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The effect of problem-based learning on medical libraries in South Africa

by

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DEDICATION

I dedicate this work to my father, Mr Simon B. Msebe.

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ABSTRACT

The study investigated the effect of problem-based learning (PBL) on medical libraries in South Africa. PBL, as a teaching/learning method, has been used in medical schools throughout the world for the past twenty or more years. It was introduced into South African medical schools in the early 1990s. Its impact was felt beyond the academia. Libraries, as engines of the institutions at which they are based, were greatly affected by the introduction of PBL.

Data for the study was gathered by means of a self-administered questionnaire. It was administered to 15 medical librarians who work in the eight medical school libraries of South Africa. A response rate of 87% was achieved, which was excellent for data analysis and reporting. Thus the results could be generalized for the entire population.

The findings of the study revealed that PBL had an effect on the services librarians provide. The use of PBL, by its very nature, encourages both individual and group fact-finding. Students, therefore, make greater use of library materials. The introduction of PBL had an effect on both medical librarians and library resources.

South African medical libraries generally have adequate collections (both print and online), physical layout, facilities and financial resources to support PBL effectively, although there is room for improvement. Similarly, medical librarians possess the knowledge and skills that are required to provide effective support for PBL. Medical librarians in South Africa have established collaborative relationships with academics regarding course design. This enables them to provide a relevant service for their users.

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LIST OF ABBREVIATIONS AND ACRONYMS

CBE	Community-based Education
ICTs	Information Communication Technologies
IFLA	International Federation of Library Associations
IT	Information Technology
Medunsa	Medical University of South Africa
LAN	Local Area Network
OLS	Open Learning System
OPAC	Online Public Access Catalogue
PBL	Problem-based learning
SANHIP	South African National Health Information Partnership
SDL	Self-Directed Learning
UKZN	University of KwaZulu–Natal
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNITRA	University of Transkei
USA	United States of America
WebCT	Web Course Tools
WHO	World Health Organization
Wits	University of the Witwatersrand

CHAPTER 1

INTRODUCTION

1.1 Background to the study

The education of doctors is a continuous process. Medical school courses normally last five years and have, in addition, one or two clinical years. This is followed by training in the particular specialty chosen by the doctor. The latest development in undergraduate medical education includes the introduction of a new curriculum. This new curriculum, known as problem-based learning, or PBL, has laid the foundation for a fundamental change in the way medical students are taught, with the emphasis shifting from the acquisition of knowledge to the learning process, including the development of skills to communicate effectively with patients (Dorrington 2006:598).

Barrows and Tamblyn (1980) state that in the 1960s and 1970s a group of medical educators became increasingly aware of the need to rethink how and what to teach to better prepare physicians for the demands of professional practice (in Wilkerson and Gijselaers 1996:1). They criticized traditional health sciences education for its excessive emphasis on memorization, its fragmentation and its failure to equip graduates with problem-solving skills required for a lifetime of learning. They reasoned that professional practice required skills in problem-solving, including an ability to acquire essential data, to synthesize the data into possible hypotheses and to test those hypotheses through acquisition of additional data (Wilkerson and Gijselaers 1996).

According to Barrows and Tamblyn (1980), PBL is a method of learning in which the learners first encounter a problem, followed by a systematic, student-centred enquiry process (in Schwartz, Mennin and Webb 2001:2). The purpose of using problems in PBL is to stimulate learning of information and concepts brought out by the problems, rather than to solve the problems. PBL teaches a method of approaching, and an attitude towards, problem-solving.

PBL is a teaching strategy that takes everyday situations and creates learning opportunities from them. This model is collaborative in nature and uses interactive applications to engage groups of learners fully, by introducing real-life, or simulated, problems that need to be solved (Macklin 2001:307). One PBL simulated patient case begins in the following way:

> Sandy Horton is a 42-year old housewife who comes to your office with a one-year history of difficult breathing on exertion. The problem has become significantly worse over the last one or two months. Also, Mrs Horton notes excessive fatigue and a sensation of chest pressure with physical activity. This morning she developed palpitations (sensation of irregular and fast heart rate) associated with a feeling of being short of breath while at rest (dyspnea) (Timm *et al*., 2000 in Eldredge 2004:55).

Eldredge (2004:55) states that in a PBL curriculum medical students work through one simulated case per week in their tutorial groups. These tutorial groups meet regularly (for example, twice a week) and consist of about six students. Students have no prior reading or lectures to prepare them for this problem. They must rely on their existing collective knowledge and reasoning abilities to solve the problem through the PBL process. Medical libraries in higher education institutions provide services to all types of healthcare students and professionals. The challenge for librarians is ensuring that users are provided with access to the resources they need and the skills to use those resources to the benefit of a patient-centred environment. Librarians have to support differing user groups, who may have varying levels of computer and library skills and provide skills training on a wide variety of resources from their institutions.

PBL is an instructional methodology used where librarians can work together with lecturers to develop a seamless approach to integrating information retrieval directly into the curriculum. As more and more students begin their fact-finding by using search engines on the World Wide Web, librarians can take on a significant role in the

development of critical thinking skills, by introducing information literacy as a natural part of the learning process (Macklin 2001:307).

Students are given a problem to work on in a PBL setting. The problem helps students, especially novice researchers, evaluate the relevance of information. It creates a context for understanding which skills a student might use to effectively answer it. PBL requires the active engagement of the learner and encourages students to take direct responsibility for their learning.

Students are expected, individually and in groups, to use evidence and research findings as the basis of their approach to the medical problems presented to them. This generates a hunger for access to good-quality information. The information services offered by librarians have to align with this level of demand and electronic information sources, particularly bibliographic resources and web resources, play a key role (Foster 2003). In order to use library resources effectively, Foster (2003) recommends that students go through an information and Information and Technology (IT) skills development programme. This is seen to be key, by both the academics teaching the course and the librarians. The skills learned stay with the students throughout their medical careers. Librarians need to have the necessary skills and knowledge to transfer information retrieval skills to students, in order to assist in supporting PBL.

The effective use of library resources has an impact on the library collection as well. The PBL approach means that students have to use the medical literature extensively. Medical libraries in South Africa need to be well equipped in terms of resources to meet this challenge.

1.2 Statement of the problem

Libraries in higher learning institutions play a crucial role in supporting the curriculum by providing resources such as books, journals (both print and on-line) and databases. The problem on which this study is based is whether or not medical libraries in South

Africa are equipped in terms of resources to support PBL effectively and if librarians have the skills and knowledge to assist in supporting PBL.

A further problem that has been identified in the sources consulted thus far (Cheney 2004; Snavely 2004) is that medical librarians are not part of the design of courses. They do not play any active role in the design stage of the teaching process. They assist students only when students ask for help after being given assignments by their lecturers.

Librarians have to be knowledgeable and expert in using not only resources provided by their own institutions but also the Internet. Recent developments in Web-based support for learning to use software such as Web Course Tools (WebCT) and Open Learning System (OLS) are providing libraries with new methods of delivering and supporting information literacy programmes. It is important for librarians to master these skills in order for them to be major supporters of PBL.

The present study focuses on the effect of PBL on medical libraries only. As has been noted from the literature (Cheney 2004; Dorrington 2004; and Snavely 2004), PBL as a teaching method has been adopted in other disciplines as well. The effect of PBL in other disciplines has been excluded.

1.3 Rationale for the study

Studies (Butler, Inman and Lobb 2005; Hendry *et al*., 2006) have examined the effect of PBL on students. These studies were aimed at ascertaining students' perceptions of, and attitudes to, PBL and the effectiveness of PBL as a learning/teaching method.
The present researcher has found, having studied the available literature and research, that there is a lack of research done on the effect of PBL on medical libraries in South Africa.

Sources consulted thus far suggest that the few articles written about PBL in South African universities are written by academics in institutions which have implemented

PBL as a teaching and learning method (Iputo 1997; Meel 2003; and Igumbor *et al*., 2006). There is a need for studies or research papers that capture librarians' experiences of PBL in their academic institutions.

In PBL the key issue for academic medical librarians is to provide information literacy knowledge and skills education and training to undergraduate medical students and academic staff and provide support for students, often using different versions of core databases. This key issue in PBL has implications for the training that librarians have to undertake for themselves in order to gain the knowledge and experience needed to teach information knowledge and skills programmes. The purpose of this study, therefore, was to investigate ways in which PBL has affected medical libraries in South Africa.

As a medical librarian the researcher has a personal interest in understanding the effect that PBL has on medical libraries, especially in the areas of skills (the professional skills librarians need to possess in order to facilitate PBL in their institutions) and library resources (are medical libraries sufficiently equipped to support PBL?).

The results of the study will hopefully assist medical librarians to be better equipped to deal with the challenges brought by PBL. The results may also help new medical librarians who enter the profession to understand what problem-based education is and the role that medical librarians should play in ensuring that adequate, effective and efficient support is given to students and lecturers regarding PBL. Students cannot solve problems if they do not know how to locate the information they need. The results of the study will also hopefully assist in establishing collaborative partnerships between medical librarians and lecturers.

1.4 Purpose and research questions

The purpose of the study was to ascertain the effect of PBL on medical libraries. This study will attempt to answer the following questions regarding medical librarians in South Africa:

- Has there been a change in the way librarians conduct user education since the introduction of PBL?
- Are medical libraries adequately equipped, in terms of the collection, physical layout, facilities and financial resources, to support PBL?
- What knowledge and skills do librarians need to participate effectively in PBL?
- Is there any collaboration in the design of courses between lecturers and librarians?
- How should the collaboration/partnership between lecturers and librarians be established?

1.5 Definitions of PBL

There are various definitions of PBL, which include the following:
Barrows and Tamblyn (1980) define PBL as a method of learning in which learners first encounter a problem, which is then followed by a systematic, student-centred enquiry process (in Schwartz, Mennin and Webb 2001:2).

PBL is an instructional method characterized by the use of patient problems as a context for students to learn problem-solving skills and acquire knowledge about the basic and clinical sciences (Davies and Harden 1999:4).

PBL is a form of education in which information is mastered in the same context in which it will be used. It is a student-driven process, in which the student sets the pace and the role of the teacher becomes one of guide, facilitator and resource (Donner and Bickley 1993:294).

PBL is generally described as a student-centered learning in which students generate study issues with faculty guidance (Marshall *et al.*, 1993:300).

Problem-based learning is a pedagogical strategy for posing significant, contextualized, real-world situations and providing resources, guidance and instruction to learners as they develop content knowledge and problem-solving skills (Mayo, Donnelly, Nash and Schwartz 1993).

Engel (1989) describes problem-based learning as a "means of developing learning for capability rather than learning for the sake of acquiring knowledge" (in Boud and Feletti 1997:15).

In some ways, what PBL is seems self-evident: it is learning that results from working with problems. Official descriptions generally describe it as "an instructional strategy in which students confront contextualized, ill-structured problems and strive to find meaningful solutions" (Rhem 1998:1).

The common factor among all these definitions is the fact that PBL is a student-centred pedagogical strategy which uses real-life patient problems to teach students problem-solving skills. These skills in turn prepare students for medical practice in the medical environment.

1.6 Theoretical framework

The methodology of PBL centres on the cognitive psychology theory that states that new knowledge is always constructed on what is already known (Boud and Feletti 1991 in Macklin 2001:307). The present study is based on the theory of constructivism, which is a cognitive perspective to learning that, at its core, holds that knowledge is constructed by the learner and developed through experience. Gergen (1999) defines constructivism as a view in which an individual mind constructs reality, but within a systematic relationship to the external world (in Talja, Tuominen and Savolainen 2005). The names of Jean Piaget and George Kelly are associated with this position.

Bush (2006:14) states that learning is a search for meaning; we construct our own understanding of the world. Information that is registered as input is matched with previously stored knowledge. The new understanding is, again, stored for future use and now has more connections.

The crux of constructivism is in the active construction of meaning through interactions with the social and the physical environment (Bush 2006). Constructivism is a deeply textured perspective on learning, because it has both theory and practice at play. Without the social learning aspect, constructivism could be problematic for educators. The learning environment has a necessary social community component that ensures that students share a negotiation of sorts when constructing meaning from content knowledge. Social learning also lends itself to learners giving up misconceptions that are individually held as the group comes to a shared understanding (Bush 2006:15).

In information science, constructivist ideas are commonly labeled under the cognitive viewpoint. Talja, Tuominen and Savolainen (2005) define cognitive constructivism as a metatheoretical position that sees knowledge production as the creation of mental models. This position has been influenced by Piaget's theory of cognitive development, proposing that humans cannot be given information which they immediately understand and use. Instead, humans must construct their own knowledge. Individuals build their knowledge through experiences that enable them to build mental models of the world. Mental models consist of schemas, scripts and knowledge structures. These models may change and become more detailed and sophisticated as individuals receive new sensory data or encounter novel situations.

Cognitive constructivists start with the assumption that the individual mind generates knowledge by creating knowledge structures and mental models which represent the world and mediate or filter information (Talja, Tuominen and Savolainen 2005). Constructivist theories in information science assume that the individual mind is the most important arena on knowledge creation. The constructivist theory has been chosen as a theory on which the present study is based because the constructivist theories underlined

that information is not a pill an individual can swallow in order to become informed, but a plastic substance that can be shaped in many ways. An information user is not a passive information processing system, but actively makes sense of the surrounding reality and attaches meanings to information (Talja, Tuominen and Savolainen 2005).

The theory of constructivism includes knowledge integration instead of compartmentalization, meaningful learner involvement and effective utilization of a variety of information resources for curricular activities, continuous assessment and collaborative learning (Marlow and Page in South Africa. Department of Education 1999:32).

According to Jonnasen (1994:34), the guidelines to how knowledge construction can be facilitated include:

- Creation of real-world environments that promote contextualized learning;
- Provision of tools and environments that help learners interpret the multiple perspectives of the world;
- Provision of multiple representations of reality; and
- Focus on knowledge construction and not reproduction.

A medical library has a crucial role to play in meeting these principles through its policies, programmes, resources and strategies, that reflect constructivist pedagogy by providing the real-world environment, learning tools, varying interpretations of reality depicted in numbers of resources and by focusing on the individual's active construction of knowledge. The theoretical basis for this study is supported by the International Federation of Library Associations/United Nations Educational, Science and Cultural Organization (IFLA /UNESCO) University Library Manifesto (1999), which provides a framework for the evaluation of university libraries. The Manifesto is based on the United Nations Universal Declaration of Human Rights and Freedom. The Manifesto states that access to services and collections should not be subject to any form of ideological, political or religious censorship, or commercial pressures. It explains how the

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library contributes to education by providing information and ideas that are fundamental to functioning successfully in today's information and knowledge-based society. The medical library offers learning services, books and resources and links with the wider library and information network, in an effort to achieve its objectives.

