bullens, Van Damme, Jaspert and Janssen (2002); Azer (2003) argue that the cognitive level of multiple-choice questions is influenced by how the questions have been constructed, and what is required for those questions. They might be constructed in such a manner/way that they are at an application, analysis, synthesis and evaluation level (Cashin, 1987; Azer, 2003; Zheng, Lawhorn, Lumley and Freeman, 2008). According to McCartan, Houston, Kelly and Kelly (2002), the recognition of the correct answer in multiple-choice questions is referred to as the 'cueing effect' and the findings of the studies conducted on the cueing effect were not clear as to whether essay

questions were of a higher cognitive level or not. The information obtained of their use is similar to that of multiple-choice questions. It might be that cueing of responses in multiple-choice questions could be content related (McCartan, Houston, Kelly and Kelly, 2002), as it might be the case with essay questions (Mukarugwiza, 2003).

Other shortcomings of essay questions as pointed out by Quinn (1995); Woolfolk (2001) are that in this type of questioning, only a limited selection of questions are answered, hence less material of the syllabus is sampled. Moreover, these questions are notoriously unreliable from the point of view of marking. Learners know that some teachers are easy markers and others are hard, and so the final mark depends to a large extent on the marker. There is often a wide variation between markers and even between the same markers at different times. Schuwirth and Marz (1997) further point out that essay questions yield lower reliability than multiple choice questions due to lack of objectivity and inadequate content sampling. Multiple-choice questions have more reliability because a variety of higher-level questions can be asked within a short period of time. Thus a broader sampling of the whole domain can occur than with essay questions. However, if a relatively small domain needs to be sampled, reliability of open-ended questions could reach adequate levels, which according to the literature is 0.80 (Schuwirth and Marz, 1997).

Nevertheless, educators such as Hancock (1994); Azer, (2003); Cheaney and Ingebritsen, (2005) claim that multiple-choice questions usually encourage low levels of learning, not the high-level understanding that is the focus of problem-based learning. Open-ended questions (essays), however, usually induce high levels of learning (Hancock, 1994). He also affirms that essay questions could improve results if they are written at higher levels of learning, whilst multiple-choice questions could improve results if they are written at lower levels of learning (Hancock, 1994; Zheng, Lawhorn, Lumley and Freeman, 2008). Darwazeh (1997,

2004); Wainner and Wang (1994) attest that essay questions have greater effect on students' achievement than multiple-choice ones especially when they are written on high levels such as (application, analysis, synthesis, evaluation).

Al-Smadi (1992) indicates that the use of question type (essay or multiple-choice) of low cognitive levels does not help students learn at higher levels of learning. He further highlights that these levels of questions generally elicit short responses and require no deep thinking. In other words, they do not require students comprehend, interpret, or use the information in new situations. The use of question type (essay, multiple-choice) of high cognitive levels plays an important role in helping students to understand the text because they generally elicit long complex, and deep responses; and require students comprehend, interpret, and use the information properly (Squire, 2001; Al-Smadi, 1992).

The review of previous studies reveal that there have been controversial issues with the examination question types (essay, multiple-choice), and their effect on students' achievement and the cognitive levels of learning. Some researchers, Arrasmith, Sheehan and Applebaum (1984); Hambleton and Murphy (1992); Lukhele, Thissen, and Wainer (1994); Darwazeh (1997), have expressed that essay type questions have more effect on students' learning than multiple-choice ones, especially on higher level learning. Bridgman and Lewis (1994); Perkins, (1990); Foos and Fisher (1988); Zheng, Lawhorn, Lumley and Freeman (2008), indicate that multiple-choice type questions have more effect on students' achievement than essay ones especially on lower level of learning. In contrast, Bridgman, 1992; Bridgman and Rock, 1993; Thissen, Wainner and Wang, 1994 found that there were no differences between the effect of essay versus multiple-choice question types on all levels of learning.

Al-Nayef (1989); Royer and Konold (1984); Hancock (1994); Oermann and Gaberson (1998) Shavelson and Huang (2003); found that high level questions have a greater effect on students' achievement than low levels ones. Perkins (1990); Samson et al., (1987) contended that low level questions have a greater effect on students' achievement than higher level ones. However, Darwazeh and Reigluth (1982); Darwazeh (2001, 2004); Barnes (1983) did not find significant differences among the different levels of questions on learning.

The literature, however, indicates no differences in gains of students understanding of factual material through problem-based learning compared to a traditional lecture-based and instructor-centered setting (Dyke, Jamrozik, and Plant, 2001). Cheaney and Ingebritsen (2005), however, suggest that if the development of higher-order understanding by the students is a goal , then assessment should be in the form of problems and opportunities that demonstrate the complexity of the student's thinking process (Wright et al., (1998). Since performance on examination reflects only low-level command of the subject matter, not the high-level understanding that is the focus of problem-based learning (Dyke, Jamrozik, and Plant, 2001).

In conclusion, Azer (2003) notes that multiple-choice and essay questions have been used in the assessment of students. However, the educational goals of these questions are said to test factual knowledge rather than a deeper understanding or use of information. Thus, they do not focus on testing cognitive skills, and many of them test small print in textbooks (Azer, 2003).

2.6. Assessment in problem-based learning (PBL)

This section on assessment of learning is incorporated because the school in which this particular study was conducted uses a PBL programme. Azer (2003) indicates that problem-based learning has been widely used in nursing, medical and other allied health curricula for 20–30 years, with a major goal of promoting higher-order learning (application, analysis, synthesis and evaluation) in accordance with Bloom's taxonomy (Azer, 2003; Cheaney and Ingebritsen, 2005; Palmer and Devitt, 2007). With the introduction of PBL and shift from a traditional lecture-based curriculum to a student-centered program, assessment needs to match the philosophy of the curriculum and reflect its educational outcomes. However, Azer (2003) suggests that the writers of examination questions should be aware of changes introduced in the curriculum and the key principles of the new program. For example, the approach used in a problem-based learning program is student-centered and aims at the following educational objectives: Enhancement of students' skills to acquire principles and concepts that are better retained by the learners and allow them to apply information learned in other situations. The development of a student's: reasoning skills, critical thinking, decision-making strategies, and the preparation for life-long learning. As well as the promotion of small group learning, effective team-work and collaborative learning (Engel, 1991; Albanese and Mitchell, 1993; Ryan and Quinn, 1994; and Azer, 2003).

According to Creedy and Hand (1994); Cruickshank and Olander (2002); Azer (2003), in problem-based learning, the question should test understanding rather than recall of information. Therefore, students need to use an approach or the hypotheses deductive theory, which they usually use in problem-based learning tutorials. These authors further emphasize that the explanation of the answer should reflect a process of thinking rather than a single statement, and distractors should be part of the test items. This will keep the students engaged with the question. Most importantly, educators should assess whether students are able to

apply information from different disciplines to develop a meaningful understanding related to a case (Schmidt, 1993; Azer, 2003). In addition, students should be allowed to analyse the problem on its own and the student's context and environment (Coles, 1990, 1991) used to construct a method to arrive at a detailed analysis (this process is sometimes referred to as "situation-based learning") (Dockett and Tegel, 1993; Russell, Credy, and Davis, 1994). However, care must be taken to ensure that students are not forced to follow one particular path to a predetermined conclusion (sometimes referred to as "solution-based learning" (Cowdroy, 1994). In problem-based learning, the focus is on the process, not the product (Patel, Groen, and Norman, 1991; Margestson, 1994; Shannon and Brine, 1994).

Despite the criticism leveled against PBL, it is undeniable that what problem- based learning sets out to achieve, in terms of encouraging and developing the skills of application, analysis, synthesis, evaluation and problem-solving (Palmer and Devitt, 2007; Zheng, Lawhorn, Lumley and Freeman, 2008). These authors further asserted that critical thinking, problem-solving and professional skills are essential and valued components of good professionals/ nursing education and the students' clinical ability. These skills need to be mastered, therefore must be taught, learned and assessed (Palmer and Devitt, 2007; Zheng, Lawhorn, Lumley and Freeman, 2008). In conjunction with the promotion of these skills, an effective assessment process is required. Since it has long been recognized that in the assessment of clinical competence, problem-solving ability has been one of the most difficult areas to measure and quantify (Palmer and Devitt, 2007; Cheaney and Ingebritsen, 2005). According to Wright, Millar, Kosciuk, Penberthy, Williams, et al., (1998); Cheaney and Ingebritsen (2005), even though, it has been difficult to devise a strictly objective means of assessing students performance in problem-based learning material. Assessment of authentic learning

experiences must involve problems and provide opportunities where the complexity of the students' thinking process is exhibited

Aaron et al., (1998), further urge that the issues of how well the questions that require a short written-answer test clinical behavior, whether that can be categorized as compiled or elaborated, and what proportion of the questions in the examination require simple recall or recognition cannot be resolved by the any experiments. However, a more detailed "think-aloud" protocol would be required to answer these questions. It seems probable that both groups of questions could, to a significant extent, be answered correctly by students with the lower level of knowledge organization. That is, those questions that appeared to require elaborated knowledge could be answered by recall or recognition. Equally, questions that seem to require only recall might, for some students, provide a challenge that required some elaboration or integration of the facts at their disposal. It should be remembered, however, that written-answer questions were specifically designed to test a higher order of knowledge organization, and if the contamination is significant, it would have the effect of diminishing the significance of the difference in performance (Aaron, et al.). These authors continue by highlighting that observed difference, which is significant, is thus likely to underestimate the beneficial effects of a problem-based teaching approach. The results in the Zheng, Lawhorn, Lumley and Freeman (2008) study provide quantitative support for opinions that at least some traditional courses are too low-level orientated and support instructional models that emphasize clinically oriented problem-based learning in the schools.

Davis (1999) asserts that a variety of assessment methods could be used in a PBL programme to assess attainment of taxonomies of learning outcomes, such as: factual knowledge, comprehension, problem solving ability, clinical reasoning, judgment, technical skills, attitude, amongst others. Research shows that students vary in their preferences for different

formats, so using a variety of methods might help students do their best (Davis, 1999; Aaron, et al 1998). According to Hancock, various methods for assessing students' learning in a problem-based curriculum include: objective structured clinical examination; clinical proficiency testing; triple jump evaluation (identifying facts, developing hypotheses, establishing learning needs to further evaluate the problem, solving the learning needs, presenting findings); clinical experience journals; written/computer-based clinical simulations; multiple-choice tests; essays questions; and process-oriented assessments. These may lead to different levels of learning outcomes, and different levels of questions (remember, comprehension, application, etc). However, the type of questions on the one hand and the level of questions may influence the depth of cognitive processing on the other hand (Hancock, 1994).

2.7. Challenges regarding assessment of learning

Crighton, Arian and Bethel (1995) note that one of the shortfalls affecting the quality of education is the examination questions are constructed. This is critical because it serves as a gatekeeper to the students exiting programmes. The authors note that the examination questions focus on a narrow range of low-level skills and are dominated by the content of the approved textbooks. Over reliance on a single textbook and reproduction of materials from new textbooks may also be major factors contributing to rote memorization. For example, a single textbook in each subject could be the only source of teaching and learning in many schools. The examination board may use the same textbook in constructing examination papers. This might have a negative effect on education. "The emphasis on a single textbook per subject a year during the course of study is one of the most important reasons for shortfalls in the quality of teachers and efficiency of educational output" (Khushk and Christie, 2004, p.13).

Ole Takona and James (2001) indicate that the university examination system groups students into classifications and measures performance level within narrow criteria that does not recognize improvement of student thinking skills as the primary goal of education. McCormick, in Squire's (2001) study, also warns that another disadvantage of examination is to teach, at the "remembering" level and then test at the "synthesis" level. These examinations may consequently have a negative effect on the educational process, resulting in a poor national and international image (Crighton, Arian and Bethel (1995). In response to these inconsistencies in the examination system, Squire (1999) asserts that assessment of learning should be done in light of educational objectives or outcomes; meaning the same level of mental activity is expressed in the educational objectives be used to measure students performance. For example, if the educational objective calls for students to recall the subject matter taught, they should not be expected to demonstrate their ability to analyse or to apply what was taught. Carter (1984); Ferris and Azizi (2005) further attest that when objectives call for the use and development of higher level thinking skills, the means for evaluating the achievement of these goals must reflect the same higher cognitive levels.

Hancock, 1994; Azer, 2003 report multiple-choice questions usually encourage lower levels of learning, whereas essay questions encourage higher levels (Hancock (1994). However, Bullens, Van Damme, Jaspert and Janssen,2002 ; Azer, 2003) asserted that the cognitive level of multiple-choice questions is influenced by how the questions have been constructed, and they might be set in such a way that they are at the higher cognitive level (Cashin, 1987; Azer, 2003). In contrast to the above authors, Bridgman (1992); Bridgman and Rock (1993); Thissen, Wainner and Wang (1994) found that there were no differences between the effects of essay versus multi-choice question types on all levels of learning.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents a description of the processes that was followed in conducting this study. It includes the study's approach, design, research setting, population, sample and sampling as well as a description of the instrument used to collect the data. The reliability and validity of the instruments is discussed as well as a brief description of data analysis and ethical consideration.

3.2. Research approach

This study employed a quantitative approach. According to Burns and Groves (2001) a quantitative approach is research that is used to describe variables, examine relationships among variables, and determine cause-and-effect interactions between variables. This approach was chosen because the researcher was trying to analyse and describe examination questions in terms of the levels of cognitive domain set in the Bachelor of Nursing programme at the University of KwaZulu-Natal (UKZN), School of Nursing.

3.3. Research design

Content analysis, also called *textual analysis,* is used in this study. According to Barbie (1989) and Weber (1990) content analysis is a social research method appropriate for studying human communication and is used in analyzing text documents. This analysis can be quantitative, qualitative or both. Content analysis, according Trochim (2002), is unobtrusive research as it uses unobtrusive measures in collecting data. Unobtrusive measures are measures that don't require the researcher to intrude into the research context. Direct and

participant observation requires the researcher be physically present. This can lead the respondents to alter their behavior in order to look good in the eyes of the researcher. A questionnaire is an interruption in the natural stream of behavior. Respondents can get tired of filling out a survey or resentful of the questions asked. Unobtrusive measurement presumably reduces the biases that result from the intrusion of the researcher or measurement instrument. There are three unobtrusive methods often employed by social scientists: content analysis (used in this study), historical/comparative analysis, and analysis of existing statistics (Barbie, 1989; Trochim, 2002; Weber, 1990).

Typically, the major purpose of content analysis is to determine the presence of certain words or concepts within texts or sets of texts, to identify patterns in text, to quantify and analyze the presence, meanings and relationships of such words and concepts, and then make inferences about messages within the texts. According to Trochim (2002), content analysis is an extremely broad area of research. It includes thematic analysis of text and quantitative descriptive analysis. In a thematic analysis of text the researcher identifies themes or major ideas in a document or set of documents. The documents can be any kind of text including field notes, newspaper articles, technical papers or organizational memos. In quantitative descriptive analysis the purpose is to describe features of the text quantitatively. For instance, you might want to find out which words or phrases were used most frequently in the text, which was intended to in this study. This study therefore uses a *quantitative descriptive analysis*.

3.4. Research setting

The setting of this study was the School of Nursing at University of KwaZulu-Natal (Howard college campus). The setting was selected because the School employed community-based education (CBE) and problem-based learning (PBL) in the bachelor of nursing programme,

with the aim of preparing and producing graduates (with higher order thinking skills), who could function well in a rapidly changing health environment (Macleod and Farrel, 1994). Therefore, the focus was on the Bachelor of Nursing programme.

3.5. Units of analysis and sampling

Convinience non-probability convenient sampling was used in this study to select examination papers to number of examination papers were missing from the school of nursing archives. According to Polit and Beck (2004), convenience sampling entail using the most conveniently available sources of data as study participants. Therefore in this study the researcher used the conveniently available examination papers. The critique of convenience non probability sampling is that the sample cannot claim to be representative of the population, limiting the generalisability of the research results. The researcher therefore minimized the biases of convenience non probability sampling by ensuring that all the selected examination papers are consistent with the characteristics of the target population, which in the context of this study comprised of examination papers from first to fourth year. This therefore maximized representation as stated in Polit and Beck (2004).

Barbie (1989) maintains that in the analysis of communication, as in the study of people, it is often impossible to observe directly all, you are interested in. Usually, it is appropriate to sample. The sample is referred to as units of analysis. Barbie (1989) indicates that sampling in content analysis occurs at any (or all) of the following levels: words, phrases, sentences, paragraphs, sections, chapters, books, writers, and/or the contexts relevant to work and the units of communication such as words, paragraphs, books, newspapers. Krippendorf (1980) states that the researcher must address questions such as 'what is the population from which data is drawn, and what the boundaries to which data is collected are. In this study the population, or units of analysis, were examination question papers in a Bachelor of Nursing

Degree from first to fourth year. The boundaries were those written examination papers set from the period 2003 to 2007.

According to Burns and Grove (2001) the researcher uses his/her own judgment in selecting participants (or units) in non-probability sampling. One example of non-probability sampling is convenient sampling where the researcher will use available subjects or units. This study made use of available examination questions from the period 2003 to 2007. The targeted data source for this study was the past written examination questions in nursing modules, from 2003 to 2007, covering four different levels in the Bachelor of Nursing programme. According to the records nursing modules examinations were either semesterized or yearly. However, all thirty-nine final examination and supplementary question papers, from 2003-2007 set across all four academic levels, were used as a data source for this study.

3.6. Data collection instrument

The template for collecting data in this study was developed by the researcher basing it on Bloom's taxonomy (See Appendix 1). There was no need to obtain permission to use the data collection instrument as it was developed by the researcher. The template consisted of the following concepts or cognitive domains: knowledge, comprehension, application, analysis, synthesis and evaluation. The template was designed in such that verbs used on the examination questions were reviewed and classified according to the taxonomy. The template used in this study had space for indicating the academic levels in the programme, examination time in the year, whether it was a final or supplementary examination, question stems used and cognitive domains.

3.7. Data coding and analysis

Content analysis is essentially a coding operation (Barbie, 1989). Carley (1990) stated that it is important to decide early which form of content analysis the researcher is going to adopt. According to Carley (1990), there are two general categories of content analysis; conceptual analysis and relational analysis. Conceptual analysis can be thought of as establishing the existence and frequency of concepts within text, and relational analysis on the other hand, goes one step further by examining the relationships among concepts in a text. In this study the researcher employed conceptual analysis. Carney (1972) suggests eight steps in coding and analyzing data. These steps detailed the process of data collection and analysis. They include:

Step One: Decide the level of analysis

The researcher must decide upon the level of analysis; whether to code for a single word or for sets of words or phrases. This study coded for single words, that were cognitive terms, such as: define, analyze, evaluate.

Step Two: Decide how many concepts to code for

The researcher must now decide how many different concepts to code for and whether he/she is going to code concepts used with similar meaning under one code or not, for example code exhale and breathe out together. The researcher has to decide whether to code concepts used which are action verbs used in questions and also make use of 'question stems' which are at the same cognitive level in Bloom's Taxonomy, as indicated in Appendix 2. This involved developing a pre-defined or interactive set of concepts and categories. This study identifies 'action verbs' and/or questions stems used.

Step Three: Decide whether to code for existence or frequency of a concept

After a certain number and set of concepts were chosen for coding, the researcher must answer a key question: is he/she going to code for existence or frequency? When coding for existence, the term or cognitive domain would only be counted once, no matter how many times it appeared. However, when coding for frequency, the researcher records the number of times the term or cognitive domain appears in a text. This study was coded for frequency. Thus kept a record of the number of times certain cognitive domains were used in question papers across the four years.

Step Four: Decide on how you will distinguish among concepts

The researcher must next decide on the level of generalization, that is, whether concepts are to be coded exactly as they appear, or if they can be recorded as the same even when they appear in different forms. The researcher needs to determine if the two words mean radically different things to him/her, or if they are similar enough that they can be coded as being the same thing. This study recorded action verbs or cognitive domains, question stems and activities for students used (See Appendix 2). It is important to note that other examiners may not use 'action verbs' as stipulated in Bloom's Taxonomy but may use Kipling's six wise men which are used in question stems in Appendix 2.

Step Five: Develop rules for coding the texts

In this study the rules included how data will be analyzed, counting the action verbs used in each test paper and establish the frequency in the use of the action verbs in the examination paper, establish occurrence of the use of each action verb in relation to Bloom's taxonomy. Lastly establish which action verbs are used more than others and they are pegged at which level in Bloom's taxonomy.

Step Six: Decide what to do with "irrelevant" information

The next choice a researcher must make involves irrelevant information. The researcher must decide whether irrelevant information should be ignored or used to re-examine and/or alter the coding scheme. Irrelevant data was not used but a record of it was kept.

Step Seven: Code the texts

Once the choices about irrelevant information are made, the next step is to code the text. This is done either by hand, that is, reading through the text and manually writing down concept occurrences, or through the use of various computer programs. In this study the researcher coded the data manually. The researcher reviewed the examination questions, identified cognitive domains used and wrote them on the template provided; Appendix 1. After entering data in the provided templates guided by the coding process detailed above, data was then transferred to the SPSS Programme for further analysis. This was done by using frequency distributions, percentages and where necessary graphs. The data was cleaned and double-checked for any entry errors.

Step Eight: Analyze your results

Once the coding is done, the researcher examines the data and attempts to draw whatever conclusions and generalizations are possible. The researcher looks for trends or number of appearances of certain concepts and then makes conclusions. In this particular study a provided template to enter cognitive domains was used, a check for frequency of these cognitive domains was made and then conclusions drawn.

3.8. Issues of reliability and validity

According to Webber (1990), the reliability of a content analysis study refers to its *stability*, or the tendency for coders to consistently re-code the same data in the same way over a period of time; *reproducibility*, or the tendency for a group of coders to classify categories membership in the same way; and *accuracy*, or the extent to which the classification of a text corresponds to a standard or norm statistically. In this study two people independently reviewed the examination questions and coded them into the provided template. The coders then compared notes and reconciled differences that showed up in their data. The validity of a content analysis study refers to the correspondence of the *categories* to the *conclusions*, and the *generalizability* of results to a theory.

3.9. Ethical considerations

Research is seen as potentially volatile, even hazardous, requiring careful consideration and preparation before someone should be allowed to enter the field (Punch, 1990). Nursing research must not only have the potential to generate and refine knowledge but must be ethical in its development and implementation (Burns and Grove, 2001).

Therefore, the research proposal was presented to the UKZN Research Committee for scrutiny and approval, and to verify that ethical guidelines were followed. Permission was sought from the School of Nursing requesting access to the examination questions. The past examination questions released and a master list of examination questions were kept safe under lock and key. These examination questions were also strictly reviewed under secured, safe and lockable room and no one was allowed to enter the room/ place during this process.

Anonymity and confidentiality were maintained by ensuring that the names of examiners and moderators or external examiners were erased using tippex. This was done by the support staff members who took examination papers from the archives before making copies of exam papers to be given to the researcher. The researcher was made to pay for the copies of examination papers because this support staff used the school's resources to make copies of the exam papers. Codes and special numbers were assigned to examination questions papers. Codes represented the names of module and the number represented the level in the undergraduate programme.

4.0. Limitations of the study

Obtaining relevant empirical literature on cognitive levels of the examination questions in UKZN, particularly in nursing education is a problem, since this aspect in nursing education is not well researched. A great deal of time was spent on the literature review endeavoring to source material. Databases such as: Cumulative Index to Nursing and Allied Health Literature (CINAHL), EBSCO Host databases (including the Medical Literature Analysis and Retrieval System on line (MEDLINE) and PubMed), Educational Resource Information Centre (Eric), and Academic Search Premier, etc, was used in searching for literature. Another factor is that the findings will be limited to the period under which the examination questions were reviewed in this study and do not reflect past examination questions.

CHAPTER 4

DATA ANALYSIS

4.1. Introduction

This chapter provides an analysis of the data collected from the records (past written examination questions). The examination questions were the primary source of data collection. These examination questions were used to elicit the answers specific to the study. A template with cognitive domains (knowledge, comprehension, application, analysis, synthesis and evaluation) from Bloom's taxonomy was used to collect data. The researcher and the supervisor independently reviewed the examination questions; identified cognitive domains used and coded them on the template provided. The two coders compared notes and reconciled differences that emerged from the data. A sample of the examination questions was also re-classified by another researcher to establish reliability of the classifying procedure.

The data of this study was then captured and transferred to SPSS version 11.5 for further analysis. This was expressed as frequency distribution, percentages, and where necessary, graphs. A total of thirty-nine (39) examination papers, which contained 1319 questions from all the levels of BN programme for the year 2003 - 2007 were reviewed in this study. Out of these question papers, seven (7) with 239 examination questions were for first years, second years accounted for five (5) papers containing 170 questions, third years had 9 papers with 285 questions and fourth years had 18 papers with 625 questions. First year nursing is a year course as is second year nursing. Therefore, there is only one theory paper at the end of the year and a supplementary paper, as and when there is a need. It is noted that fourth year had more question papers because this level had four (4) examination papers per year, thus two (2)

in the first semester and two in the second semester; one for Psychiatric Nursing and one for Midwifery per semester. Table 1 below shows the composition of examination question papers and questions contained in the papers for all academic levels from 2003 – 2007.

Table1: Composition of examination questions papers and questions for all academic levels from 2003 – 2007.

ACADEMIC LEVELS	EXAMINATION PAPERS	EXAMINATIONS QUESTIONS
Year I	7	239
Year II	5	170
Year III	9	285
Year IV	18	625
TOTAL	**39**	**1319**

4.2. FINDINGS/ RESULT: COGNITIVE LEVELS IN BLOOM'S TAXONOMY BY ACADEMIC LEVELS (2003 – 2007)

4.2.1 Nature of questions used

A mix of questions was used; multiple choice questions, short answer questions, short essays and long essay questions. The marks for multiple choice questions ranged between 10 and 20 marks. What was noted, was that multiple choice questions were based on short scenarios. The candidates were expected to use the scenario as a reference in order to respond to a question. The total number of MCQs in the examination papers ranged between 20% and 25%.

4.2.2. Cognitive levels used in first year examination questions

The researcher in this study grouped the results according to levels in the program, over a period of five (5) years. In this level, a total of seven (7) question papers, comprised of two hundred and thirty-nine (239) examination questions were reviewed. The findings regarding the levels of questions at first year showed that examination questions were fairly distributed across the six (6) levels of Bloom's taxonomy, although the distribution was not equal, all levels were covered. Table 2 below shows the cognitive levels used in examination questions for first year from 2003 – 2007.

Table 2: Cognitive levels in examination questions for first years (2003 – 2007)

Cognitive Levels	Year 2003		Year 2004		Year 2005		Year 2006		Year 2007		Mean		SD
	F	%	F	%	F	%	F	%	F	%	F	%	
Knowledge	24	60.0	22	36.7	20	21.3	46	43.9	53	47.3	**165**	**41.8**	**2.2**
Comprehension	5	12.5	10	16.7	31	33.0	19	18.1	21	18.8	**86**	**19.8**	**1.7**
Application	1	2.5	3	5.0	1	1.0	4	3.8	2	1.8	**11**	**2.8**	**1.0**
Analysis	6	15.0	11	18.3	28	29.8	14	13.3	19	17.0	**78**	**18.7**	**1.5**
Synthesis	2	5.0	4	6.7	3	3.2	10	9.5	4	3.6	**23**	**5.6**	**1.1**
Evaluation	2	5.0	10	16.6	11	11.7	12	11.4	13	11.5	**48**	**11.3**	**1.2**
Total	**40**	**100**	**60**	**100**	**94**	**100**	**105**	**100**	**112**	**100**	**411**	**100**	**8.6**

For the first years in the academic 2003 year, one question paper with 33 questions was reviewed. The majority of the questions were set at the knowledge/ recall level which constituted 60% (n=24), followed by analysis level at 15% (n=6), and comprehension level at 12.5% (n=5) of the questions asked. Questions at the synthesis and evaluation levels each accounted for 5% (n=2) and one question at application with 2.5% (n=1).

In 2004, one question paper which contained 33 questions was reviewed. The results showed a decrease in knowledge/ recall questions from 60% to 36.7% (n=22), a fall by 22.3%, which marked a significant change in examination questions setting. This shift from a lower order domain weighed in favor of the higher order cognitive level of analysis which was recorded at 18.3% (n=11). This was followed by 16.7% (n=10) of the questions at comprehension level, evaluation level 16.6% (n=10), synthesis at 6.7% (n=3) and application level at 5% (n=1).

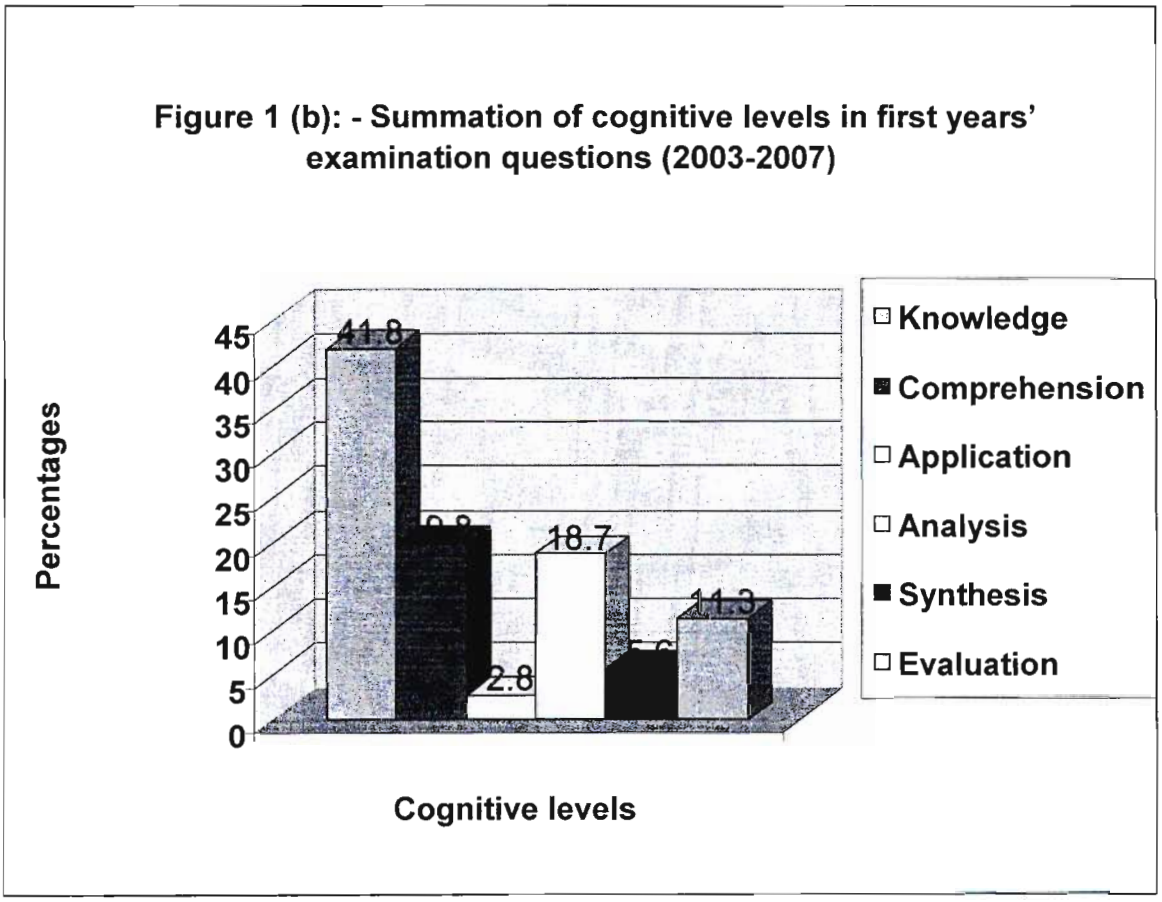
One question paper comprised of 33 questions was reviewed in 2005. This showed another shift in emphasis from a lower order domain of knowledge/ recall level to the comprehension level with 33% (n=31). A movement towards a higher order domain of analysis 29.8% (n=28) followed. Fewer questions were asked at the knowledge level (21%), followed by evaluation level at 11.7% (n=11), synthesis level at 3.2% (n=3) and application had the least number of 1.0% (n=1) in 2005.