1.7 Delimitations of the study

This study focuses on the effect of PBL on medical libraries only. As has been noted in the literature (Cheney 2004; Dorrington 2004; and Snavely 2004), PBL as a teaching method has been adopted in other disciplines as well. The effect of PBL in other disciplines has been excluded.

1.8 Summary

The purpose of this study was to investigate the effect of problem-based learning (PBL) on medical libraries in South Africa. In this introduction, a brief background of the study, the statement of the problem, the rationale for the study and questions to be asked, as well as the definition of the term "problem-based learning", were explored. Constructivism, the theory on which this study and theoretical framework is based, was discussed.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Taylor (2006) states that a literature review provides a classification and evaluation of what accredited scholars and researchers have written on a topic, organized according to a guiding concept such as the research objective or the problem a researcher wishes to address. It is a critical summary of related studies on research under study, generally surveyed to put the study in context and provide an integrated overview of the field of research.

In this chapter the concept of problem-based learning (PBL) as a teaching/learning tool, as well as other topics such as the role of medical libraries, the introduction of PBL in medical schools internationally and in South Africa, and its impact on medical libraries, are discussed in detail.

2.2 The role of medical libraries

According to Tarbor (in Besson 1990:301), the wealth of medical literature is increasing at an exponential rate and this contributes to a significant change in the nature and role of medical and health care libraries. There is also an increasing emphasis on the information service aspects of libraries, particularly as they serve a wide range of practitioners. Further influences on such changes include the sophistication of information technology and the rapid rate of its application in health care libraries. It is now possible to search on-line databases and catalogues and retrieve information rapidly from the medical literature, which could not be done twenty years ago. Information Communication Technologies (ICTs) have played a large part in this development and facilitated the accessibility of major libraries and their collections in a way not previously possible. In

this age of the "virtual library", the world's collections of health sciences literature are brought to the individual at his/her place of work through the use of a personal computer on the desk of a user (Tarbor in Besson 1990:301).

The medical library assumes responsibility for teaching its users on a daily basis (Carroad and McGregor in Darling 1982:237). Medical libraries endeavour to interact actively with users by providing instruction in bibliographic techniques and user education programmes. Such programmes have demonstrated that the library staff are increasing their efforts to become an integral part of the medical education team. These programmes include activities that place the library or the medical librarian almost entirely in a teaching role. Increasingly, medical librarians are offering multiple instructional approaches aimed at a variety of professionals, preprofessionals and other library users (Carroad and McGregor in Darling 1982:237).

According to Lindberg and Humphreys (2005:1067), the primary purpose of a medical library is to provide scholarly information to support health care, education and the research conducted at the institutions/universities in which the library is based. Carroad and McGregor (1982) point out that libraries have always been viewed as educational support units (in Darling 1982:238). Collection development policies have been formulated in good measure in response to formal and continuing education needs. The existence of the medical school library is intimately linked to curricular goals. Students rely on the medical library to provide them with course-related materials, including required and supplementary reading.

Differences between medical and general libraries are evident in the collection, clientele and budget and space requirements. Whereas the majority of the materials in a general university or public library are books, the greater proportion of the medical library's collection consists of serials and electronic resources (e-journals, e-books and databases).

Periodicals and electronic resources are of prime importance in medicine because they carry reports of advances in the study of disease, methods of diagnosis and treatment and uses of new drugs. Publication in journals (both print and electronic) puts them within reach of practicing physicians and researchers at the earliest possible time (Brandon in Annan and Felter 1970:2). Journals are an important vehicle for disseminating peer-reviewed research results (Lindberg and Humphreys 2005:1067).

In order to select appropriate support materials, the library directly seeks and obtains information concerning instructional programmes. Methods for meeting this objective include routinely obtaining class reading lists, meeting formally or informally with academic staff in the faculty to discuss curricular trends and also receiving suggestions for book and/or journal orders from academic staff and/or students (Carroad and McGregor in Darling 1982:238).

According to Carroad and McGregor (1982), the objective of instructional activities, regardless of format, is to bring needed information to more library users than could be served on a one-to-one basis (in Darling 1982:239). Important by-products of the library's teaching endeavours are an enhanced image of the library and a more supportive library clientele. The heightened awareness of available library resources and services helps users to view the library as a vital institution. This attitude may have a direct effect on library budgets and staff positions apportioned to the library by the medical school, university, or any other parent institution (Carroad and McGregor in Darling 1982:239).

Medical libraries are fundamental to the practice of health care and to medical education and research. Their importance in the whole spectrum of library services is directly related to the importance which individuals and society give to health services. Matthews and Picken (1979:11) state that medical libraries are essential for the organization and retrieval of the vast and continuously expanding fields of knowledge in the health sciences and thus to the effective delivery of health care.

The basic role of a medical librarian has not significantly changed throughout history. It has been, and remains, to collect information and organize it for effective use. What has changed is the environment in which this role is carried out and the tools used to accomplish the tasks (Braude 1997:1). Over the one-hundred-year history of the evolution of health sciences librarianship, specialty education has been used as the mechanism for differentiating between medical librarianship and other types of librarianship and for acquiring skills and knowledge to succeed in the profession (Braude 1997:1).

2.3 Definition, historical perspective of PBL in medical libraries and rationale for PBL in medical schools

In this section the conceptual definition of the term "PBL", the history of PBL, the justification for the introduction of PBL in medical schools and how this has affected medical libraries, are discussed.

2.3.1 Conceptual definition of PBL

There is no universal definition of problem-based learning, and a measure of misunderstanding prevails regarding both its philosophy and practice (Spencer and Jordan 1999:1281). The term is used, for example, to describe both an educational method and a curricular philosophy. This has important implications for evaluation, research and comparisons of programmes.

PBL is generally understood to mean an instructional strategy in which students identify issues raised by specific problems to help develop understanding about underlying concepts and principles (Spencer and Jordan 1999:1281). The focus is usually a written problem comprising phenomena/concepts that need explanation. New knowledge and understanding arise through working on the problem, rather than in the traditional approaches in which the new knowledge is a prerequisite for working on the

problem. A better term for the approach might be "problem first learning" (Spencer and Jordan 1999:1281). Dolmans and Schmidt (1996) regard PBL as a systematic attempt to apply findings of cognitive psychology to educational practice (in Spencer and Jordan 1999:1282).

According to Boud (1985a:13 in Boud and Feletti 1991:13), the basic view of what constitutes problem-based learning is that:

> The principal idea behind problem-based learning is … that the starting point for learning should be a problem, a query or a puzzle that the learner wishes to solve.

PBL is a way of constructing and teaching courses using problems as a stimulus and focus for student activity (Boud and Feletti 1991:13). Rhem (1998) defines PBL as learning that results from working with problems. It is an instructional strategy in which students confront contextualized, ill-structured problems and strive to find meaningful solutions.

PBL is generally described as student-centred learning in which students generate study issues with lecturer/tutor guidance. Students are encouraged to pursue their own learning using a variety of resources, ranging from the medical literature and laboratory work to clinical observation and consultation with experts (Marshall *et al*., 1993:300).

Donner and Bickley (1993:294) define PBL as a form of education in which information is mastered in the same context in which it will be used. In medical terms, PBL is seen as a student-driven process in which the student sets the pace and the role of the teacher becomes one of guide, facilitator and resource.

2.3.2 History of PBL

Problem-based learning has been described as one of the most significant developments in professional education (Spencer and Jordan 1999:1281). It has been endorsed by

bodies such as the World Health Organization (WHO) and is increasingly proposed as a solution to both the ills of medical education and new challenges such as clinical governance.

According to Rankin (1992:36), Spencer and Jordan (1999:1281) and Boud and Feletti (1991:14), PBL is not a new concept in education. Its roots go back in history as far as Plato and the Socratic pedagogy and its manifestations have been varied. In medicine today, PBL is understood to mean a highly structured, student-centred, educational methodology.

In 1889 a method known as "multiple working hypotheses" was advocated (Chamberlin 1965 in Spencer and Jordan 1999:1281). Dewey, one of the educational theorists of the early part of the 21st century, recommended that students should be presented with real-life problems and then helped to discover the information required to solve them. Later, other workers showed that giving students ready-made solutions for problems was "manifestly ineffective" for learning (Salih 1985 in Spencer and Jordan 1999:1282).

According to Butler, Inman and Lobb (2005:194), the contemporary incarnation of PBL in medical schools began in the late 1960s at McMaster University's School of Medicine and is now widely disseminated. The people who set up the McMaster University programme envisioned a learning style that is very different from didactic lectures. The first report of the McMaster University's education committee in 1967 placed an emphasis on problem-solving. Howard Barrows, first as a visiting professor from July 1968-1969 and then as a member of the faculty from January 1971 to September 1980, introduced the more advanced concept of PBL (Butler, Inman and Lobb 2005:194).

The workplace of the 21st century requires professionals who not only have an extensive store of knowledge, but who also know how to keep that knowledge up-to-date, apply it to solve problems and function as part of a team (Evensen and Hmelo 2000:1). This revised view of the workplace compels educators to rethink and reinvent the ways in

which professionals are prepared. Schooling, in particular, must extend beyond the traditional preparatory goal of establishing a knowledge base. In order to realize this goal, educators have adopted constructivist pedagogical designs that are based on the assumption that learning is a product of both cognitive and social interactions in problem-based environments (Savery and Duffy 1995). Problem-based learning is an example of such a design.

Khoo (2003) states that concern with rigidity and over-emphasis on memorizing of large volumes of information in medical education is not a new phenomenon. In 1899 Sir William Osler recommended abolishing lectures and allowing medical students more time for self-study (Khoo 2003:401). He asserted that a more important role of teachers was to help students develop their skills in observation and reasoning.

PBL as a general model was developed in medical education in the early 1970s and since then it has been refined and implemented in over sixty medical schools. The most widespread application of the PBL approach has been in the first two years of medical science curricula, where it replaces the traditional lecture-based approach to anatomy, pharmacology, physiology and so forth (Savery and Duffy 2001:7).

According to Boud and Feletti (1991:14), the notion of PBL is not new. It was the way in which learning took place before the advent of classrooms and curricula. What is new, however, is the way in which this ancient idea has been linked to an often sophisticated analysis of professional practice and to a humanistic technology of education to develop highly competent practitioners who have the ability to continue to learn effectively throughout their lives.

Boud and Feletti (1991:14) point out that PBL had its origins in the health sciences, where it was used as an approach to radically shift the medical curriculum from a collection of subjects representing individual discipline interests to an integrative programme of study which engaged students in problem formulation and problem-solving from their very first day.

The pioneers of PBL were the innovative foundation faculty in medical schools at Case Western Reserve University in the United States (USA) (in the 1950s) and McMaster University in Canada (in the late 1960s). At each of these institutions strong leadership advocated focusing on the quality of education and critically evaluating its effect on their respective environments. Their resultant curricula, featuring organ-system problem-based approaches, were examined cautiously in other North American medical schools (Bussigel, Barzansky and Grenholm 1988 in Boud and Feletti 1991:14).

McMaster University in Canada was one of the first medical schools to seriously adapt their curriculum by drawing on the principles of PBL. PBL was introduced at McMaster University in 1969. McMaster Medical School pioneered the first completely problem-based medical curriculum, with Maastricht following in 1974 as the first in Europe.

About 150 medical schools worldwide (some 10% of the total) have adopted problem-based curricula; in the United Kingdom, Manchester, Glasgow and Liverpool have taken this route, with several other schools, including St Bartholomew's, St George's, Birmingham and Newcastle introducing elements of PBL (Spencer and Jordan 1999:1282).

By the late 1970s PBL had spread worldwide, initially in medical education and related areas, but later in other professional fields. Since then, many medical schools in the USA, Canada, Europe and Africa have implemented PBL as part of their curricula.

The Network of Community-Oriented Educational Institutions for Health Sciences, an international organization of problem-based medical schools, was organized in 1979, with leadership from McMaster University in Canada and the Rijksuniversitetit Limburg in Maastricht, Netherlands. Today many more medical schools outside the USA than within provide problem-based curricula. The University of New Mexico and Mercer University were early pioneers in problem-based medical education in the USA (Rankin 1992:36).

2.3.3 Rationale for the introduction of PBL

Spencer and Jordan (1999:1280) state that medical education is a life-long process embracing pre-medical experience, undergraduate education, general clinical training, specialist or vocational training, subspecialty training and continuing medical education. The rationale for the introduction of PBL in any educational curriculum is based on the ability of PBL to make learning relevant for the student, to improve communication skills and to develop the ability to work in a co-operative manner with group members and to inculcate self-directed and life-long learning (Khoo 2003:401).

Khoo (2003:402) states that the PBL curriculum uses a problem (usually clinical) as a trigger for student learning. The philosophy of PBL involves using the theories of adult learning to foster life-long learning and self-directed learning in medical students. Thus PBL requires the student to be an active participant in the learning process. The students learn in small groups of six to ten and are expected to talk, question, learn and respond during the sessions. A tutor facilitates the learning process for each group and much of the learning is student-led, problem-based and self-directed. The tutor's role is that of facilitator (Martin 2003b:179). Throughout the PBL tutorial, they are expected to critically analyze, clarify and debate ideas, issues and diverse viewpoints. Therefore there has to be active communication, with the possibility of disagreements among the group members.

One of the arguments used to support the superiority of PBL is the concept of contextual learning. The basic premise is that when we learn material in the context of how it will be used, it promotes learning and the ability to use the information. In PBL, the problem is usually portrayed in the real-life context of a patient coming to visit a doctor, or some variation (Albanese 2000:733).

Schmidt (1983) in Albanese (2000:733) is of the opinion that information-processing theory underlies PBL. This theory involves three major elements: prior knowledge activation, encoding specificity and elaboration of knowledge. Prior knowledge

activation refers to students using knowledge they already possess to understand and structure new information. Encoding specificity refers to the fact that the more closely a situation in which something is learned resembles the situation in which it will be applied the more likely it is that transfer of learning will occur. This aspect of information-processing theory resembles the contextual learning theory used to support PBL. Elaboration of knowledge refers to the fact that information will be better understood and remembered if there is opportunity for elaboration (for example, discussion and answering questions). The three elements are commonly a part of PBL (Albanese 2000:733).