For the first years in 2006, two (2) question papers were reviewed and each contained 31 and 37 questions respectively. Questions at the knowledge/ recall level accounted for 43.9% (n=46) of the questions which were asked, followed by the comprehension level with 18.1% (n=19). The analysis level recorded 13.3%, (n=14), evaluation level 11.4% (n=12), synthesis level 9.5% (n=10) and application level accounted for 3.8% (n=4) of the examination questions asked in 2006.

Of the two question papers reviewed in 2007, each paper was comprised of 36 questions totalling 72 examination questions. The knowledge/ recall level accounted for 47.3% (n=53), followed by comprehension, analysis and evaluation levels with 18.8% (n=21), 17.0% (n=19) and 11.5% (13) of the questions asked respectively. The application level recorded 1.8% (n=2) of the examination questions in 2007.

According to the pattern that emerged from the data presented in Table 2 which is depicted in Fig.1 (b), questions at the knowledge/ recall cognitive level dominated in examination questions during the period 2003-2007. These account for about 41.8% (n=165) of the questions asked; followed by questions at the comprehensive level 19.8% (n=86), analysis level 18.7%(n=78), and evaluation level 11.3% (n=48). Questions at the application level were least used accounting for 2.8% (n=11) of the questions asked.

At this level, the lower order level questions (knowledge and comprehension) accounted for 61.6% (n=251), while higher order level questions (application, analysis, synthesis and evaluation) recorded 38.4% (n=160). Figure 1 (b) below summarises the cognitive levels of examination questions in the first years BN programme over five years (2003-2007).



4.2.2. Cognitive levels used in second years' examination questions

At this level, there were five (5) question papers reviewed, and they were comprised of one hundred and seventy (170) examination questions at this level. Table 3 below presents cognitive levels used in examination questions for second year from 2003 – 2007.

Table 3: Cognitive levels in second years' examination questions for 2003-2007

Cognitive Levels	Year 2003		Year 2004		Year 2005		Year 2006		Year 2007		Mean		SD
	F	%	F	%	F	%	F	%	F	%	F	%	
Knowledge	22	30.1	16	21.6	24	39.3	14	20.9	18	32.1	**94**	**28.8**	**1.6**
Comprehension	16	22.0	19	25.7	7	11.5	15	22.3	11	19.6	**68**	**20.2**	**1.3**
Application	5	6.8	6	8.1	11	18.0	4	6.0	2	3.6	**28**	**8.5**	**2.1**
Analysis	19	26.0	13	17.6	10	16.4	20	29.9	13	23.2	**75**	**22.6**	**1.3**
Synthesis	3	4.1	10	13.5	5	8.2	4	6.0	4	7.1	**26**	**7.8**	**1.4**
Evaluation	8	11.0	10	13.5	4	6.6	10	14.9	8	14.4	**40**	**12.1**	**1.1**
Total	**73**	**100**	**74**	**100**	**61**	**100**	**67**	**100**	**56**	**100**	**331**	**100**	**8.8**

One question paper was reviewed for 2003 second years and it contained 38 questions. The findings revealed that the knowledge/ recall level accounted for 30.1% (n=22), followed by analysis level with 26% (n=19), comprehension level 22% (n=16), evaluation level 11.0% (n=8), application level 6.8% (n-5) and synthesis level with 4.1% (n=3) of the questions asked in year 2003.

In 2004, one question paper was reviewed and it comprised 30 questions. The results indicated that the majority of the questions had been asked at the comprehension level with 26.7% (n=19), and the knowledge/ recall level followed with 21.6% (16). Analysis level recorded 17.6 % (n=13) of the questions, while synthesis and evaluation levels accounted for

13.5% (n=10) each in 2004. Last was the application level which obtained 8.1% (n=6) of the examination questions asked.

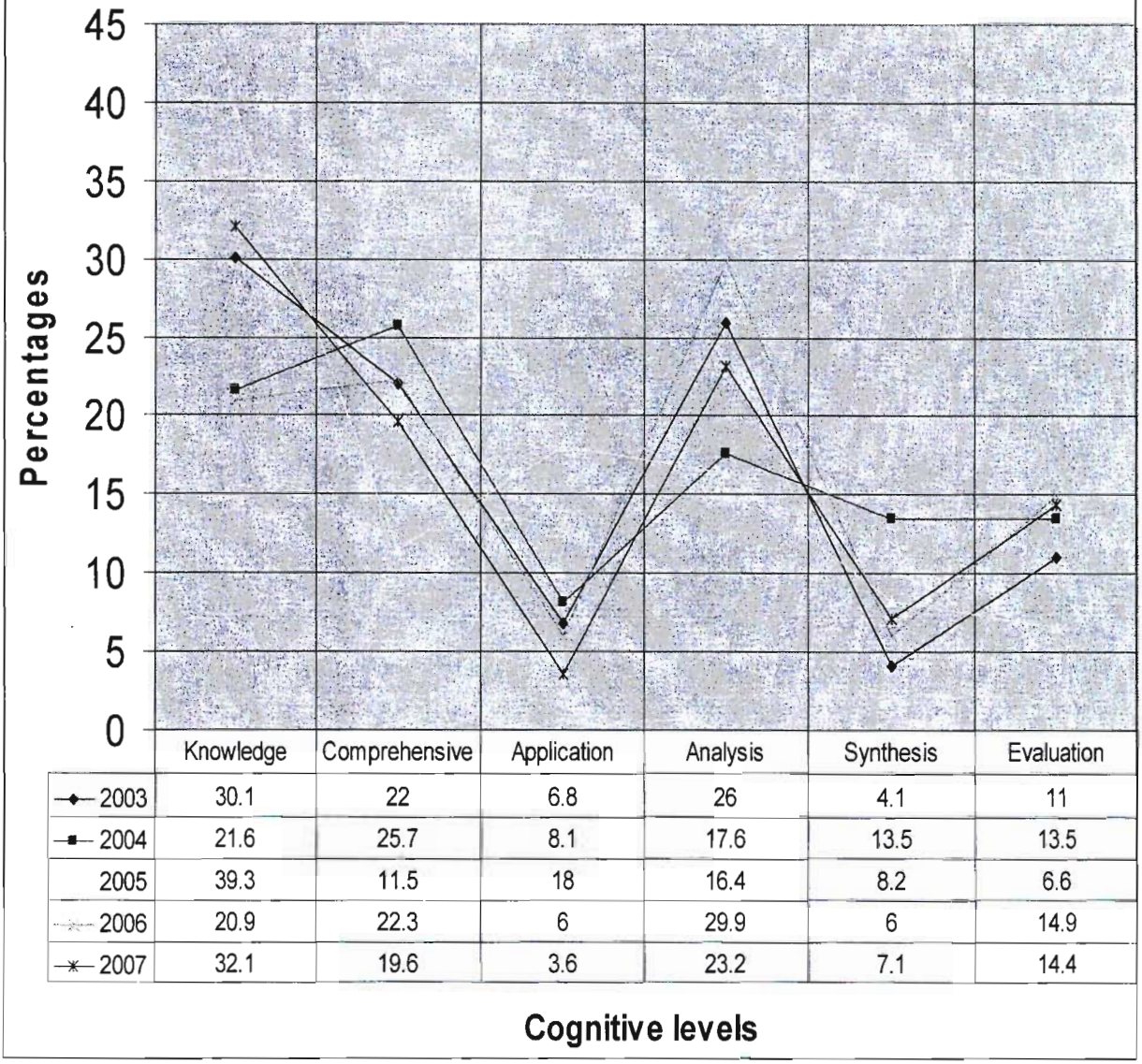
In the 2005 examination, one question paper was reviewed, comprised of 34 questions. The findings revealed that 39.3% (n=24) of the questions were recorded at the knowledge/ recall level. This was followed by the application level with 18.0% (11), analysis 16.4% (n=10) and comprehension 11.5 (n=7) of the questions. The synthesis and evaluation levels questions were least used in 2005 at 8.2% (n=5) and 6.6% (n=4) respectively.

One question paper was reviewed in 2006 and it contained 35 questions. Of these questions, 29.9% (n=20) of them were drawn from the analysis level, followed by comprehensive level 22.3% (n=15) and then knowledge level 20.9 %(n=14). Fewer questions were set at the application and synthesis levels which accounted for 6% (n=4) each of the questions asked.

In reviewing examination questions for the second years of 2007, one question paper was reviewed and it was composed of 33 questions. The findings revealed that knowledge/ recall level questions accounted for 32.1% (n=18) of the questions, followed by analysis level 23.2% (n=13) and comprehensive level with 19.6% (11). Evaluation level in the high order of the hierarchical cognitive domains, accounted for 14.4% (n=8), synthesis level 7.1% (4) and lastly, application level with 3.6% (n=2) of the questions.

The graph in figure 2 below shows the trend in the use/ frequency distribution of cognitive levels in the second year examination questions set over five (5) years (2003-2007) to establish the commonly and less commonly used domains.

Figure 2: Distribution of cognitive levels in second years examination questions (2003-2007)



	Knowledge	Comprehensive	Application	Analysis	Synthesis	Evaluation
2003	30.1	22	6.8	26	4.1	11
2004	21.6	25.7	8.1	17.6	13.5	13.5
2005	39.3	11.5	18	16.4	8.2	6.6
2006	20.9	22.3	6	29.9	6	14.9
2007	32.1	19.6	3.6	23.2	7.1	14.4

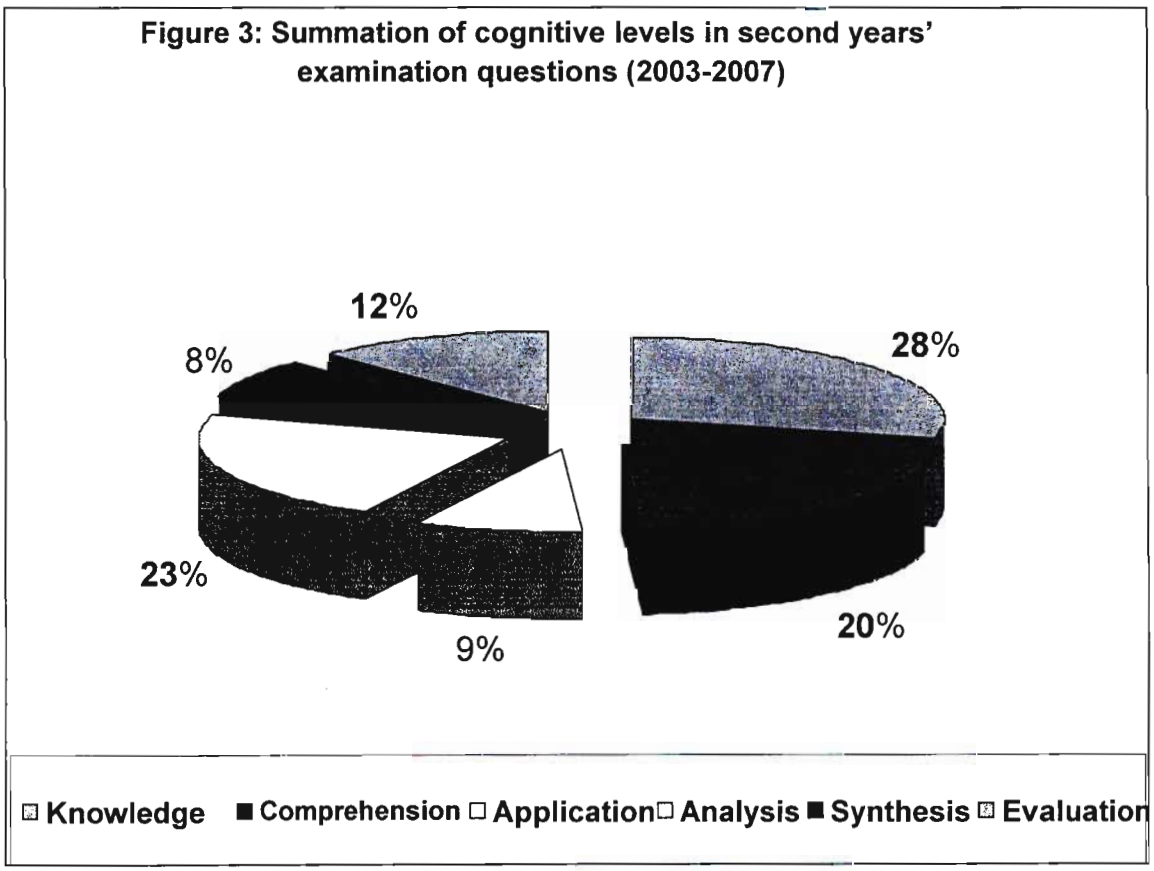
On average, based on the evidence in table3 depicted in figure 3, in the second year examination questions set in the BN programme, 28.8% (n=94) of the questions were set at the knowledge/ recall level, 22.6% (n=75) at the analysis level, 20.2% (n=68) at the comprehensive level, 12.1% (n=40) at the evaluation level, 8.5% (n=28) at the application level and 7.8% (n=26) at the synthesis level.

In this level, the lower order level questions (knowledge and comprehension) recorded 49% (n=162) and higher order level questions (application, analysis, synthesis and evaluation) for

51% (n=169). The means and standard deviation are also reported in table 3 for each cognitive level in second years' examination questions over five (5) years.

The figure 3 below summarises the cognitive levels of examination questions used in the second years' BN programme over five years (2003-2007).

Figure 3: Summation of cognitive levels in second years' examination questions (2003-2007)



4.2.3. Cognitive levels used in examination questions for third years

In this level, nine (9) question papers were reviewed and they contained 170 examination questions. Table 4 below presents cognitive levels used in the examination questions for third year from 2003 – 2007.

Table 4: Cognitive levels used in examination questions for third years (2003-2007)

Cognitive Levels	Year 2003		Year 2004		Year 2005		Year 2006		Year 2007		Mean		SD
	F	%	F	%	F	%	F	%	F	%	F	%	
Knowledge	42	35.6	41	35.3	40	33.9	13	21.7	19	25.0	**155**	**30.3**	**1.0**
Comprehension	23	19.5	24	20.7	30	25.4	5	8.3	19	25.0	**101**	**19.8**	**1.4**
Application	8	6.8	2	1.7	9	7.6	8	13.3	3	3.9	**30**	**6.7**	**1.6**
Analysis	23	19.5	27	23.3	24	20.3	5	8.3	13	17.1	**92**	**17.7**	**1.2**
Synthesis	6	5.1	10	8.6	8	6.8	26	43.3	12	15.8	**62**	**15.9**	**4.0**
Evaluation	16	13.5	12	10.4	7	6.0	3	5.0	10	13.2	**48**	**9.6**	**1.2**
Total	**118**	**100**	**116**	**100**	**118**	**100**	**60**	**100**	**76**	**100**	**488**	**100**	**10.4**

The two (2) question papers reviewed for 2003 third year students in the BN programme were comprised of 72 questions, with each paper containing 37 and 35 questions respectively. The findings indicated that 35.6% (n=42) were positioned at the knowledge/ recall level, 19.5% (n=23) at both the comprehension and analysis levels and 13.5% (n=16) at the evaluation level. Fewer questions were set at the application and synthesis levels which accounted for 6.8% (n=8) and 5.1% (n=6) of the questions respectively.

In 2004 for the third years, two question papers were reviewed and each carried 38 examination questions, thus 76 questions in all. The majority of the questions were set at the knowledge/ recall level of Bloom's taxonomy with 35.3% (n=41) of the questions asked. Analysis level questions with 23.3% (n=27) and comprehension level questions with 20.7% (n=24) of the questions followed. Synthesis and evaluation levels recorded 10.4% (n=12) and 8.6% (n=10) respectively. Fewer questions were observed at the application level which accounted for only 1.7% (n=2) of the examination questions.

In 2005, two (2) question papers were reviewed and each contained 33 examination questions, thus totalling 66 questions. It was evident that 33.9% (n=40) of the questions were drawn

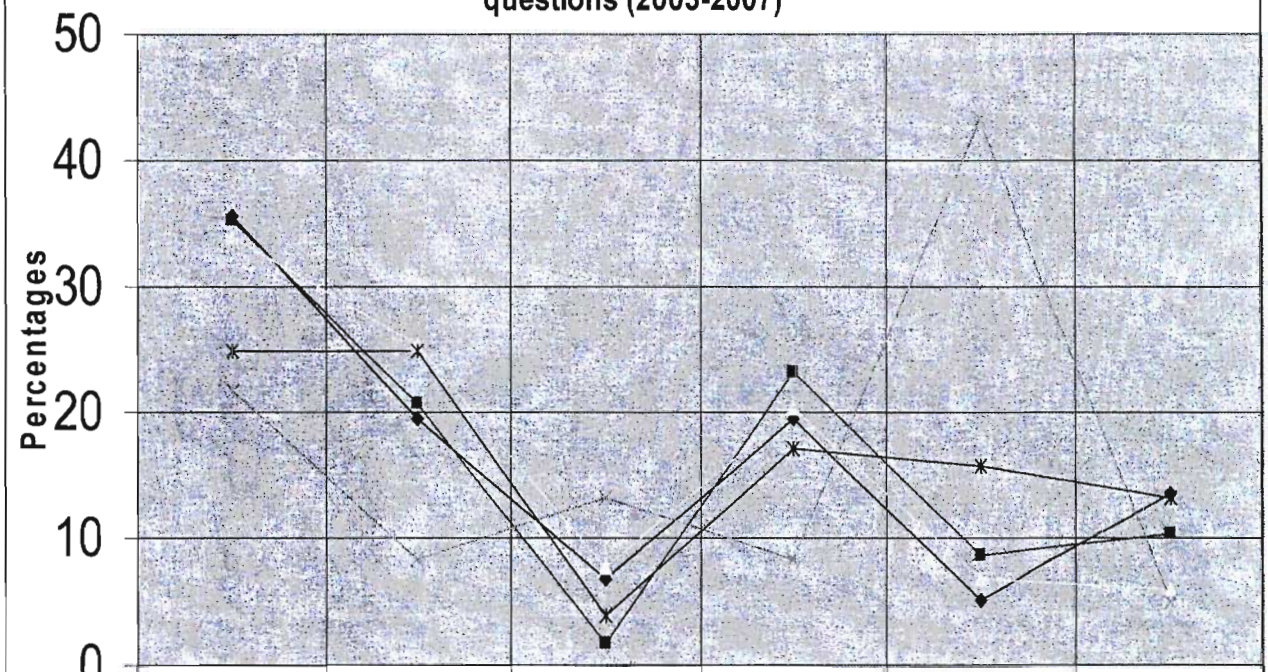
from the knowledge\ recall level, while 25.4% (n=30) were from the comprehension and 20.3% (n=24) from the analysis level. Questions at the application level recorded 7.6 % (n= 9), synthesis 6.8% (n=8)) and evaluation 6.0% (n=&) levels were less commonly used in the examination.

In 2006, one question paper was reviewed, comprising 26 examination questions. The year 2006 witnessed an abrupt shift in emphasis from knowledge\ recall level questions to synthesis level questions of 43.3% (n=26) as knowledge\ recall level was 21.7% (n=13), almost half of the synthesis level questions. The year also saw an upsurge in the application level questions which accounted for 13.3% (n=8). The less common questions were drawn from the comprehension 8.3% (n=5), analysis 8.3% (n=5) and evaluation with 5% (n=3) of the questions in that year. This is shown in Table 4.

For the third years of 2007, two question papers were reviewed each containing 20 and 25 questions, making a total of 45 questions. In reviewing these questions, data in table 4 showed that the knowledge/ recall and comprehension levels accounted each for 25% (n=19), the analysis level for 17.1% (n=13), synthesis level for 15.8% (n=12) and evaluation level 13.2%. (n=10) of the questions. Fewer questions were set from the application level which had 3.9% (n=3) of the examination questions used.

The graph in figure 4 below shows the trend in the use/ frequency distribution of cognitive levels in the third year examination questions set over five (5) years (2003-2007) to establish the commonly and less commonly used domains.

Figure 4: Distribution of cognitive levels in third years examination questions (2003-2007)



	Knowledge	Comprehensive	Application	Analysis	Synthesis	Evaluation
2003	35.6	19.5	6.8	19.5	5.1	13.5
2004	35.3	20.7	1.7	23.3	8.6	10.4
2005	33.9	25.4	7.6	20.3	6.8	6
2006	21.7	8.3	13.3	8.3	43.3	5
2007	25	25	3.9	17.1	15.8	13.2

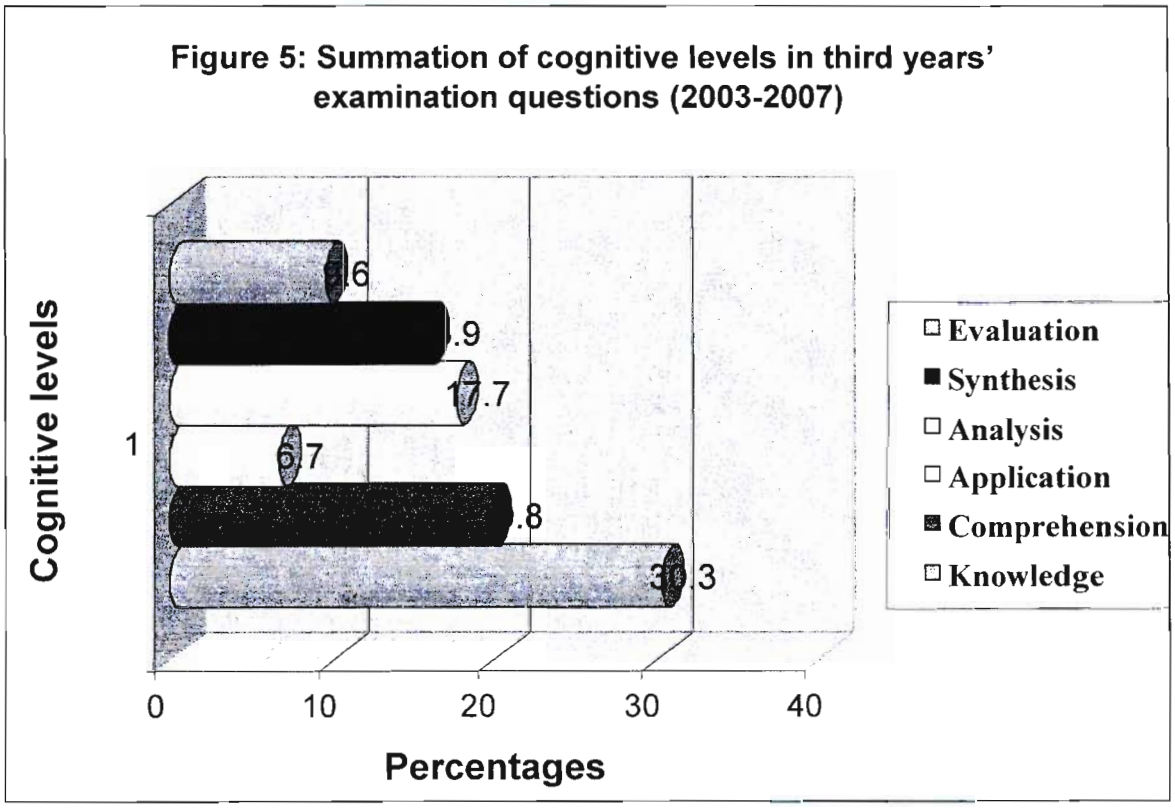
Cognitive levels

According to the data in table 4, and depicted in figure 4 above, the composition of the examination questions set during the period 2003-2007 was as follows: knowledge/ recall level questions accounted for 30.3% (n=155) of the questions, comprehension level 19.8% (n=101), the analysis level 17.7% (n=92), synthesis 15.8% (n=62), evaluation 9.6% (n=48), and the application level 6.7% (30). Notable is the range of questions for the synthesis level which was between 5.1% in 2003 and 43.3% in 2006.

However, the lower order level questions (knowledge and comprehension) accounted for 50.1% (n=256) and higher order level questions (application, analysis, synthesis and

evaluation) for 49.9% (n=232). The means and standard deviation are also reported in table 4 for each cognitive level in third years' examination questions over five (5) years.

Figure 5 below summarises the cognitive levels of examination questions in the third years' BN programme over five years (2003-2007).



4.2.4. Cognitive levels in examination questions for fourth years

At this level, there were 18 question papers reviewed, out of which 625 examination questions were set for the fourth years over a period of five (5) years. Table 5 below presents cognitive levels used in examination questions for fourth years from 2003 – 2007.

Table 5: Cognitive levels in examination questions for fourth years (2003-2007)

Cognitive Levels	Year 2003		Year 2004		Year 2005		Year 2006		Year 2007		Mean		SD
	F	%	F	%	F	%	F	%	F	%	F	%	
Knowledge	16	31.4	61	61.6	72	51.1	146	51.6	146	45.8	441	**48.3**	**1.1**
Comprehension	9	17.6	14	14.1	21	14.9	54	19.1	65	20.4	163	**17.2**	**0.4**
Application	1	2.0	4	4.1	12	8.5	7	2.5	13	4.1	37	**4.2**	**0.8**
Analysis	3	5.9	15	15.2	23	16.3	47	16.6	47	14.7	135	**13.7**	**0.8**
Synthesis	21	41.1	2	2.0	5	3.5	12	4.2	21	6.6	61	**11.5**	**4.3**
Evaluation	1	2.0	3	3.0	8	5.7	17	6.0	27	8.4	56	**5.0**	**0.7**
Total	**51**	**100**	**99**	**100**	**141**	**100**	**283**	**100**	**319**	**100**	**893**	**100**	**8.0**

For the fourth years of 2003, only one question paper was reviewed and it was composed of 21 examination questions. The findings revealed that the majority of the questions were set at the synthesis level 41.1% (n=21); followed by the knowledge/ recall level questions at 31.4% (n=16), comprehension level at 17.6% (n=9) and analysis level at 5.9% (n=3). Less commonly questions were set at the application level and evaluation level with 2% (n=1).

In 2004, two (2) question papers were reviewed and they contained 76 questions in which each paper accounted for 32 and 44 respectively. In reviewing these questions, it was showed that knowledge/ recall level 61.6% (n=61) were in the preponderance in 2004 for the fourth years. This was followed by the analysis level with 15.2% (n=15), and comprehension level with 14.1% (n=14) of the questions. Less commonly used questions were observed at the application level 4.1% (n=4), evaluation level 3 % (n=3), and synthesis level 2.0% (n=2).

In 2005, three (3) question papers were reviewed, containing 100 examination questions, with each paper accounting for 45, 31, and 24 questions respectively. The findings revealed that the knowledge level dominated the examination papers by accounting for 51.1% (n=72) of the

examination questions, followed by analysis level at 16.3% (n=23), comprehension level at 14.9% (n=21), and application level at 8.5% (n=12). While the evaluation and synthesis levels had very few questions accounting for 5.7% (n=8) and 3.5% (n=5) respectively.

In 2006, there were six (6) question papers reviewed comprised of 222 examination questions, in which each paper accounted for 26, 33, 34, 41, 47, and 41questions respectively. A similar picture emerges for 2006 as for 2004 and 2005 in which knowledge/ recall level questions had 51.6% (n=146); comprehension level 19.1% (n=54), analysis level 16.6% (n=47), evaluation level 6.0% (n=17), synthesis level 4.2% (n=12) and lastly application level 2.5% (n=7).

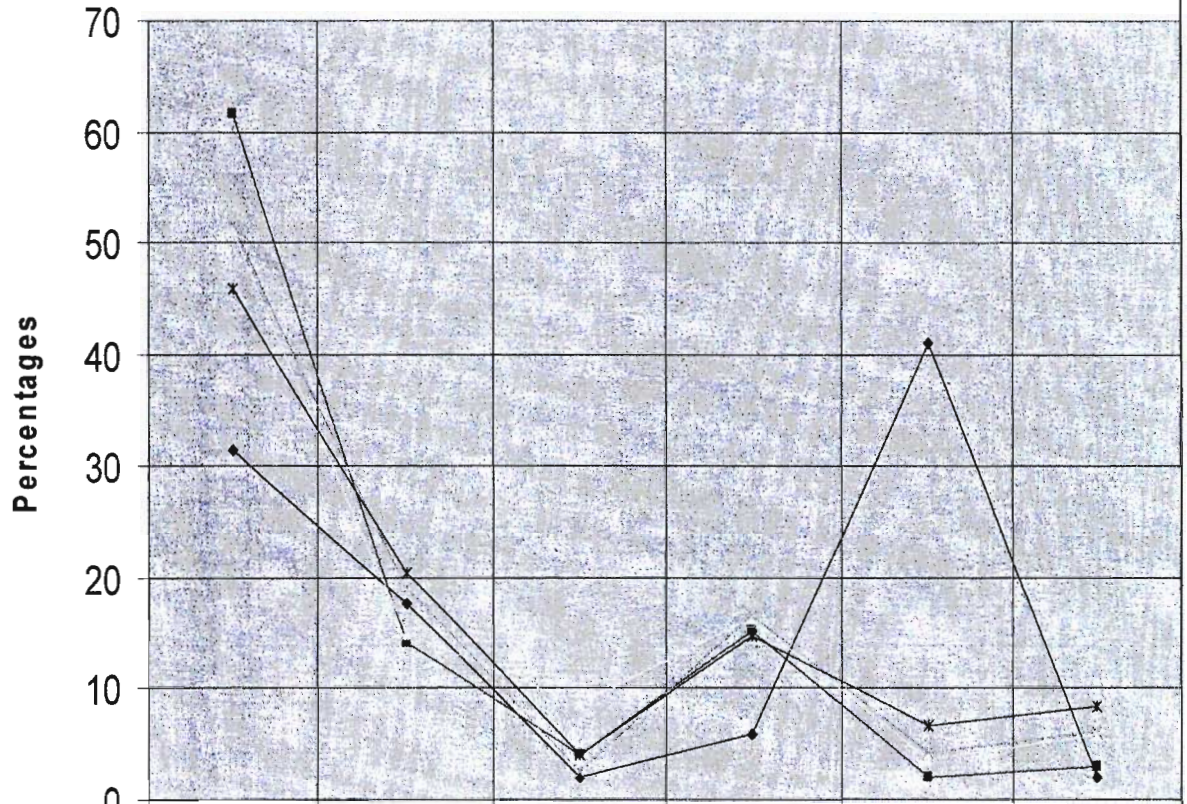
In 2007, six (6) question papers reviewed, were comprised of 206 examination questions in which each paper accounted for 32, 47, 30, 35, 23, and 39 questions respectively. The same picture as was portrayed for 2004, 2005 and 2006 was repeated for 2007. Knowledge/ recall level dominated the examination questions and recorded 45.8% (n=146), followed by comprehension level questions at 20.4% (n= 65), analysis level questions with 14.7% (n=47), evaluation level 8.4% (n=27), synthesis level 6.6% (n=21) and application level 4.1% (n=13).

The researcher noted that the examiners used similar questions repeatedly in different examination papers. This was noted from 2004 to 2007 where a trend was noted with lower order questions dominating.

The graph in figure 6 below shows the trend in the use/ frequency distribution of cognitive levels in the fourth year examination questions set over five (5) years (2003-2007) to establish the commonly and less commonly used domains. It is however important to note that there was almost a balance between higher order questions (47%) and lower order questions in

2003. A change where lower order dominated was noted from 2004 where lower order questions were 76% and higher order questions were 24%.