There is reasonably strong evidence that PBL has an effect on the learning environment. Woodward, Ferrier, Cohen and Goldsmith (1990) used records from the Canadian health care system to follow graduates of McMaster University (which was one of the first medical schools to adopt a PBL curriculum), in comparison with graduates of traditional medical schools as they entered medical practice (in Albanese 2000:736). The authors analyzed differences in how and where they practised medicine, as well as their efforts at furthering their medical education. The results showed that McMaster graduates were more likely to spend time in direct patient care, bill for more psychotherapy services per month, have an academic appointment, enter family medicine and be in group practice. The finding is that students and lecturers in PBL schools enjoy the education process more than those in traditional schools (Albanese 2000:736).

It would seem likely that students who enjoy their medical education experience and their interactions with their peers and instructors would be more likely to engage in life-long learning. As long as the costs of implementing PBL do not overtax the medical school resources, it would seem that investing in a more positive workplace environment for lecturers and students would be a worthwhile goal in and of itself (Albanese 2000:736).

According to Tosteson (1994), the strengths of PBL lie in its emphasis on teamwork, the fostering of long-term memory and the provision of a framework that sustains life-long learning (in Alleyne *et al*., 2002:273). This sentiment is echoed by Marshall *et al*.

(1993:302), who assert that students in a PBL programme use the library more frequently, for longer periods of time and more intensively than their counterparts in more traditional programmes.

Rankin (1992:36) states that the PBL curriculum covers the same subject content as the conventional curriculum, but has some additional educational aims. A primary educational aim is to teach problem-solving skills. The underlying premises, supported by research, are that problem-solving skills can be learned or enhanced and that these skills are essential to good clinical judgment.

A second educational aim is to integrate the basic sciences with the clinical sciences throughout the curriculum. This integration helps students see the relevance of the basic sciences to clinical medicine and establishes a tangible clinical base from which to retain the knowledge. A third educational aim is to develop life-long learners, a commitment required of today's doctors. The problem-based education setting promotes active, independent learning and thus is believed to nurture life-long learning habits (Rankin 1992:37).

Contemporary PBL medical programmes usually employ two fundamental principles: basic sciences are learned in the process of analyzing typical cases and learning is motivated by student curiosity (Donner and Bickley 1993:294). As used in medical education, the PBL curriculum is intended to meet three goals, which are:

- The student must acquire a body of basic biomedical knowledge equivalent to that learned in a traditional curriculum;
- The student must learn to apply this basic knowledge in patient care; and
- The student must acquire the attitudes, habits and techniques of a life-long learner (Donner and Bickley 1993:295).

At the core of PBL is the promotion of the merits of learner-centred and problem-oriented approaches to learning, which aim to produce doctors, better equipped with the adult

learning skills necessary for them to adapt to, and meet, the changing needs of the community they serve (Spencer and Jordan 1999:1280).

PBL is designed to focus on student-centred education, prioritize problem-solving, facilitate early clinical exposure, foster life-long and community-oriented learning principles (Myers, Saunders and Rogers 2002:473). Spencer and Jordan (1999:1282) have identified several benefits of PBL, which are:

- Promotes deep, rather than surface learning;
- Enhances and retains self-directed skills;
- Learning environment is more stimulating;
- Promotes interaction between students and staff;
- Promotes collaboration between disciplines, for example basic and clinical scientists;
- More enjoyable for students and teachers;
- Promotes retention of knowledge; and
- Improves motivation.

Martin (2003a:43) also identified benefits of PBL, which include:

- Students on a PBL curriculum tend to use library services at an earlier stage in their medical education;
- They conduct literature searches more routinely;
- They use journals in pre-clinical years; and
- They demonstrate a more independent approach to problem-solving.

Several disadvantages have been identified, which include the costs for starting up and maintenance, excessive demands on staff time, relative inefficiency, variable tutor quality, the need for supplemental training, reduced acquisition of knowledge of basic sciences and implementation difficulties when class sizes are large or where there is a

broad lack of enthusiasm for the approach (Spencer and Jordan 1999:1282; Donner and Bickley 1993:297).

However, the benefits of PBL to medical students (creating active, independent learners, holistic, divergent and creative thinkers, people who can solve problems or improve situations and better communicators) and tutors far outweigh the disadvantages (Drinan in Boud and Feletti 1991:295). The library benefits from partnerships with students and lecturers on PBL library instruction programmes in many ways, including the development of skilled library users, pre-trained future clientele and increased visibility in the parent institution (Tennant and Miyamoto 2002:181).

It should be noted that there is, as yet, no evidence that graduates of problem-based programmes make better or worse doctors in the long term (Spencer and Jordan 1999:1282; Uys *et al*., 2004:359).

2.4 The introduction of PBL in South African medical schools

During the past few years there has been mounting pressure from the South African Department of Health on schools of health professional education to embark on PBL (Uys *et al*., 2004:352). Medical schools at different universities embarked on a process of curriculum reform as a result of this, with nursing schools following shortly after. The purpose of the reform was to meet the needs of medical education in the twenty-first century (Myers, Saunders and Rogers 2002:473).

According to Igumbor and Kwizera (2005), there are eight medical schools in South Africa. These are the University of Cape Town, University of the Witwatersrand, University of Limpopo (Medunsa Campus), University of KwaZulu-Natal (Nelson R. Mandela School of Medicine), University of Stellenbosch, University of the Free State, University of Pretoria and the University of Transkei (UNITRA). The UNITRA School of Medicine is the only medical school which is situated in a previous homeland region. This medical school has been in existence since 1985 and has produced over 500 medical

graduates. Training in the initial years adopted the traditional medical curriculum approach, characterized by distinct disciplines in the basic, pre-clinical and clinical years.

Doctors, policy-makers and medical educators, both within and outside UNITRA, expressed concern about whether or not the tertiary, hospital-based, technology-driven, western-style traditional curriculum adopted would result in doctors who were effective communicators, loyal team members, prudent managers of scarce resources and providers of comprehensive primary care (Iputo and Kwizera 2005:388).

These attributes were deemed to be the basic essentials for doctors working in the rural and impoverished environment of the Transkei. The consensus, therefore, was that in order for UNITRA to realize its ambition, it had to adopt an innovative programme of community-based education (CBE) and that the pedagogical approach to be used would be one of PBL in small tutorial groups.

This educational pedagogy was adopted with effect from 1992, for which the school is under consideration as a WHO collaborating centre for PBL/CBE (Igumbor and Kwizera 2005:417; Iputo and Kwizera 2005:388).

In 1997, the Nelson R. Mandela School of Medicine Faculty Board accepted a proposal to introduce Curriculum 2001, a self-directed learning (SDL) and PBL curriculum that replaced the traditional, discipline-based curriculum in January 2001. A comprehensive survey of various aspects of students completing years one to five of the traditional six-year curriculum was undertaken. At the final year-end examinations in November 2000, students completed an anonymous questionnaire covering different aspects of their experiences in the faculty (McLean 2004:143). This study, involving traditional curriculum students, provided some of the foundations for comparing PBL students in Curriculum 2001. The new programme introduced students to patients only three months into their studies (McLean 2004:148), compared to the traditional curriculum, in which exposure to patients was delayed.

In 1998, the faculty at the University of the Witwatersand (Wits) identified the attributes that it wished its graduating students to possess (Myers, Saunders and Rogers 2002:474). These attributes included the need to acquire and be able to demonstrate acceptable standards in the essential skills of medicine, the ability to evaluate medical literature critically, as well as to use a modern library effectively in order to keep up-to-date with new developments. The faculty then investigated various PBL curricula, worldwide. The electronic medical curriculum of the University of Sydney was purchased for development in 2001. The faculty decided to adopt a "hybrid" approach, which incorporated a case-based PBL approach within the more traditional format of lectures and interdisciplinary training (Myers, Saunders and Rogers 2002:474).

Although the five other medical schools (University of Cape Town, University of Limpopo-Medunsa Campus, University of Pretoria, University of Stellenbosch and the University of the Free State) have also adopted PBL as a teaching/learning tool, no empirical studies on the introduction of PBL in these medical schools have been conducted.

2.5 Challenges facing medical libraries in Africa, including South Africa

As in all library services, the purpose of the medical library is to serve its parent institution and, therefore, to fulfill the vision and mission of that institution. According to Matthews and Picken (1979:11), medical librarianship is fundamental to the practice of health care and to medical education and research. Medical libraries are essential for the organization and retrieval of the vast and continuously expanding fields of knowledge in the health sciences and thus to the delivery of health care.

Medicine differs from many other subject fields in many aspects, for example, its breadth and depth, its antiquity and cumulative growth upon earlier knowledge and the extent to which it has been bibliographically organized (Matthews and Picken 1979:12). Medical literature, for example, is divided into two broad groups, which are the basic medical sciences and clinical medicine. Clinical medicine subdivides into about thirty different

specialties, each with its own specific literature, and the basic medical sciences now encompass a far wider range of subjects than the three classics of anatomy, physiology and biochemistry (Matthews and Picken 1979:63). A considerable financial commitment is required to enable the medical library to provide even the most basic coverage.

According to Rankin (1992:37), medical students are the heaviest users of academic medical libraries. Their information needs are often for textbooks and for general and overview material. DaRosa (1983) points out, however, that usually medical students exhibit limited efficiency in finding information (in Rankin 1992:37). The challenge for medical librarians, therefore, is to intensify information literacy programmes, in order to ensure the optimal use of library resources. In environments where medical librarians are faced with severe staff shortages and ever-dwindling budgets, this could prove to be a mammoth task.

The connection between library use, learning and the PBL curriculum has been obvious to PBL educators and medical school administrators (Rankin 1992:38). PBL faculty members interpret learning resources broadly. They suggest that a rich variety of resources are needed to support the student in the PBL curriculum: printed material, audiovisuals, models and specimens, subject experts and health related services and programmes (Rankin 1992:38). However, budget allocations for medical libraries do not always reflect the expectations that academic staff place on them. Increasingly, more has to be achieved with minimal resources.

A University of New Mexico study, done by Saunders, Northup and Mennin (1985), confirmed the connection between library use and the PBL curriculum (in Rankin 1992:38). It reported that students in the PBL curriculum spent more study time in the library, consulted colleagues and lecturers for information more often, relied less on textbooks and used a greater variety of information resources. It is very important that medical school administrators take cognizance of this fact, in order to enable the medical library to meet these challenges.

Marshall *et al*. (1993:304) point out that the nature of the PBL curriculum itself, with its emphasis on self-directed learning and resource identification and use, has a major impact on the medical library. Medical librarians and lecturers, therefore, should consider the increased demands that PBL students are likely to make on the medical library, particularly in the first two years of the programme.

The information explosion continues unabated and institutions are becoming more and more information intensive. This makes it difficult for users to stay current on what is available and increases their demand for relevant information. Librarians/information specialists must be able to sift, sort, index, abstract, package and analyze information. They must continually canvass their current and potential users, formally and informally, about their information needs and troll the world of information to keep current on what is available. This will enable them to streamline and target their services to the users' requirements and anticipate and prepare for future needs (Myers and Sherwood 1996:17).

However, regardless of what librarians are called in the profession or how much more technology is used to access information through library resources, Barh (2000) points out that the most effective librarians in the new millennium will be those who empower learners and who facilitate the teaching and learning process. Given the insufficiencies of professional staffing and budgets in most academic libraries, the level of curriculum involvement that PBL requires may seem like an unattainable goal. However, emphasis should be put on the necessity of librarians' enhanced teaching roles and this may help to make the necessary arguments to prioritise new librarian positions and obtain other resources when opportunities arise (Barh 2000).

2.6 The effect of PBL on medical libraries

The key question for librarians and medical educators who are planning for curriculum change of whether students and lecturers in PBL programmes use the library and its resources more differently than do participants in traditional programmes, was explored at three medical schools in the province of Ontario, Canada, in 1991 (Marshall *et al*.,

1993:299). At the time of the study, McMaster University Medical School was totally problem-based, the University of Western Ontario had one PBL day each week for first-year medical students and the University of Toronto, although planning for medical curriculum change, had not yet initiated PBL.

Marshall *et al*. (1993:299) point out that data collected in the study suggest that more medical students in PBL than in the more traditional programmes use the library and that, when PBL students use the library, they do so more frequently, for longer periods of time and as a source of a greater proportion of their study materials. PBL students also use the library more than their counterparts as a place to study and meet other students. Students in the problem-based curriculum used the following sources more extensively:

- End-user MEDLINE searching;
- Library journals;
- Reserve or short-term loan materials;
- Photocopy services; and
- Audiovisual materials.

PBL students also reported purchasing more textbooks (Marshall *et al*., 1993:299). Earlier studies at single institutions such as McMaster University and the University of New Mexico suggest that resource use is one of the major differences between students in problem-based and traditional curricula (Martin 2003b:180; Marshall *et al*., 1993:300).

It is important to note that while library and resource use may be affected by many factors, such as library location, collection, physical facilities and number and quality of library staff, it seems unlikely that these factors could be entirely responsible for type and magnitude of differences observed in this study. Marshall *et al.* (1993:304) assert that the nature of the PBL curriculum itself, with its emphasis on self-directed learning and resource identification and use, has a major impact. The results suggest that librarians and medical educators should consider the increased demands that PBL students are likely to

make on both the medical school and medical libraries, particularly in the first two years of the programme.

The results of the study described by Marshall *et al*. (1993:304) bring out a point which is worth noting. The patterns of library and resource use by medical staff at the three schools were quite similar. Since the differences in resource use appear to be much greater for PBL students than for PBL lecturers, convincing medical school management of the increased resource needs, especially in times of decreased budgets, may prove to be a challenge.

According to Myers, Saunders and Rogers (2002:474), user education plays an even greater role for students enrolled in PBL programmes than for those in traditional curricula, both as part of the PBL process and an enabler for life-long learning. Donner and Bickley (1993:295) stress that the PBL student comes to depend on texts and other library material far more completely than do students in a traditional programme. PBL students are conditioned to correct any lack of information immediately, as a case develops. They are not just advised to be life-long learners; they are trained to be.