Figure 6: Distribution of cognitive levels in fourth years examination questions (2003-2007)



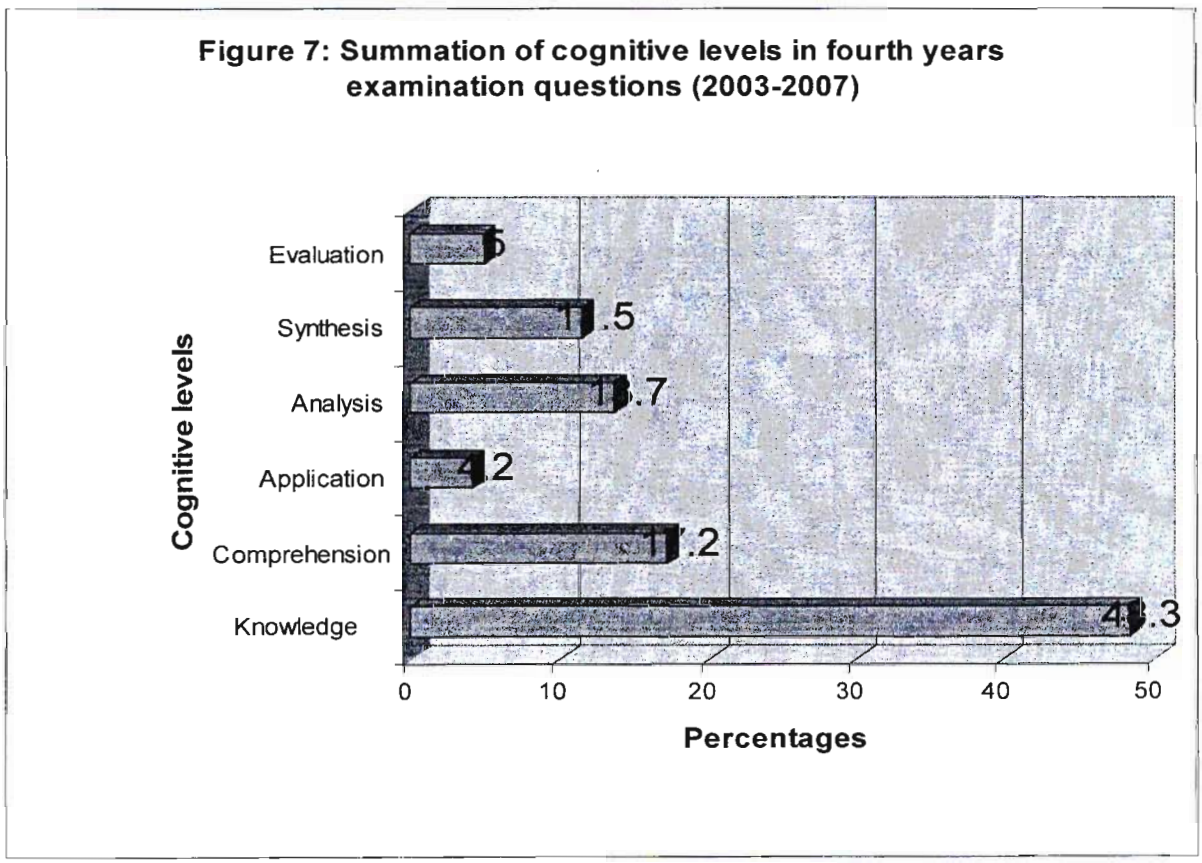
	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
2003	31.4	17.6	2	5.9	41.1	2
2004	61.6	14.1	4.1	15.2	2	3
2005	51.1	14.9	8.5	16.3	3.5	5.7
2006	51.6	19.1	2.5	16.6	4.2	6
2007	45.8	20.4	4.1	14.7	6.6	8.4

According to the data in table 5 and depicted in figure 7, 48.3% (n=441) of the examination questions were at knowledge/ recall level, followed by comprehensive level questions at 17.2% (n=163), analysis level questions at 13.7% (n=135) and synthesis level at 11.5% (n=61) for fourth years during the period 2003 - 2007. The less commonly used questions

were set at evaluation level accounting for 5.0% (n=56) and application level at 4.2% (n=37), which in principle should anchor BN programmes at this level.

At this level, the lower order level questions (knowledge and comprehension) accounted for 65.5% (n=604) and higher order level questions (application, analysis, synthesis and evaluation) for 34.5% (n=289).The means and standard deviation are also reported in table 5 for each cognitive level in fourth examination years' questions over five (5) years.

The figure 7 below summarises the cognitive levels of examination questions in the fourth years BN programme over five years (2003-2007).



4.2.5. Cognitive levels used in examination questions for all academic levels during the period 2003-2007

Data in table 6 presents the results of all the years by academic levels. Thus, for academic level I, the data represented the mean percentages of questions in the examinations for all first years between 2003 and 2007. The same logic is used for academic levels II, III and IV. The question papers reviewed had questions distributed across the six (6) cognitive levels in Bloom's taxonomies. The findings however, showed that the highest percentage of 37.3% was at the knowledge/ recall level, followed by 19.3% at the comprehension level, 18.2% at the analysis level, 10.2% at the synthesis, 9.5% at the evaluation level, and 5.5% at the application level. It was also evident that more knowledge/ recall questions were noted at fourth year which accounted for 48.3%, followed by first year with 41.8%, third year with 30.3% and lastly second year with 28.8%.

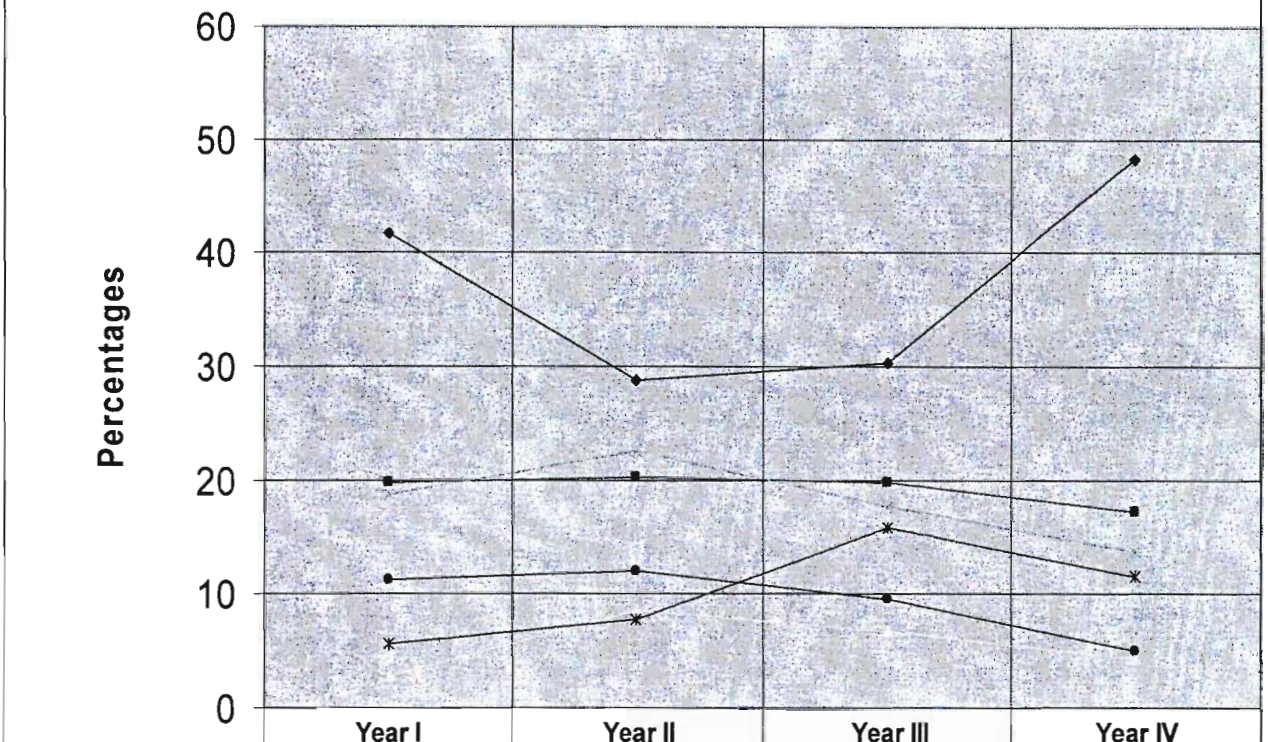
However, the lower order level questions (knowledge and comprehension) accounted for 56.6% (n=1273) and higher order level questions (application, analysis, synthesis and evaluation) for 43.4% (n=850). The means and standard deviations of the cognitive levels in examination questions of all academic levels over five (5) years are also reported in table 6 below.

Table 6: Summation of cognitive levels used in 2003 – 2007 by academic levels

COGNITIVE LEVELS	ACADEMIC LEVELS										
	Year I		Year II		Year III		Year IV		Mean		SD
	F	%	F	%	F	%	F	%	F	%	
Knowledge	165	41.8	94	28.8	155	30.3	441	48.3	855	**37.3**	**0.55**
Comprehension	86	19.8	68	20.2	101	19.8	163	17.2	418	**19.3**	**0.12**
Application	11	2.8	28	8.5	30	6.7	37	4.2	106	**5.5**	**0.41**
Analysis	78	18.7	75	22.6	92	17.7	135	13.7	380	**18.2**	**0.32**
Synthesis	23	5.6	26	7.8	62	15.9	61	11.5	172	**10.2**	**0.59**
Evaluation	48	11.3	40	12.1	48	9.6	56	5.0	192	**9.5**	**0.39**
TOTAL	**411**	**100**	**331**	**100**	**488**	**100**	**893**	**100**	**2123**	**100**	**2.38**

The graph in figure 8 below shows the trend in the use/ frequency distribution of cognitive levels in all academic levels examination questions set over five (5) years (2003-2007) to establish the commonly and less commonly used domains, as well as the level of complexity.

Figure 8: Distribution of cognitive levels in examination question for all academic levels over 5 years



	Year I	Year II	Year III	Year IV
Knowledge	41.8	28.8	30.3	48.3
Comprehension	19.8	20.2	19.8	17.2
Application	2.8	8.5	6.7	4.2
Analysis	18.7	22.6	17.7	13.7
Synthesis	5.6	7.8	15.9	11.5
Evaluation	11.2	12.1	9.6	5

4.2.6. Level of complexity of questions

An increase in the level of complexity by 13% was noted between first year and second year level, and an increase of 1% was noted between second and third year level. There was

however a significant drop of 16% in the level of complexity of questions at fourth year level, with lower order questions dominating. A negative difference of -4% was noted between 1st and fourth year and a negative difference of -17% noted between second and fourth year regarding the level of complexity of questions.

Table 7: Summation of cognitive levels used in 2003 – 2007 by academic levels

	COGNITIVE LEVELS	Year I		Year II		Year III		Year IV	
		%	Total	%	Total	%	Total	%	Total
Low Level	Knowledge	41.8	**62**	28.8	**49**	30.3	**50**	48.3	**66**
	Comprehension	19.8		20.2		19.8		17.2	
High Level	Application	2.8	**38**	8.5	**51**	6.7	**50**	4.2	**34**
	Analysis	18.7		22.6		17.7		13.7	
	Synthesis	5.6		7.8		15.9		11.5	
	Evaluation	11.3		12.1		9.6		5.0	
	TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Level of complexity		Difference Between 1st and 2nd Year = **13%**				Difference Between 2nd and 3rd Year = **1%**		Difference Between 3rd & 4th Year **= -16%**	

4.2.7 Level of complexity of questions pegged at Comprehension, Analysis and Synthesis Domains

According to Bloom's Taxonomy comprehension, analysis and synthesis domains have three levels each, with the questions pegged at the first level being the simplest and those at third level the most complex. Table 8 reflects the further analysis of questions in these three domains across the four years of the BN programme. In general, the results show that the majority of the questions were pegged at the first level across the three domains; questions at

lower level of comprehension ranging from 46% to 56%, lower level of analysis ranging from 54% to 72% and lower level of synthesis ranging from 62% to 80%.

Table 8: Pegging of questions at 3 levels of comprehension, analysis and synthesis levels

Year	Comprehension						Analysis						Synthesis					
	Level 1		Level 2		Level 3		Level 1		Level 2		Level 3		Level 1		Level 2		Level 3	
	Freq	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Year 1	39	*46*	26	*30*	21	*24*	42	*54*	20	*26*	16	*20*	16	*70*	7	*30*	0	*0*
Year 2	40	*59*	20	*29*	8	*12*	40	*54*	16	*21*	19	*25*	16	*62*	7	*27*	3	*11*
Year 3	51	*50*	42	*42*	8	*8*	51	*55*	36	*39*	5	*6*	43	*69*	16	*26*	3	*5*
Year 4	92	*56*	40	*25*	31	*19*	97	*72*	16	*12*	22	*16*	49	*80*	12	*20*	0	*0*

According to the findings in this study, second year had the highest number of questions (59%) at the first level of comprehension (translation), followed by fourth year with 56% of questions and third year with 50% and lastly, first year with 46% of questions at level one. At third year 42% were at level two which is interpretation level, followed by first year with 30% of the questions at interpretation level, and second year with 29% of the questions at this level, lastly fourth year with 24% of the questions at this level. Very few questions were pegged at level three (extrapolation) of comprehension (Year 1- 24%; Year 2- 12%; Year 3- 8%; and Year 4-19%). See Figure 9.

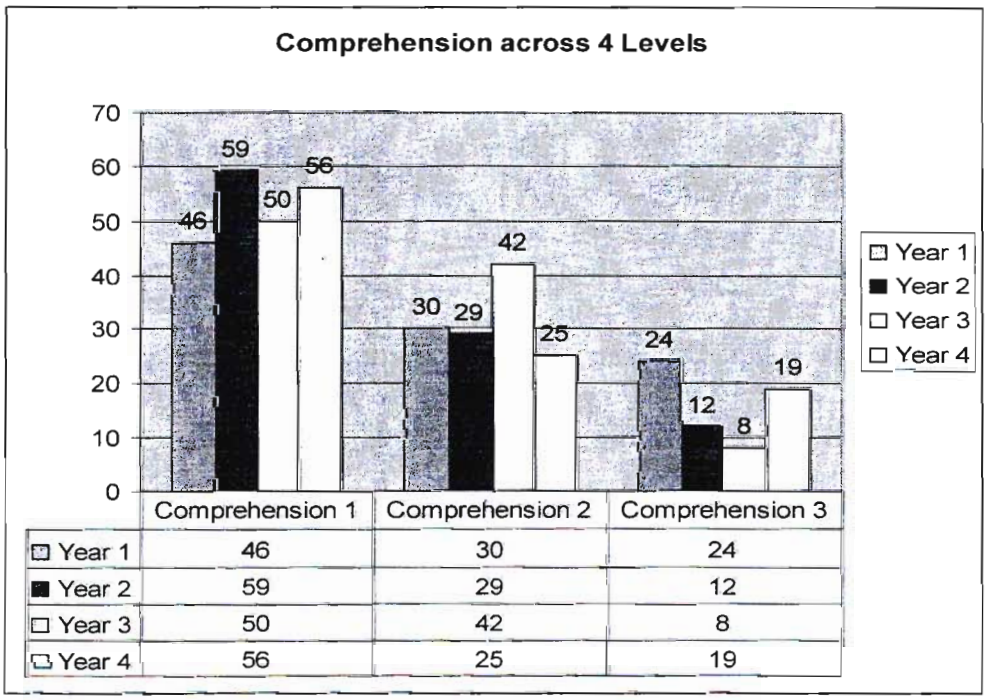
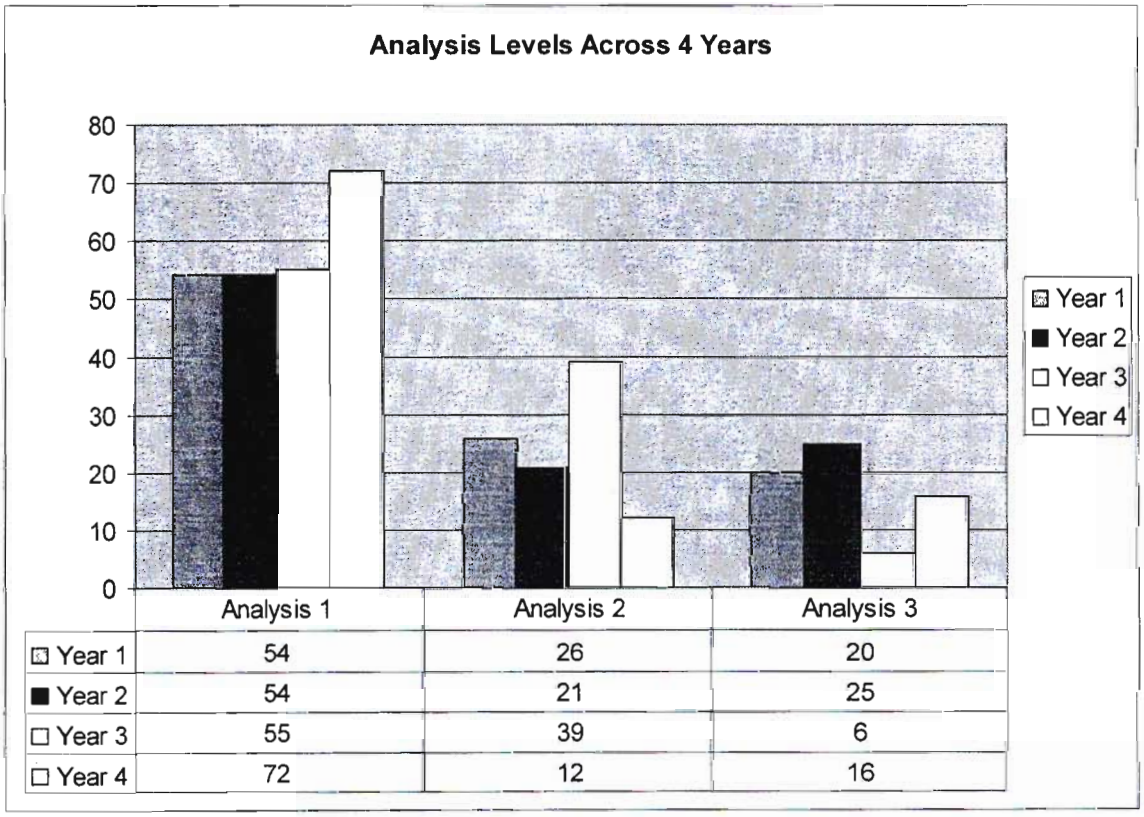


Figure 9: Questions at 3 levels of comprehension across the 4 Years in the BN Programme

Regarding the three subcategories at the analysis level, the findings revealed that most of the questions were pegged at the first level of analysis (Year 1; 54; Year 2-54%; Year 3; 55% and Year 4- 72%). Fourth year had the highest number of questions pegged at the first level when compared with other levels in the programme. Third year had the highest percentage (39%) of questions at level 2 of analysis (that is, analysis of relationships) when compared with other years. Very few questions were found to be pegged at the 3rd levels of analysis; that is analysis of organizational principles (Year 1-20%; Year 2-25%; Year 3-6% and Year 4-16%. Third year had the lowest number (6%) of questions at level 3 of analysis followed by fourth year (16%).



	Analysis 1	Analysis 2	Analysis 3
Year 1	54	26	20
Year 2	54	21	25
Year 3	55	39	6
Year 4	72	12	16

Figure 10: Questions at 3 levels of Analysis across the 4 Years in the BN Programme

The findings in this study further revealed that most of the questions at synthesis category were found at the first level (that is, production of unique communication) with fourth year taking the lead (80%) followed by first year (70%), and third year (69%) with second year last

(62%). First year had 30% of the questions at level two of synthesis (that is production of a plan/ proposed set of operations), second year had 27% followed by third year with 26% and fourth year with 20% of the questions. Only second year (11%) and third year (5%) questions papers had questions at third level of synthesis; that is derivation of sets of abstract relationships (See Figure 11).

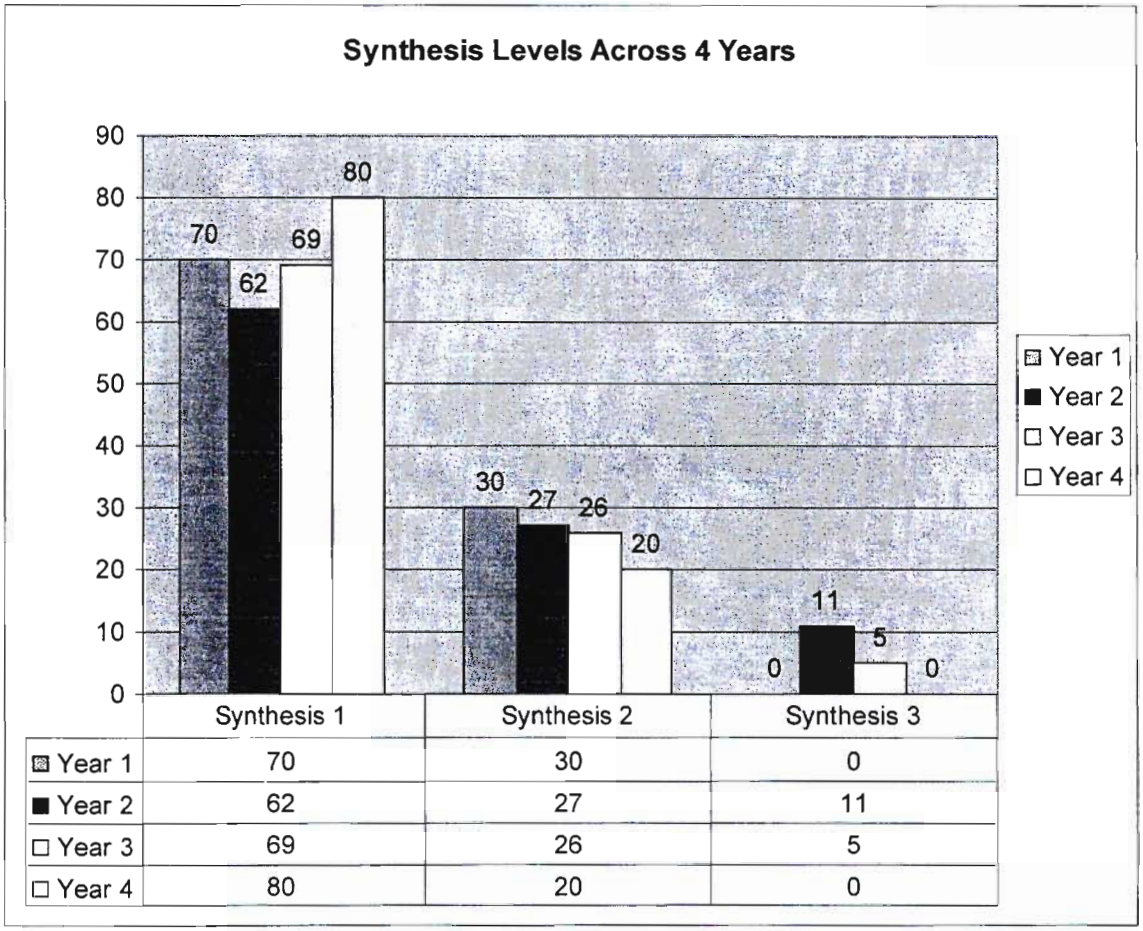


Figure 11: Questions at 3 levels of Synthesis across the 4 Years in the BN Programme

4.2.8 Action verbs commonly used in examination question by all academic levels

Bloom gives examples of action verbs used across the six cognitive domains. In this particular study the results reflect that 'analyse' was the most commonly used action verb (15.2%), followed by choose (9.9%) write (9.8%), describe (9.8%), circle (9.1%), discuss (7.1%), match (6.3%), explain (6.1%) and define (4.1%). Table 6 provides a list of action verbs which were used in question papers. Those which were below 1% are not included on this table. They included 'answer, calculate, compile, compare, contrast, complete, create,

determine, develop, differentiate, distinguish, draw, evaluate, formulate, give, how, illustrate, indicate, interpret, justify, label, make, mention, name, organize, outline, plan, prioritise, show, use, who, and why'.

Although the number of examination questions might seem equal/ proportionate to the cognitive levels and action verbs used in this study, this could be attributed to the fact that the frequency of cognitive concepts (action verbs/ question stems, cognitive domains) were coded and recorded despite the number of times that certain cognitive domains had been used in questions.

Table 9: Action verbs used in all academic levels for the year 2003 – 2007

Action verbs used	First year		Second year		Third year		Forth year		Mean	
	F	%	F	%	F	%	F	%	F	%
Analyse	23	9.6	34	20.0	58	20.4	86	13.8	201	15.2
Choose	20	8.4	30	17.7	25	8.8	56	9.0	131	9.9
Write	10	4.2	0	0	0	0	119	19.0	129	9.8
Describe	11	4.6	8	4.7	35	12.3	75	12.0	129	9.8
Circle	0	0	0	0	0	0	120	19.2	120	9.1
Discuss	17	7.1	20	11.8	32	11.2	25	4	94	7.1
Match	36	15.1	10	5.9	33	11.6	4	0.6	83	6.3
Explain	28	11.7	17	10.0	11	3.9	25	4.0	81	6.1
Define	17	7.1	8	4.7	5	1.8	24	3.8	54	4.1
Identify	2	0.8	10	5.9	5	1.8	9	1.4	26	2.0
Select	18	7.5	0	0	0	0	9	1.4	27	2.1
List	10	4.2	4	2.4	5	1.8	7	1.1	26	2.0
Which	20	8.4	2	1.2	0	0	0	0	22	1.7
State	5	2.1	1	0.6	7	2.5	5	0.8	18	1.4
Record	0	0	0	0	17	6.0	0	0	17	1.3
Tabulate	5	2.1	3	1.8	1	0.4	8	1.3	17	1.3
What	3	1.3	5	2.9	4	1.4	3	0.5	15	1.1

For the first years, 239 examination questions were reviewed. The findings as in table 6 revealed that the most commonly used action verbs were match at 15.1% (n=36), followed by explain at 11.7% (28), analyse at 9.6% (n=23), choose and which at 8.4% (n=20) respectively, select at 7.5% (n=18), define and discuss at 7.1% (n=17).

Of the 170 examination questions reviewed, the data in table 6 showed that 'analyse' 20% (n=34) was the most frequently used action verb in the examination questions for second years. This was followed by choose with 17.7% (n=30), discuss 11.4% (n=20), explain 10% (n=17), identify and match each achieved 5.9% (n=10).

There were 285 examination questions reviewed. The findings as shown in table 6 indicated that analyse was the most commonly used action verb with 20.4% (n=58). It was followed by describe 12.3% (n=35), match 11.6% (n=33), discuss 11.2% (n=32), choose 8.8% (n=25) and record 6.0% (n=17).

The fourth years had 625 examination questions reviewed for the year 2003 - 2007. The findings revealed that the action verb 'circle' was the word mentioned most frequently in the examination questions for fourth years, accounting for 19.2% (n=120). It was followed by write 19.0% (n=119), analyse 13.8% (86), describe 12.0% (n=75), choose 9.0% (n=56), discuss and explain both at 4.0% (n=25).

On the basis of the data in table 7, analyse 15.2% (n=201) was a commonly used action verb, followed by choose with 9.9% (n=131), describe and write with 9.8% (n=129) each, circle 9.1% (120), discuss 7.1% (n=94), match 6.3% (n=83), explain 6.1% (n=81) and define 4.1% (n=54).

General observation regarding construction of questions based on short scenarios, problems or essay type questions

Although this was not the main purpose of the research, the researcher observed that scenarios were commonly used as a base to questions, either as part of MCQ's or short essay questions. However, although scenarios were used in some essay questions, they were not followed with appropriate questions. A scenario was presented, but the questions asked were not compelling the students to go back to the scenario and look for the answer. There was a disjuncture between the scenario and the questions asked. In some cases the students could answer the questions without even looking at the scenario. For example a scenario on an ectopic pregnancy was followed by a question "Describe the clinical presentation of a patient with an ectopic pregnancy" this affected the level of the question, because the action verb "describe" is at lower level, and the question does not compel the student to refer to the scenario.

Conclusion

This chapter presented findings obtained from the data collected from examination questions which were used from 2003 to 2007. The findings were presented in relation to the research objective. This chapter leads to chapter five where findings are discussed and interpreted in relation to the reviewed literature.

CHAPTER 5

DISCUSSIONS OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1. Introduction

This chapter presents a discussion of the significant findings in this research study, the conclusions drawn, as well as the recommendations made. Taking into consideration the purpose of the study, which was to describe and analyse the examination questions set over the four-year academic period, at the UKZN school of Nursing, in terms of the levels of cognitive domain in Bloom's taxonomy. The results of the study are interpreted within the context of relevant literature, previous studies on this topic, the research objectives and the conceptual framework used in the study.

5.2 DISCUSSIONS OF THE FINDINGS

5.2.1 Nature of questions used

The findings revealed that a variety of questions were used in the Bachelors programme, including multiple choice questions, short answer questions, short and long essay questions. It was also noted that multiple choice questions were based on scenarios to stimulate the student's thinking. According to Palmer, Petter and Devitt (2007) MCQs can measure both higher order and lower order thinking skills. Furthermore, MCQs if well constructed can stimulate higher order thinking. Azer (2003) asserted that well constructed MCQs may demand a great deal of analytical thinking, enabling examiners to test integration of knowledge, problem solving skills and application of knowledge. Palmer, et al (2007) assert that using scenarios, just like in this study may play an important role in ensuring that higher

cognitive function is stimulated. Furthermore, these authors also assert that essay questions also promote higher order function and test different facets of understanding.

5.2.2. Cognitive levels of examinations questions in a Bachelor of Nursing Programme

According to the findings of this study, all the six categories of cognitive function in Bloom's taxonomies were evident in the examination questions, across the four levels (Knowledge 37.3%; Comprehension 19.3%; Application 5.5%; Analysis 18.2%; Synthesis 10.2% and Evaluation 9.5%). Having all categories of cognitive function represented in examination questions is in line with the findings from the studies by Kim (1996); Darwazeh (1996, 2001). According to these studies, a mixture of questions at various levels of the taxonomy might result in the greatest learning at higher levels. Sanders (1973) and Darwazeh (2004), highlight the advantage of having papers with mixed questions, in that low ability students performed better on knowledge recall questions; and high ability students performed better on application level questions.

The findings in this particular study reflected a slight difference between higher order (43.4%) and lower order questions (56.6%). Taking into consideration that the BN programme is problem-based, higher order questions were supposed to dominate but the reverse was encountered. Such findings were not new, and in this study, again, lower order questions dominate. Studies by Combs (1998); Kim (1996); (Cross, 2000); Azer, (2003) revealed that approximately 80 to 90 percent of teachers tend to ask questions aimed at the lower cognitive levels. According to Azer (2003), questions in a problem-based programme should use complex questions which are demanding intellectually, not just the ability to recall information. This would appear to indicate that the examination questions of Bachelor of nursing programme, used in this study, were less intellectually demanding. Defending the use of lower order questions, Hunkins (1995), and Aaron, Crocket, Morrish, Basualdo,

Kovithavongs, Mielke, and Cook (1998) in their study indicate that although questions at the lower cognitive levels may indicate that a student lacks information, they are more often used to demonstrate knowledge or construct knowledge. Furthermore, Hunkins (1995) endorses the fact that when lower order level questions are asked, they are successful in stimulating further discussions. West and Pearson's (1994) study, however, refute this, and state that higher order level questions appeared to be seeking more details or some form of explanation. These authors also add that these questions sought justification for a position, or asked students to draw conclusions.

The findings in this study further showed that first and second years levels in a BN programme used more questions at higher order levels, recording 38.4% (n=160) and 51% (n=169) respectively, when compared to third and fourth year levels. Hancock (1994); Rayan (1973); Redfield (1981); Richards and Vesta (1974) indicate that giving students higher order level questions help them to activate their cognitive strategies more effectively than lower order level questions. Zheng, Lawhorn, Lumley and Freeman's (2008) study also reveal similar results, some undergraduates are being challenged with a greater proportion of higher-order questions in their introductory courses than others. They further suggested that some undergraduate courses need to be reformed and emphasize higher-order thinking skills. This contradicted the studies of Colletta and Chiappetta (1989); Gronlund (1995); Cepni and Azar (1998), who assert that at first year level, students are expected to recall or bring to mind such things as specific facts or terminology, basic concepts and answer questions as they have learned them.

One may link the higher number of questions which were asked at lower level (56.6%) to a problem of construction of questions. Zheng, Lawhorn, Lumley and Freeman (2008) reported that some examiners assume that having a scenario automatically raises the level of the

question. According to these authors construction of multiple-choice questions at the application and analysis levels is much more difficult. Bullens, Van Damme, Jaspert and Janssen (2002); Azer's (2003) studies reveal that the cognitive level of multiple-choice questions is influenced by how the questions have been constructed, and what is required as answers to those questions. Cashin (1987); Azer (2003) asserted that with good support, multiple-choice questions might be constructed at an analysis or evaluation level.