Earl (1996:191) states that future physicians must learn to cope with continuing changes in access to medical information. Vast national and international computer networks allow physicians to investigate almost any topic. Instructional techniques, such as PBL, emphasize the importance of information-seeking skills and require the learner to search the literature. The need for bibliographic instruction links the library to the clinic, the patients' bedside, and the laboratory (Earl 1996:191).

Learner-centred approaches, such as PBL, challenge the traditional view of the lecturer as the person who determines what, when and how students will learn, with didactic teaching as the predominant method. Creating an environment in which students can learn effectively and efficiently becomes the new prerequisite, demanding not only that lecturers are experts in their fields but also that they understand how people learn (Spencer and Jordan 1999:1283).

Spencer and Jordan (1999:1283) point out that this has major implications in terms of staff development, with the recognition that changing a curriculum and keeping it going are unlikely to be effective if lecturers are not able to take on new roles. Such development needs to take place at all levels from the institutional to the individual, including academic/medical librarians (Brew 1995 in Spencer and Jordan 1999:1283).

PBL encourages students to acquire and assimilate knowledge to use in their personal and professional lives and learn how to make their own unique contributions for expanding and improving their fields. Academic/medical librarians need to facilitate this learning process and form part of the learning facilitation team. In order for librarians to best facilitate this learning process, there needs to be a re-evaluation of the traditional library instruction and an interface between lecturers and librarians that is closer than an invitation to do the occasional course-related guest lecture. Rather than talking at passive students, Bahr (2000) recommends learning by doing, with librarians available to advise and facilitate students' searches for knowledge in print and electronic format. Strategies that encourage life-long learning, rather than memorization of facts and figures, should be designed.

Allen (2000 in Bahr 2000) encourages librarians to converse with students rather than lecture in library instruction classes. He points out that the librarian's expertise is not so much in his/her subject knowledge but in knowing how to go about finding answers to questions. Wilkinson (2000 in Bahr 2000) encourages lecturers and librarians not to expect students to "parrot" information but help them to frame their own questions and learn how to find the answers. Research is necessary for true learning and librarians are uniquely positioned to assist this process and help students cope with data overload.

Librarians need to put themselves in the shoes of modern-day students and try to understand and respect their environment, pressures, perceptions and consequent information-seeking behaviours. According to MacAdams (2000 in Bahr 2000), students are outcome-oriented, so they measure success by the result, not by a separately constructed set of values. Given this, librarians then need to understand that formal

search strategies may not seem practical to busy students who have grown up in the age of the Web and they will not assimilate strategies when they are taught (MacAdams 2000 in Bahr 2000). In today's information-intensive environment, it is imperative that medical schools make library instruction a required part of the curriculum (Earl 1996:191).

This view is shared by Myers, Saunders and Rogers (2002:474), who emphasize that the library and its resources are an essential component of medical education. As medical schools locally and internationally have changed from the traditional curriculum to PBL, the effects on medical libraries that support these programmes have, as has been shown in the discussion above, been considerable.

2.7 Summary

In this chapter, PBL as a teaching strategy was explained in more detail. The chapter included an in-depth discussion of the conceptual definition of PBL, the history of PBL, the rationale for switching from the traditional curriculum to PBL, its benefits and disadvantages. The chapter concluded with a description on the challenges facing medical libraries as well as the effects of PBL on medical libraries.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

In Chapter 1 the research problem as well as the purpose and research questions of this study was presented. This presentation was followed by the literature related to the study. Chapter 3 presents the research methodology that was used to address the research problem. It includes the design of the study, population, sampling, data collection instruments, methods of data analysis and validity and reliability considerations.

3.2 Research design

Babbie and Mouton (2001:74) define a research design as a plan or blueprint of how research is conducted. This view is shared by Nachmias and Nachmias (1982:75), who describe a research design as the programme that guides the investigator in the process of collecting, analyzing and interpreting observations. It is a model of proof that allows the researcher to draw inferences concerning causal relations among the variables under investigation (Nachmias and Nachmias 1982:75). It is a strategic framework for action that serves as a bridge between research questions and the execution or implementation of the research (Terre Blanche and Durrheim 1999:29). Since the purpose of this study was to describe medical librarians' experience of PBL, a cross-sectional, descriptive survey design was used (Babbie and Mouton 2001:92).

According to Robson (1993:49), surveys can be classified as either cross-sectional or longitudinal. This study is a cross-sectional survey, as is focuses on the state of affairs in the population at one time, whereas longitudinal surveys describe or assess change or development over time (Bless and Higson-Smith 1995:66; Ngulube 2003:200).

The survey research strategy was chosen as the most appropriate research strategy, for various reasons.

According to Nachmias and Nachmias (1982:179), the survey research method allows the researcher to approach a sample of individuals presumed to have undergone certain experiences and then try to elicit some responses (written or oral) from them, concerning these experiences. The responses constitute the data upon which the research problems are examined. The present study also followed the same procedure, in order to obtain responses from respondents who were medical librarians working in medical libraries in South Africa.

The survey design was chosen because it is economical, in the sense that it allows the researcher to gather information on a once-off basis in order to describe the nature of existing conditions (Simba 2006:52).

Surveys are chiefly used in studies that have individual people as the units of analysis (Babbie and Mouton 2001:232). The researcher chose to use the survey method because the units of analysis in this study are individual people who are medical librarians.

According to Babbie and Mouton (2001:232), survey research is probably the best method available to the social scientist interested in collecting original data for describing a population too large or geographically diverse to observe directly. The population in this study consists of medical librarians who work in different academic institutions in South Africa. It was not feasible for the researcher to observe them directly and a survey was therefore used as a tool to gather data.

There are three broad methodological paradigms in social research: the quantitative, qualitative and participatory action paradigms (Babbie and Mouton 2001:49). The quantitative paradigm places emphasis on the quantification of constructs, that is, the quantitative researcher believes that the best, or only, way of measuring the properties of

phenomena (for example, the experiences of medical librarians regarding PBL) is through quantitative measurement – assigning numbers to the perceived qualities of things. Quantitative methods begin with a series of predetermined categories, usually embodied in standardized quantitative measures, and use this data to make broad and generalisable comparisons (Terre Blanche and Durrheim 1999:42).

The qualitative research paradigm refers to the generic research approach in social research, according to which research takes its departure point as the insider perspective on social action, that is, the qualitative researcher seeks always to study human action from the insiders' perspective (Babbie and Mouton 2001:53). Qualitative researchers collect data in the form of written or spoken language, or in the form of observations that are recorded in language, and analyse the data by identifying and categorizing themes (Terre Blanche and Durrheim 1999:42).

The distinguishing features of participatory action research are participatory involvement (engagement and encounter), a closer relationship between the researcher and the researched and a strong emphasis on the political dimension of social research (Babbie and Mouton 2001:58). The participant researcher joins the group of people who are being studied, in order to better observe and understand their behaviour, feelings, attitudes or beliefs better (Bless and Higson-Smith 1995:43).

The present study employed the quantitative research paradigm because of the type of data the researcher sought. The measurements as well as the data analysis method used required this approach. The quantitative paradigm was used in this study, as it puts emphasis on the quantification of constructs (Babbie and Mouton 2001:49).

3.3 Sampling

This section describes the population of the study, sampling frame, sample size as well as the characteristics of the sample.

3.3.1 Population

Ngulube (2003:201) and Bless and Higson-Smith (1995:85) define the population of a study as a set of objects, whether animate or inanimate, which are the focus of the research and about which the researcher wants to determine some characteristics. It is the aggregate of all cases that conform to some designated set of specifications (Nachmias and Nachmias 1982:295). For example, people (students, employees, ratepayers or patients), an event or institution, or a set of records, could constitute a study population. The specific nature of the population depends on the purpose of the investigation.

A population can also be defined as any group of people, objects or institutions with at least one common characteristic (Busha and Harter 1980:56). The common characteristic of the population under study is that all (15 in total) are qualified medical librarians working in the eight medical schools of South Africa, as already mentioned in Chapter 2.

3.3.2 Sampling frame

Sampling involves decisions about which people, settings, events, behaviours and/or social processes to observe (Terre Blanche and Durrheim 1999:44). Simply put, a sampling frame is the list or quasi list of elements from which a probability sample is selected (Babbie and Mouton 2001:184). Studies of organizations/associations/societies are often the simplest from a sampling standpoint, because organizations, associations or societies typically have membership lists. In such cases, according to Babbie and Mouton (2001:184), the list of members constitutes an excellent sampling frame.

Medical libraries in South Africa belong to an association called the South African National Health Information Partnership (SANHIP), which is a professional association of medical librarians. The list of SANHIP members was used as a sampling frame for this study.

3.3.3 Sample size

Depending on the size of the population and the purpose of the study, a researcher can study the whole universe or subset of the population (Ngulube 2003:201). The subset of the whole population which is actually investigated by a researcher and whose characteristics will be generalized to the entire population is called a sample (Bless and Higson-Smith 1995:86). The whole population was studied as it totals less than 100 (Leedy 1997:211).

Good sampling, according to Bless and Higson-Smith (1995:87), implies:

- A well-defined population;
- An adequately chosen sample; and
- An estimate of how representative of the whole population the sample is, that is, how well in terms of probability the sample statistics conform to the unknown population parameters.

Terre Blanche and Durrheim (1999:44) stress that the main concern in sampling is representativeness. The aim is to select a sample that will be representative of the population about which the researcher aims to draw conclusions. Properly drawn samples provide information appropriate for describing the population of elements composing the sampling frame (Babbie and Mouton 2001:184).

As mentioned in Chapter 2, there are eight medical schools in South Africa, which are the University of Cape Town, University of the Witwatersrand, University of Limpopo (Medunsa Campus), University of KwaZulu-Natal (Nelson R. Mandela School of Medicine), University of Stellenbosch, University of the Free State, University of Pretoria and the University of Transkei (UNITRA) (Igumbor and Kwizera 2005).

These medical schools have medical libraries attached to them (Musiker 1986:130). The medical libraries are relatively small support sections in these medical schools, with a

professional staff complement of not more than four qualified librarians in each medical library. Some medical libraries consist of only one qualified librarian (who is usually the head librarian) and paraprofessional staff, hence the small population of 15 qualified medical librarians that were studied, as shown in Table 1.

Table 1: The population of medical librarians under study

University	No. of medical librarians
University of the Witwatersrand	2
UNITRA	2
University of the Free State	2
University of Stellenbosch	1
University of Cape Town	2
University of Pretoria	2
Medunsa	1
University of KwaZulu-Natal	3 (excluding the researcher)
Total	15

Often sampling frames do not truly include all the elements their names might imply. Omissions are almost inevitable (Babbie and Mouton 2001:187). This error of omission was taken into consideration when the population was identified and corrective measures were employed to ensure representativeness and minimize bias. The questionnaire was emailed to those SANHIP members who did not attend the SANHIP 2007 conference, to ensure the inclusion of all medical librarians in the study.

3.3.4 Characteristics of the sample

Before a sample is chosen, the researcher must obtain as much information about the population as possible, that is, information relating to the overall demographics, for example the age, sex and class of the population (Trochin 2000). The demographics of

the population of this study included male and female librarians, different race groups and different ages.

3.4 Data collection instruments

The following topics are discussed in this section: the instrument used to gather data, the questions which the respondents were asked, pre-testing the questionnaire, the administration of the questionnaire, the response rates, methods of data analysis and issues of validity and reliability.

3.4.1 The instruments

Data is the basic material with which researchers work (Terre Blanche and Durrheim 1999:45). According to Nachmias and Nachmias (1982:153), social science data are obtained when investigators record observations about phenomena being studied, or have the observations recorded for them. Three general forms of data collection may be distinguished; observation, interviewing and survey research and non-reactive techniques. The most structured way of gathering primary data from respondents is by means of a scheduled structured interview (Bless and Higson-Smith 1995:107). This method is based on an established questionnaire, which is a set of questions with fixed wording and sequence of presentation.

The instrument that the researcher used to collect data from respondents was the self-administered questionnaire, which was sent by electronic mail to all the medical librarians working in the eight medical libraries in South Africa. The questionnaire was the preferred method of collecting data, because the study covered a geographically dispersed population (Slater 1990:62). It therefore allowed the researcher to cover the whole population in a short time and at little cost (Bless and Higson-Smith 1995:111) and it was easy to administer (Breakfast 1997:26).

3.4.2 The questionnaire

Questionnaire surveys are the most commonly used research method available to the social scientist interested in gathering primary data for describing a population too large to observe directly (Babbie and Mouton 2001:232; Ngulube 2003:205). Surveys are excellent vehicles for measuring attitudes and orientation in a population.

A five-page questionnaire, consisting of two sections, was constructed (Appendix 1). In the first part of the questionnaire the researcher was introduced and the purpose of the study was stated. Section one covered the background information of respondents, that is, highest qualification, gender and age. Section two was devoted to eliciting information regarding the medical librarians' experience with PBL. Medical librarians provided information about how they had been affected by the introduction of PBL in their institutions, the readiness of their libraries (in terms of collection, layout, facilities) to support PBL, as well as collaboration between lecturers and medical librarians in designing courses.

The questionnaire included a combination of open-ended and closed questions. The purpose for the combination was to gather both objective and subjective data. The open-ended questions afforded the respondent the opportunity to explain their opinions without being limited by preset responses (Nachmias and Nachmias 1982:211; Ngulube 2003:211). The disadvantage of open-ended responses, as identified by Babbie and Mouton (2001:233) and Bless and Higson-Smith (1995:122), is that open-ended responses must be coded before they can be processed for computer analysis. This coding process often requires that the researcher interprets the meaning of responses, thus risking the possibility of misunderstanding and researcher bias. Closed-ended responses, on the other hand, can often be transferred directly into a computer format and are easier and faster for respondents to provide.

3.4.3 Pre-testing the questionnaire

Babbie and Mouton (2001:244) point out that there is always a possibility of error, regardless of how carefully the researcher(s) designed the questionnaire. In order to eliminate errors when administering the questionnaire, that is, errors such as ambiguous, double-barreled, long questions, the researcher pre-tested the questionnaire before administering it to the respondents to maximize reliability and validity of the data collection instrument (Ngulube 2003:215).

According to Peterson (2000:16), a questionnaire can be pre-tested on any "warm body", which refers to any person who is literate. The questionnaire was pre-tested on Mrs Norma Russell, the former Head of the Medical Library at the University of KwaZulu-Natal (UKZN). Mrs Russell was chosen because of her extensive involvement with PBL at UKZN when it was introduced in 2001. Mrs Russell experienced no difficulties in completing the questionnaire. However, minor editorial and grammatical changes were made to the questionnaire following the pre-test and the questionnaire was then sent to the respondents as the pre-testing exercise was successful.

3.4.4 Administering the questionnaire

The questionnaire was distributed in two ways:

- Self-administered to the heads of medical libraries who attended the SANHIP conference in August 2007; and
- By electronic mail to all the respondents, as all of the respondents work in computerized libraries and therefore have access to email. This was done to include those librarians who did not attend the conference. The questionnaires were emailed in July 2007, with monthly email and telephonic reminders, which continued until December 2007.

3.4.5 Response rate

A response rate of 50% is adequate for analysis and reporting, while response rates of 60% and 70% are good and very good, respectively (Babbie and Mouton 2001:261). According to Williams (2003), a response rate of 20% for a self-administered questionnaire survey is sufficient for reporting and analyzing results (in Simba 2006:59). A total of 13 self-administered questionnaires were distributed during the SANHIP conference (the delegates represented seven of the eight medical libraries) and 11 were completed and returned. Of the two questionnaires that were emailed to the librarians who did not attend the conference, both were returned (both librarians were from one medical library that was not represented in the conference). This yielded an overall response rate of 87%, which is more than adequate for data analysis and reporting.

3.4.6 Methods of data analysis

Each completed questionnaire was evaluated to check for omissions and errors. The responses were coded before analysis. According to Schutt (1996), most social science research collects information about units of analysis and then expresses the information in the form of statistics (in Ngulube 2003:231). There are many computer programmes that analyze social science data, for example, AIDA, INTER-STAT, P-STAT, Dynacomp, STATS PLUS, with SPSS being the most popular (Babbie and Mouton 2001:411). Data collected from the research participants was analyzed using SPSS, a statistical analysis program that is used to analyse social science data. SPSS was chosen because of its ability to perform intricate computations and provide sophisticated presentations of the results (Babbie and Mouton 2001:411).

3.4.7 Validity and reliability

The term validity refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration (Babbie and Mouton 2001:122). It is concerned with determining whether or not one is measuring what one thinks one is

measuring (Nachmias and Nachmias 1982:138). It is the degree to which research conclusions are sound (Terre Blanch and Durrheim 1999:61). Validity was achieved in two ways:

- By pre-testing the questionnaire; and
- By ensuring that the questions that were presented to the respondents were about PBL.

Reliability refers to the degree to which a particular technique consistently measures what it sets out to measure while yielding the same result each time (Babbie and Mouton 2001:119). It is an indication of the extent to which a measure contains variable errors, that is errors that differed from individual (or some other object) to individual during any one measuring instance and that varied from time to time for a given individual measured twice by the same instrument (Nachmias and Nachmias 1982:144). It is the degree to which the results are repeatable (Terre Blanch and Durrheim 1999:62). A measurement is generally considered to be reliable if it is consistent and accurate in its collection of data (Ngulube 2003:204; Lewis-Beck 1994:363; Peil 1982:9).

A reliable method refers to a method which, if used by others in similar conditions to the original research, will produce the same or highly similar results (Kellehear 1993:9). Reliability is the dependability or confidence a researcher has that if a method is used by others in similar circumstances that they will arrive at similar findings (Kellehear 1993:11). Reliability was achieved by designing a questionnaire which was used to collect data for the study, in which consistent answers to consistent questions were received. This standardized procedure for data collection produced the best results because it gave information that could be compared easily (Ngulube 2003:204).

According to Peil (1982:9), the goal of data collection in a study is to obtain reliable and valid data, as free from bias as possible, which will provide an unambiguous response to the research questions. The pre-testing of the questionnaire before it was administered to the respondents eliminated ambiguous, double-barreled and long questions from the

questionnaire, thus maximizing the validity and reliability of the research instrument (Ngulube 2003:215).

The response rate in this study was very good. It was 87%, which is more than adequate for data analysis and reporting. A high response rate also diminishes the chance of non-response bias.

3.5 Summary

In this chapter the research methodology that was used to address the research problem was described. The questionnaire, as the data collection method used in this study, was discussed in detail. Important topics such as population, sampling, sampling frames, sample sizes, pre-testing, administering the questionnaire, response rates and methods of data analysis were also explored. The chapter concluded with an explanation of validity and reliability issues.

CHAPTER 4

RESEARCH RESULTS

4.1 Introduction

Chapter 4 presents the results of the survey of the population of medical librarians in South Africa, which was conducted by means of a self-administered questionnaire. The purpose of the questions is explained and the results are presented.

4.2 Questionnaire results

A total of 13 self-administered questionnaires were distributed during the SANHIP Conference and 11 were returned, achieving a response rate of 84.6%. Of the two questionnaires that were emailed to the librarians who did not attend the conference, both were returned, giving an overall response rate of 87%, which is excellent for data analysis and reporting. Thus results can be generalised for the entire population.

The purpose of the study was to gather information about the effect of PBL on medical libraries. Results for the questionnaire are reported under two broad sections, which are sections 1 and 2. Both open-ended and closed questions were asked.

4.2.1 Section 1: Background information

Section 1 covered the background information of the respondents, that is, educational qualification, gender and age.

4.2.1.1 Educational qualification

In question 1, respondents were asked to indicate their highest educational qualification. Their responses are presented in Table 2.

Table 2: Highest qualification

N = 13

Qualification	Frequency	%
Honours	10	76.9
Postgraduate diploma	1	7.7
Masters	1	7.7
Other	1	7.7
Total	13	100

The majority of the respondents, 10 (76.9%) held Honours degrees, whereas the other categories (Postgraduate diploma, Masters and B.Tech) were held by one (7.7%) respondent each, respectively. Thus a majority of the respondents had a higher degree in Library and Information Science.

4.2.1.2 Gender

Question 2 was asked to establish the gender of the medical librarians who participated in the study. The results of this question are reported in Table 3.

Table 3: Gender

N=13

Gender	Frequency	%
Female	9	69.2
Male	4	30.8
Total	13	100

There were more female, nine (69.2%), than male, four (30.8%), respondents in the study. Therefore more medical libraries in South Africa are staffed by female than male librarians.

4.2.1.3 Age

The respondents were asked to indicate the age category they belonged to, in question 3. The results of this question are reported in Table 4.

Table 4: Age

N=13

Age group	Frequency	%
41-50	5	38.5
51-60	4	30.8
31-40	3	23.1
60 and above	1	7.7
Total	13	100

The highest number of the respondents, five (38.5%), fell within the 41-50 age range. A significant number of respondents, four (30.8%), were within the 51-60 age range. In the 31-40 age range, there were three respondents (23.1%), and only one (7.7%) respondent was in the 60 and above age range. This indicates that the majority of the medical librarians were middle-aged.

Table 5 presents a cross tabulation of respondents' age and qualifications. The purpose was to ascertain the respondents' highest qualifications in relation to the age groups they belonged to.

Table 5: Cross-tabulation of qualification and age

N=13

Highest qualification	Age			
	31-40	41-50	51-60	60 and above
Postgraduate diploma	0	0	1	0
Honours	3	4	2	1
Masters	0	1	0	0
Other	0	1	0	0
Total	3	6	3	1

The Honours degree seemed to be a common factor among all age categories. For example, three (23.1%) respondents in the 31-40 age group held Honours degrees and four (30.8%) respondents in the 41-50 age group held Honours degrees. In the 51-60 and 60 and above age groups there were two (15.4%) and one (7.7%) respondents, respectively, who held Honours degrees. The Postgraduate diploma, Masters degree and the B.Tech were held by one (7.7%) respondent each, respectively. These respondents fell in the 41-50 and 51-60 age groups, respectively.

4.2.2 Section 2: Librarians' experiences with PBL

Section 2 covered the medical librarians' experiences of PBL. In this section, respondents were asked questions to elicit detailed information about PBL in their libraries, as well as collaboration/partnerships between the teaching staff and librarians regarding course design.

4.2.2.1 Period of PBL use

The first question in Section 2, question 4, asked how long the respondent's institution had been using PBL as a teaching and learning method. The purpose of this question was to ascertain the institution's familiarity with PBL as a teaching and learning method and

also to compare the length of PBL use among the different medical schools. The responses are shown in Table 6.

Table 6: Period of PBL use

N=13

Length of PBL use	Frequency	%
6 years and over	9	69.2
5 years	2	15.4
3 years	1	7.7
No response	1	7.7
Total	13	100

It can be noted from the table above that one respondent (7.7%) did not answer question 4. The majority of the respondents, nine (69.2%), worked in institutions which had been using PBL as a teaching and learning method for six years and more. This indicates a level of familiarity with PBL. A small number of respondents, two (15.4%), worked in institutions which had been using PBL for five years, whereas one (7.7%) respondent's institution had been using PBL for three years. Therefore the medical librarians under study were generally familiar with PBL, as their institutions had been using PBL for three or more years. None of the institutions had been using PBL for less than three years.

4.2.2.2 Effect of PBL introduction

Question 5 asked respondents if they were affected by the introduction of PBL at their institutions. The aim was to determine whether or not medical librarians had been affected by the introduction of PBL at their institutions. The results are given in Table 7.

Table 7: Effect of PBL introduction

N=13

Affected by PBL	Frequency	%
Yes	10	76.9
No	2	15.4
No response	1	7.7
Total	13	100

A substantial number of respondents, 10 (76.9%), indicated that they were affected by the introduction of PBL at their institutions, while only two (15.4%) respondents were not affected. There was a no response from one (7.7%) respondent.

4.2.2.3 Effect of PBL

Question 6 required the 10 (76.9%) respondents to explain how they were affected by the introduction of PBL at their institutions. The 10 (76.9%) respondents provided the following multiple responses:

- User education for first years had to be introduced, two (20%);
- More user education was required, one (10%);
- Searching and training demands were increased, two (20%);
- Library/information training/user education became more intensive, one (10%);
- Information queries increased, one (10%);
- Increased workload for librarians, one (10%);
- Librarians had to work with smaller groups, one (10%);
- Librarians had to rethink training procedures, one (10%);
- Demand for resources increased, including e-resources, two (20%);
- Increased library usage by students, one (10%);
- Creation of a module in Online Learning System (OLS) because the library had to find new ways of delivering information, two (20%);
- Web pages were developed for training materials, one (10%);

- Had to provide a new short-loan room (reserve book room), two (20%);
- Had to provide a group study room, one (10%);
- Multiple copies had to be purchased, one (10%);
- Financial constraints were experienced, one (10%); and
- Librarians participated with lecturers in course planning, one (10%).

The introduction of PBL in medical schools necessitated a change in the manner in which medical librarians provided library services to their users.

4.2.2.4 Changes in conducting user education

Question 7 asked respondents if there had been changes in the way they conducted user education in their libraries since the introduction of PBL. This question aimed at ascertaining the impact PBL has had on medical libraries in terms of user education. The responses to this question are presented in Table 8.

Table 8: Changes in conducting user education

N=13

Changes in user education	Frequency	%
Yes	11	84.6
No	1	7.7
No response	1	7.7
Total	13	100

A substantial number of respondents, 11 (84%), reported that there was a change in the manner in which they conducted user education programmes in their libraries since the introduction of PBL at their institutions. This indicates that PBL had an impact on how medical libraries conducted user education.

4.2.2.5 Changes in user education

In question 8, the 11 (84.6%) respondents who had reported that there were changes in the way in which they conducted user education (question 7) were asked to explain these changes. The multiple responses they provided were:

- Librarians teach students how to do literature searches and library skills, one (9%);
- Library or information training or user education was more intensive, one (9%);
- More computer training for students was needed, one (9%);
- More one-on-one teaching or user education was required, two (18 %);
- More hands-on sessions were required, one (9%);
- Structured training lectures or user education programmes were offered, one (9%);
- Information literacy became compulsory for first- and third-year students, two (18%);
- User education programmes now curriculum-related, one (9%);
- Training programmes had to be adjusted to meet the needs of PBL/case approach, one (9%);
- Training included referencing techniques, evaluation of Web sites and databases, two (18%);
- Librarians had to run pre-tests to establish information fluency of first-year students, one (9%);
- The library had to order current books and journals to provide useful information, one (9%);
- Librarians had to work with smaller groups, one (9%);
- User education was restructured to enable students to become more self-sufficient, one (9%); and
- User education changed so students could acquire life-long learning skills, one (9%).

Some of the above responses overlap with the responses to how librarians were affected by PBL generally. It is evident that librarians had to change the manner in which they conducted user education when PBL was introduced at their institutions.

4.2.2.6 Knowledge and skills to support PBL

Question 9 asked respondents to indicate whether or not librarians needed any specific knowledge and skills to support PBL effectively. The aim was to determine the impact of PBL on medical libraries/librarians, that is, to find out if librarians had to acquire any new knowledge or skills due to the introduction of PBL at their institutions. Their responses are presented in Table 9.