5.2.3. Complexity of examination questions as the level in the programme becomes higher

The results in this particular study showed an increase in the level of complexity between first and second year by 13% and an increase of 1% between second and third year level. This was in line with the statement by Hadingham (2003) that the levels of complexity of questions should increase as the level in the programme becomes higher. There was however a drop (16%) in the level of questions set for third and fourth year levels. A high percentage of questions at fourth year level were stimulating lower order function, not in line with Hadingham's (2003) recommendantions. From the findings of this study, it unfolded that fourth years repeatedly had questions aimed at lower-order levels (knowledge/recall and comprehension), which was 75.7% in 2004, 66% in 2005, 70.7% in 2006 and 66.2% in 2007 undoing the earlier (2003) initiatives in which higher-order levels (application, analysis, synthesis and evaluation) recorded 51% (as shown in table 4). Furthermore, the researcher compared the frequency in the used of action verbs across the different levels in the programme with the aim of establishing if the levels of questions were higher at fourth year.. The findings revealed a difference of -4% between first and fourth year and a difference of -17% between second and fourth year, regarding the complexity of questions. Instead of having the level of complexity of questions increasing, the reverse was found. What was notable from the findings was that the fourth years examination questions consistently took

led in lower-order level questions, (65.5%) and had few questions of higher order levels, (application, analysis, synthesis and evaluation levels) (34.5%), which in principle should anchor BN programme by this academic level. Combs (1998), in defense of the use of lower order questions, states that in some instances, the students are taught at higher cognitive levels but tested at lower cognitive levels or sometimes vice versa for a number of reasons, including the examiners ability or expertise in constructing examination questions. This implies that the level of complexity of questions may be compromised in some cases, thereby hindering the students' intellectual development (Çepni and Azar, 1998).

In the context of this study, having higher percentage of lower order questions dominating at fourth year level may be because two new disciplines (psychiatric nursing and midwifery) were introduced at this level, which means new concepts need to be mastered by the students. Testing of mastering of factual information requires the use of lower order categories in Bloom's Taxonomy (Bloom, et al, 1971). One may, however, in this particular programme expect a balance between higher and lower order questions at fourth year level, as this is a problem-based programme.

From the results of this study, it also emerged that learners were repeatedly tested on same questions that they were previously examined on, especially at fourth year level. In 2005 and 2006, fourth years students were examined on almost the same question papers and is reflected by the results showing knowledge (recall) level recorded at 51.1% and 51.6% in those years (as shown in table 5). This shows that the students previously tested on a large number of lower level questions will remain at a similar level in the following year. Shah and Afzaal (2004) also report similar findings in their study. In their evaluation paper there was an increased repetition of questions and similar content was tested. Davis (1999) associated repetition of similar examination questions with an over-reliance on a single textbook and

reproduction of materials from textbooks. Khushk and Christie (2004) maintain that this might have a negative effect on education and the quality of graduates produced.

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The findings in this study further revealed that examiners commonly used short scenarions and patient problems to base questions used. This was observed with MCQ's or short essay questions. The disjuncture was however observed between the scenario and the questions asked. Studies by Ellis (1993); Foster (1983); Schiever (1991) also revealed a problem regarding construction of examination questions using scenarios. According to these researchers, examiners require special training to build their capacity in constructing higher order questions, using scenarios. Dillon's (1994) study revealed a similar problem of disjuncture between questions and scenarios used. Dillon states that these types of questions neither promote higher order thinking skills, such as critical thinking, nor encourage participation. Entwistle (1995); Smith and Campbell's (1999) studies showed similar results, asserting that these types of questions measure the student's surface learning, that is, activities of an inappropriately low cognitive level.

5.4. CONCLUSION

The findings in this study reflect that a mix of questions are used in a BN programme. Furthermore, the questions used in this programme between 2003 and 2008 covered all six cognitive levels, with questions at lower levels slightly higher than those at higher cognitive levels. Questions at first and second year levels had a good mix of at higher and lower cognitive levels. Third year level had a good balance of high order and lower order questions. The results indicated that in 2003 fourth year level had the highest percentage of higher order questions (51%), however, a drastic change was seen between 2004 and 2008.

A change in the complexity of questions used was noted between first and second year levels and a slight change between second and third year level. Fourth year, however, had lower order questions dominating, which may be because new disciplines were introduced at this level, warranting some mastery of concepts and terms, which are mainly measured by lower order questions. Regarding the further analysis of questions in relations to three subcategories of comprehension, analysis and synthesis, the findings show that examination questions were clustered at lowest levels of these three subcategories. This should be a course for concern because the level of complexity of questions should increase as the programme progresses. The questions at third and fourth year levels should cover the second and third subcategories of these domains (comprehension, analysis and evaluation).

Construction of questions came up as one of the challenges that had an impact on the cognitive levels of questions. Scenarios presented were not properly utilized to ensure that the questions forced students to go back to the scenario before answering a question.

5.4. RECOMMENDATIONS

The findings in this study led to the following recommendations: -

Nursing education programs

There is a need to review the section on assessment of learning in the school's nursing education curriculum to ensure that it addresses in depth assessment of learning in a problem-based learning program. Furthermore, attention should be given to how to construct various forms of questions, including multiple choice questions, in order to promote the use of higher order thinking skills. The curriculum development module must have a section where students are taught how to align assessment with the educational philosophy underpinning the curriculum. Planning assessment in a curriculum should also be properly addressed and

student given assignments where they will be expected to plan assessment that increases in complexity as the students' progress in the program.

Staff development

Targeted continuing education programmes (needs-based education) in the form of in-service education, workshops and seminars should be developed and made available to academic staff. These programmes should include assessment of learning in general, assessment of learning in problem-based learning program, constructing multiple-choice questions that stimulate higher order thinking skills and constructing questions using scenarios. Targeted capacity building programs are preferred, because they address specific areas of concern.

Research

This study was conducted in one setting focusing on nursing modules only. It would be interesting to have a study that compares more than one setting and also consider all modules offered to students in undergraduate programs, the foundational and elective modules making up a BN programme. The use of triangulation in data collection technique is also recommended so that results, for instance of behavioral observations could be complemented with subjects' verbalizations in actual practice. Furthermore, research that can explore the alignment between teaching philosophy, methods and assessment is recommended, as literature indicates that teaching and assessment inform each other.

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ANNEXURES

APPENDIX 1: A Template for Collecting Data

Academic Level: _____ Exam Period _____

Final/Supplementary Exam _____

CATEGORIZATION OF EXAM QUESTIONS ACCORDING TO COGNITIVE LEVELS

Question number	Action verbs or Question Stems Used	Cognitive levels/Domains					
		Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Total							

Appendix 1: Data collection instrument

Section A: -

In each of the following, mark with a tick against the most appropriate response: -

Study objectives	**Research questions**	**Items/ Question levels**		**Response to items**	**Academic levels of the students for the year "2003"**			
					1st	**2nd**	**3rd**	**4th**
1. To describe the cognitive levels of the Bachelor of Nursing degree exam questions in the school of nursing at UKZN.	**1.** What are the cognitive levels (Knowledge, Comprehension, Application, Analysis, Synthesize and Evaluation) of the Bachelor of Nursing degree exam questions?	**1.** Are the exam questions of the 1st, 2nd, 3rd and 4th year students for 2003 have the cognitive domains?						
		Knowledge		**Yes**				
				No				
		Analysis		**Yes**				
				No				
		Comprehensive		**Yes**				
				No				
		Application		**Yes**				
				No				
		Synthesis		**Yes**				
				No				
		Evaluation		**Yes**				
				No				
Total response to items			**N**	**Yes**				
				No				
			%	**Yes**				
				No				

Study objectives	Research questions	Items/ Question levels		Response to items	Academic levels of the students for the year "2004"			
					1st	2nd	3rd	4th
1. To describe the cognitive levels of the Bachelor of Nursing degree exam questions in the school of nursing at UKZN.	1. What are the cognitive levels (Knowledge, Comprehension, Application, Analysis, Synthesize and Evaluation) of the Bachelor of Nursing degree exam questions?	2. Are the exam questions of the 1st, 2nd, 3rd and 4th year students for 2004 have the cognitive domains?						
		Knowledge		**Yes**				
				No				
		Analysis		**Yes**				
				No				
		Comprehensive		**Yes**				
				No				
		Application		**Yes**				
				No				
		Synthesis		**Yes**				
				No				
		Evaluation		**Yes**				
				No				
Total response to items			**N**	**Yes**				
				No				
			%	**Yes**				
				No				

Study objectives	Research questions	Items/ Question levels		Response to items	Academic levels of the students for the year "2005"			
					1st	2nd	3rd	4th
1. To describe the cognitive levels of the Bachelor of Nursing degree exam questions in the school of nursing at UKZN.	1. What are the cognitive levels (Knowledge, Comprehension, Application, Analysis, Synthesize and Evaluation) of the Bachelor of Nursing degree exam questions?	3. Are the exam questions of the 1st, 2nd, 3rd and 4th year students for 2005 have the cognitive domains?						
		Knowledge		**Yes**				
				No				
		Analysis		**Yes**				
				No				
		Comprehensive		**Yes**				
				No				
		Application		**Yes**				
				No				
		Synthesis		**Yes**				
				No				
		Evaluation		**Yes**				
				No				
Total response to items			**N**	**Yes**				
				No				
			%	**Yes**				
				No				

Section B

For the following, put a tick against the most appropriate response which most reflects your view

Study objectives	Research questions	Items/ Question levels	Response to items	Academic levels of the students for the year "2003"			
				1st	2nd	3rd	4th
2. To analyze the cognitive levels of the Bachelor of Nursing degree exam questions in different levels of the programme over the four year academic period.	**2.** How are the levels of cognitive domains used in the different levels of the programme over the four academic years of study of the Bachelor of Nursing students at UKZN?	**1.** How are the cognitive levels used in setting the exam questions of the 1st, 2nd, 3rd and 4th year students for 2003?					
		Knowledge	**Often**				
			Less often				
			More often				
		Analysis	**Often**				
			Less often				
			More often				
		Comprehensive	**Often**				
			Less often				
			More often				
		Application	**Often**				
			Less often				
			More often				
		Synthesis	**Often**				
			Less often				
			More often				
		Evaluation	**Often**				
			Less often				
			More often				
Total response to items			**N** **Often**				
			Less often				
			More often				
			% **Often**				
			Less often				
			More often				

Study objectives	Research questions	Items/ Question levels		Response to items	Academic levels of the students for the year "2004"			
					1st	2nd	3rd	4th
2. To analyze the cognitive levels of the Bachelor of Nursing degree exam questions in different levels of the programme over the four year academic period.	**2.** How are the levels of cognitive domains used in the different levels of the programme over the four academic years of study of the Bachelor of Nursing students at UKZN?	**2.** How are the cognitive levels used in setting the exam questions of the 1st, 2nd, 3rd and 4th year students for 2004?						
		Knowledge		**Often**				
				Less often				
				More often				
		Analysis		**Often**				
				Less often				
				More often				
		Comprehensive		**Often**				
				Less often				
				More often				
		Application		**Often**				
				Less often				
				More often				
		Synthesis		**Often**				
				Less often				
				More often				
		Evaluation		**Often**				
				Less often				
				More often				
Total response to items			**N**	**Often**				
				Less often				
				More often				
			%	**Often**				
				Less often				
				More often				

Study objectives	Research questions	Items/ Question levels		Response to items	Academic levels of the students for the year "2005"			
					1st	2nd	3rd	4th
2. To analyze the cognitive levels of the Bachelor of Nursing degree exam questions in different levels of the programme over the four year academic period.	**2.** How are the levels of cognitive domains used in the different levels of the programme over the four academic years of study of the Bachelor of Nursing students at UKZN?	**3.** How are the cognitive levels used in setting the exam questions of the 1st, 2nd, 3rd and 4th year students for 2005?						
		Knowledge		**Often**				
				Less often				
				More often				
		Analysis		**Often**				
				Less often				
				More often				
		Comprehensive		**Often**				
				Less often				
				More often				
		Application		**Often**				
				Less often				
				More often				
		Synthesis		**Often**				
				Less often				
				More often				
		Evaluation		**Often**				
				Less often				
				More often				
Total response to items			**N**	**Often**				
				Less often				
				More often				
			%	**Often**				
				Less often				
				More often				

Section C

In each of the following, put a tick against the most appropriate response:-

Study objectives	**Research questions**	**Items/ Question levels**		**Response to items**	**Academic levels of the students for the year "2003"**			
					1st	**2nd**	**3rd**	**4th**
3. To examine if the learning outcomes are in accordance or congruent with the levels of the cognitive domain.	**3.** Are the learning outcomes congruent with the levels of the cognitive domain? .	**1.** Are the learning outcomes of the 1st, 2nd, 3rd and 4th year students for 2003 congruent with the levels of cognitive domains?						
		Knowledge		**Yes**				
				No				
		Analysis		**Yes**				
				No				
		Comprehensive		**Yes**				
				No				
		Application		**Yes**				
				No				
		Synthesis		**Yes**				
				No				
		Evaluation		**Yes**				
				No				
Total response to items			**N**	**Yes**				
				No				
			%	**Yes**				
				No				

Study objectives	Research questions	Items/ Question levels		Response to items	Academic levels of the students for the year "2004"			
					1st	2nd	3rd	4th
3. To examine if the learning outcomes are in accordance or congruent with the levels of the cognitive domain.	3. Are the learning outcomes congruent with the levels of the cognitive domain? .	2. Are the learning outcomes of the 1st, 2nd, 3rd and 4th year students for 2004 congruent with the levels of cognitive domains?						
		Knowledge		Yes				
				No				
		Analysis		Yes				
				No				
		Comprehensive		Yes				
				No				
		Application		Yes				
				No				
		Synthesis		Yes				
				No				
		Evaluation		Yes				
				No				
Total response to items			N	Yes				
				No				
			%	Yes				
				No				

Study objectives	Research questions	Items/ Question levels	Response to items	Academic levels of the students for the year "2005"			
				1st	2nd	3rd	4th
3. To examine if the learning outcomes are in accordance or congruent with the levels of the cognitive domain.	3. Are the learning outcomes congruent with the levels of the cognitive domain? .	3. Are the learning outcomes of the 1st, 2nd, 3rd and 4th year students for 2004 congruent with the levels of cognitive domains?					
		Knowledge	**Yes**				
			No				
		Analysis	**Yes**				
			No				
		Comprehensive	**Yes**				
			No				
		Application	**Yes**				
			No				
		Synthesis	**Yes**				
			No				
		Evaluation	**Yes**				
			No				
Total response to items		**N**	**Yes**				
			No				
		%	**Yes**				
			No				

APPENDIX 2: A TEMPLATE FOR ANALYZING DATA

Knowledge

Useful Verbs	Sample Question Stems	Potential activities and products
tell list describe relate locate write find state name	What happened after...? How many...? Who was it that...? Can you name the...? Describe what happened at...? Who spoke to...? Can you tell why...? Find the meaning of...? What is...? Which is true or false...?	Make a list of the main events.. Make a timeline of events. Make a facts chart. Write a list of any pieces of information you can remember. List all the .... in the story. Make a chart showing... Make an acrostic. Recite a poem.

Comprehension

Useful Verbs	Sample Question Stems	Potential activities and products
explain interpret outline discuss distinguish predict restate translate compare describe	Can you write in your own words...? Can you write a brief outline...? What do you think could of happened next...? Who do you think...? What was the main idea...? Who was the key character...? Can you distinguish between...? What differences exist between...? Can you provide an example of what you mean...? Can you provide a definition for...?	Cut out or draw pictures to show a particular event. Illustrate what you think the main idea was. Make a cartoon strip showing the sequence of events. Write and perform a play based on the story. Retell the story in your words. Paint a picture of some aspect you like. Write a summary report of an event. Prepare a flow chart to illustrate the sequence of events. Make a colouring book.

Application

Useful Verbs	Sample Question Stems	Potential activities and products
solve show use illustrate construct complete examine classify	Do you know another instance where...? Could this have happened in...? Can you group by characteristics such as...? What factors would you change if...? Can you apply the method used to some experience of your own...? What questions would you ask of...? From the information given, can you develop a set of instructions about...? Would this information be useful if you had a ...?	Construct a model to demonstrate how it will work. Make a diorama to illustrate an important event. Make a scrapbook about the areas of study. Make a paper-mache map to include relevant information about an event. Take a collection of photographs to demonstrate a particular point. Make up a puzzle game suing the ideas from the study area. Make a clay model of an item in the material. Design a market strategy for your product using a known strategy as a model. Dress a doll in national costume. Paint a mural using the same materials. Write a textbook about... for others.