Table 9: Knowledge and skills to support PBL

N=13
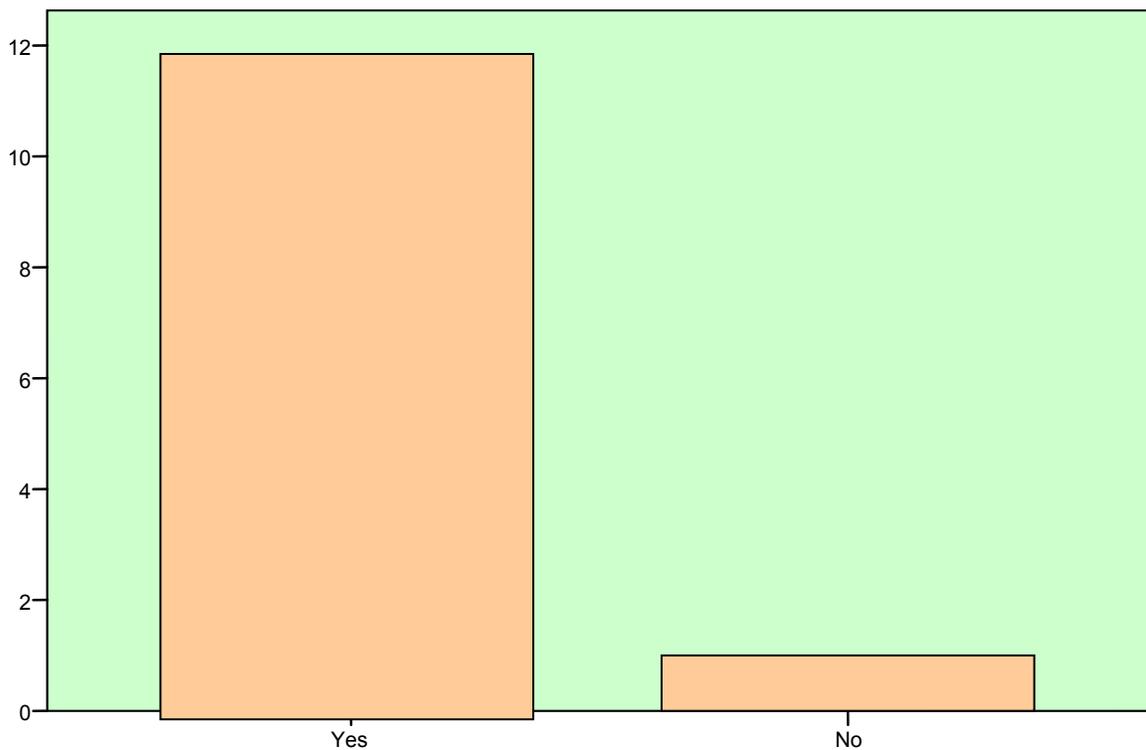
A large number of respondents, 12 (92.3%), indicated that librarians do need specific knowledge and skills to support PBL effectively, whereas only one (7.7%) respondent did not think librarians needed any specific knowledge and skills to support PBL effectively.

4.2.2.7 Knowledge and skills required by librarians

In question 10, the 12 (92.3%) respondents who indicated in the previous question that librarians needed specific knowledge and skills to support PBL effectively, were asked to state what skills and knowledge librarians needed to support PBL effectively. The multiple responses provided were as follows:

- Communication skills, two (16.6%);
- Training skills, two (16.6%);
- Customer care skills, one (8%);
- Information literacy skills, two (16.6%);
- Knowledge of themes or modules, one (8%);
- They need to know how PBL is taught, four (33%);
- Database knowledge, three (25%);
- Knowledge of bibliographic management tools, one (8%);
- Knowledge of electronic resources, two (16.6%);
- OPAC knowledge, one (8%);
- Knowledge of latest technologies, techniques and products, two (16.6%);
- Knowledge of copyright, one (8%);
- Professional development in librarianship is required, one (8%);
- Knowledge of how to acquire/create information resources, one (8%); and
- Knowledge of the development of an acquisitions policy to acquire resources for PBL curriculum, one (8%).

Thus personal skills, together with knowledge of PBL and electronic resources, are essential for librarians.

4.2.2.8 Financial resources to support PBL

In question 11 respondents were asked to state whether or not the financial resources provided to their libraries were sufficient to support PBL effectively. Responses are given in Table 10.

Table 10: Financial resources to support PBL

N=13

Financial resources	Frequency	%
Yes	8	61.5
No	4	30.8
No response	1	7.7
Total	13	100

A significant number of respondents, eight (61.5%), indicated that there were sufficient financial resources in their libraries' budget to support PBL effectively. A relatively small number of respondents, four (30.8%), stated that there was a shortage of financial resources in their libraries' budget to support PBL effectively. Only one (7.7%) respondent did not respond to this question.

4.2.2.9 Reasons for lack of financial resources

The four (30.8%) respondents who indicated that the financial resources in their libraries did not support PBL effectively were then asked to give reasons for this state of affairs. The multiple responses provided were as follows:

- Cutting down on resources due to the institution's financial constraints, two (50%);
- More on-line resources were needed, one (25%);
- Library cannot keep up with the many electronic resources available, one (25%); and
- Collection should move from print to electronic books, one (25%).

4.2.2.10 The physical layout of the library

In question 13 respondents were asked to state whether or not their libraries were adequately equipped in terms of physical layout to support PBL effectively. The responses are presented in Table 11.

Table 11: The library layout

N=13

Library layout	Frequency	%
Yes	9	69.2
No	3	23.1
No response	1	7.7
Total	13	100

A large number of respondents, nine (69.2%), reported that the physical layout of their libraries supported PBL adequately, compared to three respondents, (23.1%), who stated that the physical layout of their libraries did not support PBL effectively. Again, one respondent (7.7%) did not answer this question.

4.2.2.11 Reasons why the library layout did not support PBL

Question 14 required the three (23.1%) respondents to explain why the physical layout of their libraries did not support PBL adequately. They provided the following multiple responses:

- Lack of group study space, one (33%);
- Lack of tutorial rooms, one (33%); and
- More small rooms for discussion groups needed, one (33%).

All three (100%) respondents cited a lack of space for student group study as the reason the library's physical layout did not support PBL effectively.

4.2.2.12 Facilities to support PBL

In question 15 respondents were asked to indicate whether or not their libraries were adequately equipped in terms of facilities to support PBL effectively. Responses are shown in Table 12.

Table 12: Facilities to support PBL

N=13

Facilities	Frequency	%
Yes	9	69.2
No	3	23.1
No response	1	7.7
Total	13	100

A substantial number of respondents, nine (69.2%), reported that their libraries were adequately equipped in terms of facilities to support PBL effectively, while only three (23.1%) respondents reported that the facilities in their libraries did not support PBL adequately. One respondent (7.7%) did not answer question 15.

4.2.2.13 Reasons why facilities did not support PBL

Question 16 required the three (23.1%) respondents to explain why the facilities in their libraries did not support PBL. The multiple responses they provided were as follows:

- LAN facilities needed, one (33%);
- More computers for hands-on training needed, one (33%);
- More small rooms for discussion groups, one (33%); and
- A bigger reserve book room is needed, two (66.6%).

Only one respondent (33%) reported that a lack of computers for hands-on training was the reason the library facilities did not support PBL effectively. Two of the above reasons were also provided as responses to earlier questions.

4.2.2.14 Collection to support PBL effectively

In question 17 respondents were asked to indicate whether or not their libraries were adequately equipped in terms of the collection to support PBL effectively. Their responses are presented in Table 13.

Table 13: Collection to support PBL

N=13

Collection	Frequency	%
Yes	9	69.2
No	3	23.1
No response	1	7.7
Total	13	100

A large number of respondents, nine (69.2%), reported that their libraries were adequately equipped, in terms of the collection, to support PBL effectively. A small number of respondents, three (23.1%), reported that their libraries' collection did not support PBL effectively. One respondent (7.7%) did not answer question 17.

4.2.2.15 Reasons why the library collection did not support PBL

In question 18 the three (23.1%) respondents who reported that their libraries were not adequately equipped in terms of the collection to support PBL effectively were asked to explain why this was the case. Their multiple responses were as follows:

- Increased demand for multiple copies of books which the library cannot meet due to space problems, one (33%);
- Multiple copies have not been purchased due to financial constraints, one (33%);

- Print should be replaced by online, one (33%);

- New electronic resources needed, one (33%);

- Library cannot keep up with the many changes in the curriculum, one (33%); and

- Journal collection needs to be updated, one (33%).

A number of respondents, two (67%), reported that the demand for multiple copies was the reason their library collection did not support PBL effectively. Similarly, two (67%), respondents mentioned the inadequate print collection in their libraries as the reason the collection did not support PBL effectively.

4.2.2.16 Collaboration between medical librarians and lecturers

In question 19 respondents were asked to state whether or not collaboration between medical librarians and lecturers in designing PBL courses was important or not. It is interesting to note that all of the respondents who participated in the study indicated that collaboration between these two parties was important for the delivery of the PBL curriculum.

4.2.2.17 The importance of collaboration

Respondents were then asked, in question 20, to explain why collaboration between librarians and lecturers in designing PBL courses was important. The multiple responses they provided were as follows:

- Close collaboration was needed to ensure that students' needs were adequately met, one (8 %);

- Collaboration could help librarians purchase books that would meet students' needs, one (8%);

- To make resources available to staff and students, one (8%);

- Collaboration will enable the library to be equipped with the resources requested for subjects taught, one (8%);

- Lecturers will give librarians guidance on what information students need to access for assignments, one (8%);

- To enable librarians to keep abreast and up-to-date with the curriculum, one (8%);

- Librarians must be kept informed about changes in the curriculum, one (8%);

- Librarians need to be updated on topics and new ideas in the curriculum, one (8%);

- Librarians need to know what is in the curriculum to be able to train students effectively, one (8%);

- Librarians need to know what is in the curriculum, one (8%);

- Librarians need to provide information to users to help them to become critical thinkers and to enable them to solve problems, one (8%);

- Librarians participate in curriculum design, one (8%);

- The library should be given a permanent slot in the PBL timetable for teaching/training, one (8%); and

- To share information regarding the curriculum, one (8%).

It must be noted that there is an overlap in some of the above responses. All the respondents (100%) indicated that librarians' involvement in curriculum design would enable librarians to satisfy the needs of students more effectively.

4.2.2.18 Collaboration at respondents' institutions

Having established the importance of collaboration between lecturers and librarians, the respondents were asked to indicate if such collaboration existed at their institutions (question 21). Their responses are shown in Table 14.

Table 14: Collaboration at respondents' institutions

N=13

Collaboration	Frequency	%
Yes	12	92.3
No response	1	7.7
Total	13	100

The majority of respondents, 12 (92.3%), indicated that there was collaboration between lecturers and librarians at their institutions. One respondent (7.7%) did not answer question 21.

4.2.2.19 Nature of collaboration

In question 22 the 12 (92.3%) respondents were asked to explain the nature of collaboration between librarians and lecturers at their institutions since they had indicated that such collaboration existed at their institutions. Their multiple responses were as follows:

- Librarians are involved in preparation of case studies for each tutorial, five (41.6%);
  - Librarians work together with lecturers when doing training and web pages;
  - Librarians are part of the curriculum planning process; librarians are part of planning for compulsory information literacy training modules and assessment to support the curriculum;
  - Librarians are invited to theme discussions;
- Meetings, five (41.6%);
  - One-on-one meetings between librarians and lecturers;
  - Involvement in curricula meetings and academic discussions;
  - Meet annually to discuss literacy training for the following year;
- Lecturers maintain contact with librarians by email, phone or visits, to ensure that the library has adequate resources for their themes, four (33.3%);
  - Lecturers communicate with the library at the beginning and throughout the year;
- Librarians need to be updated on topics and new ideas, one (8%);
- Librarians need to ascertain students' IT levels, one (8%);
- A credit-bearing module should be part of the curriculum, one (8%); and
- Collaboration needs to be formalized, one (8%).

This indicates that collaboration between medical librarians existed in the form of tutorial preparation, meetings and contact between the two parties was maintained by means of emails, telephone and visits.

4.2.2.20 Establishment of collaboration/partnerships between lecturers and librarians

Question 23 required only respondents who indicated that there was no collaboration at their institutions to explain how such partnerships could be established. Since the majority of respondents, 12 (92.3%), indicated that there was collaboration between lecturers and librarians at their institutions and one respondent (7.7%) did not answer question 21, there were no responses to this question.

4.2.2.21 Comments on PBL

Question 24 invited further comments from respondents about PBL and medical libraries. There was a no response from five respondents (38.5%) to question 24. The majority of respondents, eight (61.5%) gave favourable comments about PBL. The various multiple responses provided were as follows:

- PBL helps students to work consistently and encourages use of library resources and facilities. It makes them information literate and life-long learners, two (25%)
- PBL provides the library with the opportunity to market and upgrade its services, one (13%);
- Collaboration/partnerships between librarians and lecturers are essential, so that students' needs can be met more effectively, one (13%);
- Librarians' involvement with PBL helps libraries to provide information which is of value to students and this information helps them to be employable in the labour market, one (13%);
- PBL develops students' social and technical skills, which are necessary for practice in rural and urban socio-economically deprived communities and for the provision of primary health care, one (13%); and

- PBL has changed the way medical students use and find information. This has impacted on the medical library and librarians. Librarians have to play a more active role in the curriculum to be able to support it appropriately, one (13%).

It is interesting to note that two (25%) respondents reported that PBL contributed towards making students life-long learners. This observation concurs with Khoo's assertion that PBL inculcates self-directed and life-long learning (2003:401). Boud and Feletti (1991:14) also stated that PBL enables students to learn effectively throughout their lives.

4.3 Summary

In this chapter the results of the survey of the sample population of medical librarians in South Africa, which was conducted by means of a self-administered questionnaire, were presented. The results of the survey have sufficiently informed the research objectives of the study.

CHAPTER 5

DISCUSSION OF RESULTS

5.1 Introduction

The results of the study are discussed in this chapter. The purpose of the study was to investigate the effect PBL has on medical libraries, especially in the areas of skills (what professional skills do librarians need to possess in order to facilitate PBL in their institutions?) and library resources (are medical libraries sufficiently equipped, in terms of the collection, physical layout, financial resources and facilities, to support PBL?).

The study attempted to answer the following research questions regarding PBL, medical libraries and medical librarians in South Africa:

- How has PBL affected librarians in medical libraries?
- Has there been a change in the way librarians conduct user education since the introduction of PBL?
- Are medical libraries adequately equipped, in terms of collection, physical layout and facilities, to support PBL?
- What knowledge and skills do librarians need to participate effectively in PBL?
- Is there any collaboration in the design of courses between lecturers and librarians?
- How should collaboration/partnerships between lecturers and librarians be established?

Chapter 5 discusses the information gathered from the self-administered questionnaire which was administered to 15 medical librarians who work in the eight medical school libraries of South Africa. The findings are presented according to the research questions the study sought to answer. The discussion is based on the survey questionnaire analysis and a review of the literature related to PBL. It must be noted that due to the similarity of some research questions, there might be an overlap in the discussion. A response rate of 87% was

achieved, with 13 librarians responding. This is excellent for data analysis and reporting (Babbie and Mouton 2001:261) and the results may be generalized for the entire population.

5.2 How has PBL affected medical librarians in South Africa?

This research question captures the overall purpose of the study. The findings of the study, together with the literature, indicate that medical libraries were indeed affected by the introduction of PBL at their institutions. The effect of the introduction of PBL in medical schools was not limited to academia only. Medical librarianship is fundamental to the practice of health care and to medical education and research (Matthews and Picken 1979:11). Medical libraries are essential for the organization and retrieval of the vast and continuously expanding fields of knowledge in the health sciences. Thus medical libraries contribute directly to the effective delivery of health care. The introduction of PBL in medical libraries brought about a great change, not only to the services medical librarians provided, but also to the skills they had to acquire in order to be effective supporters of PBL.

Medical school administrators should take cognizance of this fact when faculty budgets are allocated. Availability of resources plays a very important role in ensuring the effective support of PBL. Library resources, including human resources (library staff), should be allocated in a manner that allows the medical library to fulfill its mandate.

The majority of respondents, 10 (76.9%), indicated that they were affected by the introduction of PBL at their institutions. Librarians had to introduce user education for first-year students, as noted by two (20%) respondents; there were increased demands for resources, including e-resources, according to two (20%) respondents; increased library usage by students, as well as an increased workload for librarians, according to one (10%) respondent, respectively. These were some of the ways in which medical librarians were affected by the introduction of PBL at their institutions.

As noted in the literature review, medical libraries are fundamental to the practice of health care and to medical education and research. The medical library is an essential component of

medical education (Myers, Saunders and Rogers 2002:474). Medical libraries interact actively with users by providing instruction in bibliographic techniques and user education programmes. These programmes include activities that place medical librarians in teaching roles (Carroad and McGregor in Darling 1982:237).

The findings of the study support the views of Carroad and McGregor (in Darling 1982), Macklin (2001) and Foster (2003), who stress that since students in a PBL setting are expected to use evidence and research findings as the basis of their approach to medical problems presented to them, a hunger for access to good quality information is generated. Librarians therefore strive to offer information services that align with this level of demand. Electronic information sources, particularly bibliographic resources and web resources, play a pivotal role in making information accessible to library users.

The findings of the study and the literature review clearly indicate that the introduction of PBL in medical schools in South Africa affected medical librarians and the services they provided.

5.3 Has there been a change in the way librarians conduct user education for students since the introduction of PBL?

The purpose for this research question was to ascertain whether or not there were any change(s) in the manner in which librarians conducted user education due to the introduction of PBL at their institutions. Without doubt, the introduction of PBL had an important impact on the services medical librarians offered to their users, especially user education programmes. User education forms the backbone or foundation of the services librarians provide. Through user education the library is able to meet these goals:

- Users are educated or informed about new products or databases that are purchased;
- The needed information is brought to more library users than could be served on a one-to-one basis;

- An enhanced image of the library;

- A more supportive clientele; and

- Empowerment of users.

This heightened awareness of available library resources and services has a direct impact on the image of the library. It influences the users' view of the library as a vital institution. Such an attitude may have a direct effect on library budgets and staff positions apportioned to the library by the parent institution (Carroad and McGregor in Darling 1982:239).

There was consensus among respondents that the introduction of PBL in their institutions brought about changes in the manner in which librarians conducted user education. A significant number of respondents, 11 (84.6%), stated that there was a change in the manner in which they conducted user education programmes in their libraries since the introduction of PBL at their institutions. More one-to-one teaching was required, according to two (18%) respondents; user education programmes became curriculum-related, user education changed to incorporate more computer training for students, training lectures became more structured and information training became more intensive, according to one (9%) respondent each. This indicates the changed manner in which user education was conducted as a result of PBL.

The challenge for librarians is ensuring that users are provided with access to the resources they need and the skills to use those resources to the benefit of a patient-centred environment. Librarians have to support differing user groups, who may have varying levels of computer and library skills, and provide skills training on a wide variety of resources from their institutions (Foster 2003). It is important that librarians, as one respondent commented, "ascertain students' IT levels" in order to ensure that they provide relevant and effective services to their users.

5.4 What knowledge and skills do librarians need to participate effectively in PBL?

The purpose of this research question was to elicit information regarding skills and knowledge librarians needed to support PBL. Respondents were first asked to indicate their educational qualification, as this is linked to the knowledge and skills they should have to enable them to support PBL effectively. The findings show that the majority of medical librarians, 10 (76.9%) held Honours degrees. The other categories (Postgraduate diploma, Masters and B. Tech) were held by one (7.7%) respondent, respectively. Medical librarians are therefore highly educated professionals. This high level of education could be one of the factors that enabled them to cope with the demands of a complex teaching/learning method such as PBL.

Their age could be another factor working in the medical librarians' favour. A significant number of respondents, five (38.5%) fell within the 41-50 age range, whereas four (30.8%) respondents were within the 51-60 age range. In the 31-40 age range, there were three respondents (23.1%) and only one (7.7%) respondent was in the 60 and above age range. The fact that the majority of medical librarians are middle-aged and have been practicing librarians for at least 10 years or more could be a contributing factor to their ability to support PBL as effectively as the findings indicate.

The length of PBL use at the respondents' institutions could also be a factor that enhanced their ability, not only to cope with the demands of PBL, but to provide effective support for this teaching/learning strategy. In the majority of the respondents' institutions, nine (69.2%), PBL had been used for six years or more. This indicates that these librarians had become very familiar with PBL, as it had been used at their institutions for many years.

Respondents were then asked to indicate whether there were any skills or knowledge which librarians had to acquire to support PBL effectively. Again, the majority of respondents, 12 (92.3%), reported that librarians do need specific skills and knowledge to support PBL effectively. Macklin (2001:307) concurs with this view, as he argued that librarians need to have the necessary skills and knowledge to transfer information retrieval skills to students in

order to assist in supporting PBL. As more and more students begin their fact-finding by using search engines on the World Wide Web, librarians take on a significant role in the development of critical thinking skills, by introducing information literacy as a natural part of the learning process.

According to the respondents, knowledge of how PBL is taught, (four/33%); communication skills, (two/16.6%); training skills, (two/16.6%); information literacy skills, (two/16.6%), customer care skills, (one/8%), database knowledge, (three/25%); knowledge of electronic resources, (two/16.6%), as well as knowledge of latest technologies, techniques and products, (two/16.6%), are some of the skills and knowledge which librarians must possess to enable them to support PBL effectively. Thus the introduction of PBL in medical libraries necessitated a change in the librarians' professional development. A substantial amount of learning became necessary and new skills had to be learned.

According to Snavely (2004:526), developing information literacy problems appropriate to the content of a class requires significantly more course lecturer and librarian consultation and development time than is normally devoted to these activities. PBL can be ideal for teaching information literacy skills, because it is designed to create the semblance of real-life information needs and a discovery process for finding solutions. The findings of the study are in keeping with this view. User education programmes, as one (9%) respondent reported, had to change to "become curriculum-related". Many librarians supporting PBL curricula have developed a more integrated role in the PBL curriculum and have adapted user education teaching patterns to fit with PBL, by using case studies (Martin 2003a:43).

The new curriculum developed by medical schools has meant that librarians need to rethink their approach to the provision of resources to support models based on PBL (Dorrington 2006:603). The inclusion of PBL cases as part of the course requires students to use a wide range of materials, for example, textbooks, journal articles (both print and on-line), databases and web sites. The material has to be available for the period during which the case is being studied; therefore, it is essential for a system to be in place so that students have easy access to it. The introduction of library portals in addition to Open Learning

System (OLS-which is an online learning system, personalized, password-controlled and allows for interaction between lecturers and students), is evidence of the amount of learning and new skills librarians had to acquire to be major supporters of PBL.

Medical libraries interact actively with their users. This objective is achieved by providing instruction in bibliographic techniques and user education programmes. User education became more intensive, according to one (10%) respondent, and one (10%) respondent reported that more user education became necessary when PBL was introduced at their institution. These user education programmes demonstrate that medical librarians are increasing their efforts to become an integral part of the medical education team. Such programmes place medical librarians almost entirely in teaching roles (Carroad and McGregor in Darling 1982:237).

5.5 Are medical libraries adequately equipped, in terms of the collection, physical layout, facilities and financial resources, to support PBL?

According to Cheney (2004:496), libraries in higher learning institutions play a crucial role in supporting the curriculum, by providing resources such as books, journals (both print and on-line) and databases. Libraries, therefore, should boast excellent collections, facilities and resources to cater for the needs of different user groups, from new medical undergraduate students, who are familiar with computers and Internet but not library resources, to healthcare students and workers, who may not be computer literate or familiar with the Internet, to clinicians with very specific patient-centred queries, to research staff who require exhaustive literature searches (Dorrington 2006:603).

According to Martin (2003a:43), one of the main differences between medical students on PBL curricula and traditional curricula is in the use of library resources. Books are very useful in the PBL tutorial, where questions can be answered immediately by the group consulting the relevant textbook. PBL employs a variety of types of information, particularly images, for example, X-rays, ultrasound, ECG and tissue sections (Martin 2003b:180). It is

therefore crucial that the books that are purchased have high-quality illustrations and photographs.

Marshall *et al*. (1993:299) found that students in the PBL curriculum used the following resources more extensively than their counterparts in the traditional curriculum:

- End-user MEDLINE searching;
- Library journals;
- Reserve or short-term loan materials;
- Photocopy services; and
- Audiovisual materials.

This has implications for medical libraries and the resources they provide. It is imperative that medical libraries possess these resources to enable them to provide effective support to PBL. The lack or inadequate provision of these resources will have a negative impact on the medical libraries' ability to support PBL effectively. This calls for a considerable financial commitment from medical school administrators, to enable medical libraries to fulfill their obligation of making up-to-date and relevant information, resources and facilities available to their users.

It is interesting to note that the medical libraries in South Africa are adequately equipped in terms of their collections, as reported by nine (69.2%) respondents, physical layout, nine (69.2%) and facilities, nine (69.2%), to support PBL effectively. In terms of financial resources, eight (61.5%) respondents reported that they had sufficient financial resources to support PBL. This indicates a high level of competence on the part of medical libraries to support PBL effectively. There is, however, room for improvement. A small number of respondents, four (30%), reported that there were insufficient financial resources in their libraries' budget to support PBL effectively. Respondents provided the following reasons for the lack of financial resources at their institutions to support PBL effectively: cutting-down on resources due to the institution's financial constraints, two (50%); the need for more on-line resources, one (25%); the library's inability to keep up with the many electronic

resources available, one (25%), as well as the need to move the collection from print to electronic books. This indicates that a greater commitment is required from institutions to increase library budgets in order for libraries to be able to meet the demands of PBL.

A small number of respondents, three (23.1%), stated that the physical layout of their libraries did not support PBL effectively. All three (100%) respondents cited lack of space for student group study as the reason the library's physical layout did not support PBL effectively.

A number of respondents, three (23.1%), reported that the facilities in their libraries did not support PBL effectively. A shortage of computers for hands-on training, one (33%), the need for LAN facilities, one (33%) and a bigger reserve book room, two (66.6%), were the reasons the facilities were found to be inadequate.

Again, a small number of respondents, three (23.1%), indicated that their libraries' collection did not support PBL effectively, for various reasons. The demand for multiple copies, two (67%); as well as the inadequate print collection in their libraries were cited as reasons the collection did not support PBL effectively.

All of these reasons which medical librarians provided reveal that some medical libraries were struggling to support PBL effectively. As mentioned earlier, greater commitment is required from the institutions to ensure that libraries are given all the equipment, resources and facilities they require to support PBL effectively.

Medical educators became aware of the need to restructure medical education to better prepare physicians for the demands of professional practice. This precipitated the change from the traditional curriculum to PBL. Although PBL is the solution to the problem of medical education (Spencer and Jordan 1999:1280; Savery and Duffy 2001:7; Dorrington 2006:598), it is unfortunately a costly pedagogical strategy. The cost for starting-up and maintaining a PBL programme was identified as one of the disadvantages of PBL (Donner and Bickley 1993:297; Spencer and Jordan 1999:1282). Provision of up-to-date electronic

resources (electronic journals and databases) as well as reserve book rooms should have been taken into account when medical school administrators were contemplating the change from the traditional curriculum to PBL. This would have enhanced the medical libraries' ability to provide effective support to PBL.

5.6 Is there any collaboration in the design of courses between lecturers and librarians?

There was consensus among all the participants in the study that collaboration between lecturers and librarians is important for the effective delivery and support of the PBL curriculum. Respondents reported that close collaboration between the two parties is essential to ensure that librarians provide the right information and services students need, to become critical thinkers and life-long learners.

Dorrington (2006:603) states that collaboration between medical librarians and lecturers is important to ensure exchange of information in such areas as reading lists, teaching material and information literacy support. Regular communication between these parties is important. The findings of the present study support this view. Collaboration took different forms. In some institutions, collaboration occurred in the form of regular meetings, (five/41.6%); librarians' involvement in the preparation of case studies or theme discussions, (five/41.6%), or contact by email, phone or library visits by lecturers, (four/33.3%).

Snavely (2004:526) states that working with a librarian on a design and evaluation of library assignments is the least utilized type of instructional partnership. This sentiment is echoed by Cheney (2004:497), who states that there is no evidence of collaboration between librarians and lecturers concerning how best to use PBL to teach students to determine what information is needed to solve problems. PBL, by its very nature, requires these two efforts to be joined. Students cannot solve problems if they do not also know how to locate the information they need. The findings of the study, however, depart from this view. Medical librarians in South Africa value collaboration between themselves and lecturers, as it helps

them to tailor their services to meet the requirements of PBL and thus provide a relevant service to their users.

PBL encourages greater involvement, interactively, between librarians and faculty staff. Such interaction affords new opportunities for librarians to interact with faculty staff in the roles of educators, consultants and intellectual partners. Librarians also gain an improved understanding of the curricula, as well as what resources are needed (Myers, Saunders and Rogers 2002:475).

Collaboration between medical librarians and academics help librarians to provide relevant and up-to-date services for library users. This objective is achieved by routinely obtaining class reading lists, meeting formally or informally with academic staff in the faculty to discuss curricular trends and also receiving suggestions for books and/or journal orders from academic staff and/or students (Carroad and McGregor in Darling 1982:238). The findings of the present study support this view. Librarians work together with lecturers when doing training and web pages; they are involved in the preparation of case studies for each tutorial; they are part of the planning process for compulsory user education modules and assessment; and they participate in theme discussions, as reported by five (41.6%) respondents. One-on-one meetings between lecturers and librarians were held; librarians were involved in curricular meetings and academic discussions; and there were annual meetings between lecturers and librarians to discuss literacy training programmes for the following year, as reported by five (41.6%) respondents. There was, however, a need to formalize this collaboration in some institutions, according to one (8%) respondent.