Analysis

Useful Verbs	Sample Question Stems	Potential activities and products
analyse distinguish examine compare contrast investigate categorise identify explain separate advertise	Which events could have happened...? I ... happened, what might the ending have been? How was this similar to...? What was the underlying theme of...? What do you see as other possible outcomes? Why did ... changes occur? Can you compare your ... with that presented in...? Can you explain what must have happened when...? How is ... similar to ...? What are some of the problems of...? Can you distinguish between...? What were some of the motives behind...? What was the turning point in the game? What was the problem with...?	Design a questionnaire to gather information. Write a commercial to sell a new product. Conduct an investigation to produce information to support a view. Make a flow chart to show the critical stages. Construct a graph to illustrate selected information. Make a jigsaw puzzle. Make a family tree showing relationships. Put on a play about the study area. Write a biography of the study person. Prepare a report about the area of study. Arrange a party. Make all the arrangements and record the steps needed. Review a work of art in terms of form, colour and texture.

Synthesis

Useful Verbs	Sample Question Stems	Potential activities and products
create invent compose predict plan construct design imagine propose devise formulate	Can you design a ... to ...? Why not compose a song about...? Can you see a possible solution to...? If you had access to all resources how would you deal with...? Why don't you devise your own way to deal with...? What would happen if...? How many ways can you...? Can you create new and unusual uses for...? Can you write a new recipe for a tasty dish? can you develop a proposal which would...	Invent a machine to do a specific task. Design a building to house your study. Create a new product. Give it a name and plan a marketing campaign. Write about your feelings in relation to... Write a TV show, play, puppet show, role play, song or pantomime about...? Design a record, book, or magazine cover for...? Make up a new language code and write material suing it. Sell an idea. Devise a way to... Compose a rhythm or put new words to a known melody.

Evaluation

Useful Verbs	Sample Question Stems	Potential activities and products
judge select choose decide justify debate verify argue recommend assess discuss rate prioritise determine	Is there a better solution to... Judge the value of... Can you defend your position about...? Do you think ... is a good or a bad thing? How would you have handled...? What changes to ... would you recommend? Do you believe? Are you a ... person? How would you feel if...? How effective are...? What do you think about...?	Prepare a list of criteria to judge a ... show. Indicate priority and ratings. Conduct a debate about an issue of special interest. Make a booklet about 5 rules you see as important. Convince others. Form a panel to discuss views, eg "Learning at School." Write a letter to ... advising on changes needed at... Write a half yearly report. Prepare a case to present your view about...

ANNEXURE : -

Action verbs/ questions stems used in exam questions (2003 – 2007)

(i) Action verbs used in examination questions for first years

Action verbs or question stems used	First years									
	Year 2003		Year 2004		Year 2005		Year 2006		Year 2007	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Analyse	4	12.1	3	9.1	2	6.1	9	13.2	5	6.9
Choose	10	30.3	0	0	0	0	0	0	10	13.9
Compile	2	6.1	0	0	0	0	0	0	0	0
Define	5	15.2	5	15.2	0	0	7	10.3	0	0
Describe	2	6.1	0	0	1	3.0	4	5.9	4	5.6
Develop	0	0	0	0	0	0	1	1.5	1	1.4
Discuss	0	0	2	6.1	3	9.1	9	13.2	3	4.2
Distinguish	1	3.0	0	0	0	0	0	0	0	0
Explain	2	6.1	6	18.2	8	24.2	3	4.4	9	12.5
Identify	0	0	0	0	0	0	1	1.5	1	1.4
Interpret	0	0	0	0	0	0	0	0	1	1.4
How	0	0	2	6.1	0	0	0	0	0	0
List	1	3.0	2	6.1	0	0	5	7.4	2	2.8
Match	0	0	0	0	0	0	16	23.5	20	27.8
Name	1	3.0	0	0	0	0	0	0	2	2.8
Outline	0	0	0	0	0	0	0	0	1	1.4
Select	0	0	10	30.3	0	0	0	0	8	11.1
State	5	15.2	0	0	0	0	0	0	0	0
Tabulate	0	0	1	3.0	0	0	1	1.5	3	4.1
Use	0	0	1	3.0	0	0	0	0	0`	0
What	0	0	0	0	1	3.0	2	2.9	0	0
Which	0	0	0	0	18	54.6	0	0	2	2.8
Who	0	0	1	3.0	0	0	0	0	0	0
Write	0	0	0	0	0	0	10	14.7	0	0
Total	**33**	**100**	**33**	**100**	**33**	**100**	**68**	**100**	**72**	**100**

(ii) Action verbs used in examination questions for second years

Action verbs or question stems used	Second years									
	Year 2003		Year 2004		Year 2005		Year 2006		Year 2007	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Analyse	9	23.7	6	20.0	2	5.9	10	28.6	7	21.2
Choose	5	13.2	5	16.7	10	29.4	5	14.3	5	15.2
Create	0	0	0	0	0	0	1	2.9	0	0
Define	0	0	0	0	5	14.7	0	0	3	9.1
Describe	0	0	3	10.0	2	5.9	2	5.7	1	3.0
Develop	0	0	0	0	0	0	1	2.9	0	0
Discuss	4	10.5	8	26.7	1	2.9	3	8.6	4	12.1
Explain	4	10.5	0	0	3	8.8	6	17.1	4	12.1
Give	0	0	0	0	1	2.9	0	0	0	0
Identify	2	5.3	3	10.0	1	2.9	2	5.7	2	6.1
List	0	0	0	0	0	0	3	8.6	1	3.0
Match	5	13.2	1	3.3	0	0	0	0	5	15.2
Outline	2	5.3	1	3.3	0	0	1	2.9	0	0
Plan	0	0	0	0	4	11.8	0	0	0	0
show	0	0	0	0	4	11.8	0	0	0	0
State	1	2.6	0	0	0	0	0	0	0	0
Tabulate	2	5.3	0	0	0	0	0	0	1	3.0
Use	0	0	0	0	1	2.9	0	0	0	0
What	3	7.9	1	3.3	0	0	1	2.9	0	0
Which	1	2.6	1	3.3	0	0	0	0	0	0
Why	0	0	1	3.3	0	0	0	0	0	0
Total	**38**	**100**	**30**	**100**	**34**	**100**	**35**	**100**	**33**	**100**

(iii) Action verbs used in examination questions for third years

Action verbs or question stems used	Third years									
	Year 2003		Year 2004		Year 2005		Year 2006		Year 2007	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Analyse	13	18.1	19	25.0	13	19.7	3	11.5	10	22.2
Answer	5	6.9	0	0	0	0	0	0	0	0
Choose	0	0	25	32.9	0	0	0	0	0	0
Calculate	0	0	0	0	1	1.5	3	11.5	1	2.2
Compare	0	0	1	1.3	0	0	0	0	0	0
complete	0	0	0	0	0	0	3	11.5		0
Contrast	0	0	1	1.3	0	0	0	0	0	0
Define	5	6.9	0	0	0	0	0	0	0	0
Describe	8	11.1	7	9.2	13	19.7	1	3.9	6	13.6
Determine	2	2.8	0	0	0	0	0	0	0	0
Develop	0	0	0	0	0	0	0	0	1	2.2
Differentiate	1	1.4	2	2.6	3	4.6	1	3.9	2	4.4
Discuss	6	8.3	10	13.2	6	9.1	0	0	10	22.2
Draw	0	0	1	1.3	1	1.5	0	0	0	0
Evaluate	1	1.4	0	0	0	0	0	0	0	0
Explain	7	9.7	2	2.6	1	1.5	1	3.9	0	0
Formulate	0	0	0		1	1.5	0	0	1	2.2
Give	7	9.7	1	1.3	0	0	1	3.9	0	0
Identify	0	0	0	0	5	7.6	0	0	0	0
Indicate	0	0	0	0	0	0	0	0	1	2.2
Interpret	0	0	0	0	0	0	1	3.9	0	0
Justify	0	0	0	0	0	0	1	3.9	0	0
List	2	2.8	0	0	0	0	1	3.9	2	4.4
Match	13	18.1	5	6.7	15	22.7	0	0	0	0
Mention	0	0	0	0	0	0	0	0	1	2.2
Outline	0	0	1	1.3	0	0	0	0	0	0
Record	0	0	0	0	0	0	7	26.6	10	22.2
State	0	0	0	0	5	7.6	2	7.7	0	0
Tabulate	0	0	1	1.3	0	0	0	0	0	0
What	1	1.4	0		2	3.0	1	3.9	0	0
Who	1	1.4	0	0	0	0	0	0	0	0
Total	**72**	**100**	**76**	**100**	**66**	**100**	**26**	**100**	**45**	**100**

(iv) Action verbs used in examination questions for fourth years

Action verbs or question stems used	Fourth years									
	Year 2003		Year 2004		Year 2005		Year 2006		Year 2007	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Analyse	3	14.2	9	11.8	13	13.0	38	17.1	23	11.2
Choose	0	0	0	0	10	10.0	20	9.0	26	12.7
Circle	0	0	24	31.6	24	24	72	32.1	0	0
Compile	0	0	0	0	0	0	0	0	1	0.5
Define	0	0	0	0	0	0	0	0	24	11.7
Describe	8	38.0	8	10.6	7	7	30	13.5	22	10.7
Develop	0	0	2	2.6	3	3	0	0	0	0
Differentiate	0	0	0	0	0	0	0	0	1	0.5
Discuss	0	0	0	0	1	1.0	10	4.5	14	6.7
Distinguish	0	0	0	0	0	0	0	0	0	0
Explain	0	0	3	4.0	4	4	7	3.2	10	4.9
Evaluate	1	4.8	0	0	0	0	0	0	0	0
Formulate	0	0	0	0	0	0	0	0	3	1.5
Give	0	0	0	0	0	0	1	0.5	1	0.5
How	0	0	0	0	1	1.0	0	0	2	1.0
Identify	0	0	1	1.3	2	2.0	3	1.4	3	1.5
Illustrate	1	4.8	1	1.3	2	2.0	1	0.5	6	2.9
Indicate	0	0	0	0	1	1.0	0	0	0	0
Label	0	0	0	0	0	0	0	0	1	0.5
List	0	0	1	1.3	1	1.0	3	1.4	2	1.0
Make	0	0	1	1.3	0	0	0	0	0	0
Match	0	0	0	0	0	0	4	1.8	0	0
Name	4	19.1	1	1.3	1	1.0	3	1.4	0	0
Organise	0	0	0	0	2	2.0	0	0	1	0.5
Outline	0	0	0	0	0	0	1	0.5	4	2.0
Prioritise	0	0	0	0	2	2.0	0	0	0	0
Select	0	0	0	0	0	0	0	0	9	4.4
State	0	0	1	1.3	1	1.0	0	0	3	1.5
Tabulate	0	0	0	0	0	0	1	0.5	7	3.4
Use	0	0	0	0	1	1.0	0	0	0	0
What	0	0	0	0	0	0	2	0.9	1	0.5
Write	4	19.1	24	31.6	24	24	26	11.7	41	20.0
Total	**21**	**100**	**76**	**100**	**100**	**100**	**222**	**100**	**205**	**100**

(v) Action verbs used in all academic levels for the year 2003 – 2007

Action verbs/ question stems used	First year		Second year		Third year		Forth year		Average	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Analyse	23	9.6	34	20.0	58	20.4	86	13.8	201	15.2
Answer	0	0	0	0	5	1.8	0	0	5	0.4
Calculate	0	0	0	0	5	1.8	0	0	5	0.4
Choose	20	8.4	30	17.7	25	8.8	56	9.0	131	9.9
Circle	0	0	0	0	0	0	120	19.2	120	9.1
Compile	2	0.8	0	0	0	0	1	0.2	1	0.1
Compare	0	0	0	0	1	0.4	0	0	3	0.2
Complete	0	0	0	0	3	1.1	0	0	3	0.2
Contrast	0	0	0	0	1	0.4	0	0	1	0.1
Create	0	0	1	0.6	0	0	0	0	1	0.1
Define	17	7.1	8	4.7	5	1.8	24	3.8	54	4.1
Describe	11	4.6	8	4.7	35	12.3	75	12.0	129	9.8
Determine	0	0	0	0	2	0.7	0	0	2	0.2
Develop	2	0.8	1	0.6	1	0.4	5	0.8	9	0.7
Differentiate	0	0	0	0	9	3.2	1	0.2	10	0.8
Discuss	17	7.1	20	11.8	32	11.2	25	4	94	7.1
Distinguish	1	0.4	0	0	0	0	0	0	1	0.1
Draw	0	0	0	0	2	0.7	0	0	2	0.2
Evaluate	0	0	0	0	1	0.4	1	0.2	2	0.2
Explain	28	11.7	17	10.0	11	3.9	25	4.0	81	6.1
Formulate	0	0	0	0	2	0.7	3	0.5	5	0.4
Give	0	0	1	0.6	9	3.2	2	0.3	12	0.9
How	2	0.8	0	0	0	0	3	0.5	5	0.4
Identify	2	0.8	10	5.9	5	1.8	9	1.4	26	2.0
Illustrate	0	0	0	0	0	0	11	1.8	11	0.8
Indicate	0	0	0	0	1	0.4	1	0.2	2	0.2
Interpret	1	0.4	0	0	1	0.4	0	0	2	0.2
Justify	0	0	0	0	1	0.4	0	0	1	0.1
Label	0	0	0	0	0	0	1	0.2	1	0.1
List	10	4.2	4	2.4	5	1.8	7	1.1	26	2.0
Make	0	0	1	0.6	0	0	1	0.2	2	0.2
Match	36	15.1	10	5.9	33	11.6	4	0.6	83	6.3
Mention	0	0	0	0	1	0.4	0	0	1	0.1
Name	3	1.3	0	0	0	0	9	1.4	12	0.9
Organise	0	0	0	0	0	0	3	0.5	3	0.2
Outline	1	0.4	4	2.4	1	0.4	5	0.8	11	0.8
Plan	0	0	4	2.4	0	0	0	0	4	0.3
Prioritise	0	0	0	0	0	0	2	0.3	2	0.2

Record	0	0	0	0	17	6.0	0	0	17	1.3
Select	18	7.5	0	0	0	0	9	1.4	27	2.1
Show	0	0	4	2.4	0	0	0	0	4	0.3
State	5	2.1	1	0.6	7	2.5	5	0.8	18	1.4
Tabulate	5	2.1	3	1.8	1	0.4	8	1.3	17	1.3
Use	1	0.4	1	0.6	0	0	1	0.2	3	0.2
What	3	1.3	5	2.9	4	1.4	3	0.5	15	1.1
Which	20	8.4	2	1.2	0	0	0	0	22	1.7
Who	1	0.4	0	0	1	0.4	0	0	2	0.2
Why	0	0	1	0.6	0	0	0	0	1	0.1
Write	10	4.2	0	0	0	0	119	19.0	129	9.8
Total	**239**	**100**	**170**	**100**	**285**	**100**	**625**	**100**	**1319**	**100**

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UNIVERSITY OF KWAZULU-NATAL

14 NOVEMBER 2006

MRS. M GAREKWE (203508641)
NURSING SCHOOL

Dear Mrs. Garekwe

ETHICAL CLEARANCE APPROVAL NUMBER: HSS/06676A

I wish to confirm that ethical clearance has been granted for the following project:

"Analysis of cognitive levels of examination questions set in the Bachelor of Nursing programme at University of KwaZulu-Natal (UKZN)"

Yours faithfully

MS. PHUMELELE XIMBA
RESEARCH OFFICE

cc. Faculty Office (Sugen Reddy)
cc. Supervisor (Dr. N Mtshali)

UNIVERSITY OF
KWAZULU-NATAL

Wednesday, November 22, 2006

Ms Masaitsiweng Garekwe

C/O School of Nursing

University of KwaZulu-Natal

Dear Ms Garekwe

Permission to collect data from the Bachelor of Nursing Programme

Please be advised that permission has been granted for you to collect your data from the examination papers used in a BN programme, School of Nursing, University of KwaZulu-Natal.

We will you all the best in your research project. Please observe the ethical principles as detailed in your proposal.

Sincerely

Professor O Adejumo

(Head of School)

School of Nursing, Howard College Campus

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