 It is interesting to note that collaboration between lecturers and librarians existed in the majority, 12 (92.3%), of the institutions in which the medical librarians worked. This indicates that there is collaboration between lecturers and medical librarians in medical libraries in South Africa.

5.7 How should collaboration/partnership between lecturers and librarians be established?

This research question aimed at gathering information on how collaborations/partnerships between lecturers and librarians should be established, if they did not already exist. There was consensus among all respondents about the importance of collaboration and its existence at their institutions.

Collaborative discussions between lecturers and librarians provide an opportunity for in-depth examination of information literacy goals and content goals for the session and are likely to change the nature of the librarian's relationship with course lecturers to one of partner, collaborator and consultant. They also provide one of the most effective methods for truly integrating information literacy into the classroom content (Snavely 2004:527). The results of the study clearly indicate that this kind of collaboration has already been established between medical librarians and lecturers in South African medical schools.

5.8 Comments on PBL

Medical librarians provided favourable comments about PBL. It is interesting to note that not only academics were in favour of PBL as a teaching/learning method, but librarians also saw the benefits of PBL for students. Despite the increased workload brought about by the introduction of PBL at their institutions, librarians saw its value and benefit for students, as two respondents (25%) commented, "PBL helps students to work consistently and encourages use of library resources and facilities. It makes them information literate and life-long learners".

Future physicians must learn to cope with continuing changes in access to medical information (Earl 1996:191). PBL, as an instructional technique, emphasizes the importance of information-seeking skills and requires the learner to search the literature. The rationale for the introduction of PBL in any educational curriculum is based on the ability of PBL to make learning relevant to the student, to improve communication skills and to develop the

ability to work in a co-operative manner with group members and to inculcate self-directed and life-long learning (Khoo 2003:401). PBL is linked to a humanistic technology of education to develop highly competent practitioners who have the ability to continue to learn effectively throughout their lives (Boud and Feletti 1991:14).

Since PBL students enjoy their medical education experience and their interactions with their peers and instructors, they are more likely to engage in life-long learning than their counterparts in the traditional curriculum (Albenese 2000:736). PBL emphasizes teamwork, fosters long-term memory and provides a framework that sustains life-long learning (Alleyne *et al*., 2002:273). The acquisition of attitudes, habits and techniques of a life-long learner is one of the goals of a PBL curriculum (Donner and Bickley 1993:295). The findings of the study support this view. PBL helped students to become information literate and life-long learners, as reported by two (25%) respondents.

Medical education must be able to produce doctors who are effective communicators, loyal team members, prudent managers of scarce resources and providers of comprehensive health care (Iputo and Kwizera 2005:388). PBL was adopted as the pedagogical approach at the University of Transkei, because these attributes were deemed to be the basic essentials for doctors working in the rural and impoverished environment of the Transkei. PBL developed students' social and technical skills, which were necessary for practice in rural and urban socio-economically deprived communities and for the provision of primary health care, as reported by one (13%) respondent.

According to Barrows and Tamblyn (1980), one of the shortcomings of the traditional medical curriculum was its failure to equip graduates with problem-solving skills which are necessary for a lifetime of learning (in Wilkerson and Gijselaers 1996:1). Medical schools locally and internationally adopted PBL into their curriculum because PBL uses problems to stimulate learning of information and concepts. PBL teaches a method of approaching, and an attitude towards, problem-solving. It takes everyday situations and creates learning opportunities from them (Macklin 2001:307). PBL students are conditioned to correct any lack of information immediately as a case develops. They are not just advised to be life-long

learners and problem-solvers; they are trained to be (Donner and Bickley 1993:295). A comment from one (8%) respondent attests to this fact. The respondent stated that PBL, together with user education programmes librarians provide, helps students to become critical thinkers and enables them to solve problems.

The findings of the present study support the numerous benefits of PBL, as mentioned by various authors. According to two (25%) respondents, PBL helps students to work consistently and encourages use of library resources and facilities. This concurs with Rankin's view that medical students are the heaviest users of academic medical libraries. Their information needs are often for textbooks and for general and overview material (Rankin 1992:37). PBL students depend on texts and other library material far more completely than do students in a traditional programme (Donner and Bickley 1993:295). The services medical librarians provide had to change in order to align with this demand.

5.9 Summary

This chapter discussed the results of the study in the light of the six research questions the study attempted to answer pertaining to PBL, medical libraries and medical librarians in South Africa. The findings indicate that PBL indeed had an impact on medical libraries and medical librarians. It is encouraging to note that, generally, medical libraries in South Africa are equipped in terms of financial resources, physical layout, the collection and facilities, to support PBL effectively. Similarly, medical librarians possess the skills and knowledge necessary to support PBL effectively. Medical librarians have established partnerships with lecturers regarding course design which enable librarians to keep abreast and up-to-date with the curriculum, thus helping them to provide a relevant and efficient service to their users.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The purpose of this study was to investigate the effect of PBL on medical libraries (including medical librarians) in South Africa. In order to accomplish the purpose, the study attempted to answer the following research questions regarding PBL, medical libraries and medical librarians in South Africa:

- How has PBL affected librarians in medical libraries?
- Has there been a change in the way librarians conduct user education since the introduction of PBL?
- Are medical libraries adequately equipped, in terms of the collection, physical layout, facilities and financial resources, to support PBL?
- What knowledge and skills do librarians need to participate effectively in PBL?
- Is there any collaboration in the design of courses between lecturers and librarians?
- How should collaboration/partnerships between lecturers and librarians be established?

Chapter 6 presents a summary of the study, conclusions, recommendations of the study as well as an agenda for further research.

6.2 Summary of the study

The study began with an introductory chapter, Chapter 1, which covered the background to the study, statement of the problem, aim, research objectives and research questions the study attempted to answer. The chapter also included definitions of key terms used in

the study, the theoretical framework on which the study was based, as well as limitations and delimitations of the study.

In Chapter 2, *The literature review*, the following topics were the focus of the discussion:

- The role of medical libraries;
- The definition, historical perspective of PBL in medical libraries and rationale for PBL in medical schools;
- The introduction of PBL in South African medical schools;
- Challenges facing medical libraries in Africa, including South Africa; and
- The effect of PBL on medical libraries.

Chapter 3, *The research methodology*, presented the research methodology that was used to address the research problem. It included the design of the study, population, sampling, data collection instruments, methods of data analysis and validity and reliability considerations.

The results of the survey of the population of medical librarians in South Africa, which was conducted by means of a self-administered questionnaire, were presented in Chapter 4, *The research results*. The purpose of the questions asked was explained and the results were presented.

The findings of the study, in light of the six research questions the study attempted to answer, were discussed in Chapter 5, *The discussion of results*. The results of the study revealed that medical libraries generally were equipped in terms of the collection, physical layout, facilities and financial resources to support PBL effectively, although there was room for improvement. Similarly, medical librarians possess the knowledge and skills necessary to contribute to PBL effectively.

6.3 Conclusions

It is evident, from the findings of the study, that PBL brought about changes in the manner in which medical librarians performed their tasks. There was a notable increase in their workload in terms of queries and user education programmes.

The introduction of PBL in medical schools impacted on library use. Library usage by students increased. The demand for resources, including electronic resources, increased. The increased demand on library resources had an impact on the services medical librarians provided.

No mention of additional staff to cope with the increased workload that was brought about by the introduction of PBL at their institutions was made by any respondent. The conclusion, then, is that medical librarians had to cope with the demands of PBL using existing staff. Their ability to appreciate the benefits of PBL for students and support PBL fully, despite the increased workload and other challenges they had to contend with after the introduction of PBL at their institutions, must be commended.

The findings of the study indicate that the learning of new skills and acquisition of knowledge became necessary, with the introduction of PBL. Computer skills, knowledge of latest technologies, techniques, electronic resources and knowledge of how PBL is taught, are examples of skills and knowledge librarians had to acquire to support PBL effectively. Once more, no mention of staff training or courses librarians had to attend to equip them with the necessary skills was made by any respondent. The conclusion, again, is that medical librarians were required to support PBL without being offered any training to ensure that they acquired the skills and knowledge they required to carry out this function efficiently.

For PBL to be successful, ready access to first-class library and computing facilities is a necessity, not a luxury (Martin 2003b:182). Although the majority of medical libraries are adequately equipped, in terms of the collection, physical layout, facilities and financial resources, to support PBL effectively, there were some institutions in which facilities and resources to support PBL effectively were inadequate. The ever-shrinking budgets make it a daunting task to keep collections, especially electronic resources, up-to-date. Shortage of computers for hands-on training with students has a negative impact on user education programmes, which are vital for the success of PBL in medical libraries. This severely hampers the library's ability to offer a relevant and up-to-date service.

Space was found to be a hindering factor in the libraries' ability to support PBL effectively. A lack of space for student group study and the need for bigger LAN facilities and reserve book rooms/short loan rooms, contributed to the libraries' failure to provide effective support for PBL.

6.4 Recommendations

Authorities in institutions/library management have to bear in mind the increased workload for librarians when introducing PBL at their institutions. Although PBL is a learning/teaching method, its effect is not confined to teaching staff only. Provision must be made for adequate staff, to ensure effective support of PBL in medical libraries.

The increased workload necessitated a re-structuring of librarians' duties. PBL demands more interaction with students, specifically more one-to-one interaction between students and librarians. Librarians' duties must be structured with this fact in mind, to ensure that an adequate amount of time is set aside for this interaction to take place.

Exposure to other medical libraries, locally or internationally, in which PBL was already used, could have enhanced the medical librarians' adjustment to PBL. This is a matter for library administrators to take into account when considering a change from one learning

method to another. Observing the facilitation of PBL in other libraries, could have assisted librarians with the introduction of PBL in their libraries. Librarians should be encouraged, on an ongoing basis, to share their knowledge and skills gained from PBL experiences.

The high level of education for medical librarians had a positive impact on their ability to cope with PBL and learn new skills. The majority of medical librarians held Honours degrees in librarianship. Medical librarianship is a specialised type of librarianship and it requires special skills. The ability to cope with a complex teaching/learning method such as PBL, and to provide the efficient service it demands, requires a high level of education and professional maturity, as the findings indicated regarding the medical librarians who were studied. It is recommended, therefore, that the Honours degree should be the minimum requirement for the appointment of medical librarians. This will enable new medical librarians to cope with the intricacies of PBL and/or any other teaching/learning method that may be introduced in the future.

Collaboration between librarians and lecturers is important to ensure the effective delivery and support of PBL, as noted by the majority of respondents. It affords librarians the opportunity to learn new trends in the curriculum, thus enabling them to offer services that are relevant. It is important that both parties understand the value of collaboration. An efficient library service depends on this collaboration between librarians and lecturers. It is encouraging to note that such collaborations/partnerships already exist in South African medical schools. It would greatly benefit other educational institutions, which may be contemplating a change to another teaching/learning method, to establish such collaborations/partnerships. The results for librarians, lecturers and students, are favourable.

Library administrators should participate in budget discussions, so that they can inform their institutional authorities of the challenges libraries experience in their attempt to deliver services to users. Institutional administrators need to understand that the impact of PBL extends beyond academia. Libraries, as the engines of the institutions of higher

learning, are also affected. Library budgets should therefore be allocated with this fact in mind. There needs to be a greater commitment from institutions to provide libraries with budgets that will enable them to meet the demands of PBL.

6.5 Agenda for further research

The present study focused on the effect PBL had on medical libraries in South Africa. It is understood from the literature that PBL has also been adopted in other disciplines such as architecture and management. A study that investigates the effect of PBL on libraries in these disciplines in South Africa should be conducted.

Finally, this study captured medical librarians' experiences of PBL. Lecturers' experience of PBL, with reference to the library, is another area that needs to be researched.

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APPENDIX 1

The effect of problem-based learning on medical libraries in South Africa

Dear Colleague

My name is Nonhlanhla Ngcobo. I am an Information Studies Masters student at the University of Kwazulu Natal, Pietermaritzburg Campus. I am conducting research on the effect of problem-based learning (PBL) on medical libraries as a requirement for my Masters course. I kindly ask you to complete this questionnaire. All the responses will be treated confidentially, i.e., no response will be linked to a particular respondent. Participation in this research is voluntary. If you require more space for your responses/comments, please use the back pages of this questionnaire.

Instructions
Please complete the following questionnaire by clearly ticking or crossing the relevant boxes or by filling in the information requested.

Section 1 – Background information

1. Highest qualification

    1.1 Postgraduate diploma
    1.2 Honours
    1.3 Masters
    1.4 PhD
    1.5 Other, please specify ………………………….

2. Gender

    2.1 Female [   ]
    2.2 Male [   ]

3. Age

    3.1 21-30 [   ]
    3.2 31-40 [   ]
    3.3 41-50 [   ]
    3.4 51-60 [   ]
    3.5 60 and above [   ]

Section 2 – The effect of problem-based learning on medical libraries in South Africa

4. How long has your institution been using PBL as a teaching and learning method?

   4.1 One year [   ]
   4.2 Two years [   ]
   4.3 Three years [   ]
   4.4 Four years [   ]
   4.5 Five years [   ]
   4.6 Six years or over [   ]

5. Have you been affected by the introduction of PBL in your institution?

   5.1 Yes [   ]
   5.2 No [   ]

6. If you answered "Yes" in question 5, in what way have you been affected?
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7. Has there been a change in the way you conduct user education in your library since the introduction of PBL?

   7.1 Yes [   ]
   7.2 No [   ]

8. If you answered "Yes" in question 7, please explain these changes.
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9. In your opinion, do librarians need any specific knowledge and skills to support PBL effectively?

   9.1 Yes [   ]
   9.2 No [   ]

10. If you answered "Yes" in question 9, what specific knowledge and skills do librarians need to support PBL effectively?

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11. Is your library adequately equipped, in terms of financial resources, to support PBL effectively?

   11.1 Yes [ ]
   11.2 No [ ]

12. If your answer to question 11 is "No", please explain why your library is not adequately equipped.
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13. Is your library adequately equipped, in terms of layout, to support PBL effectively?

   13.1 Yes [ ]
   13.2 No [   ]

14. If your answer to question 13 is "No", please explain why your library is not adequately equipped.
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15. Is your library adequately equipped, in terms of facilities, to support PBL effectively?

   15.1 Yes [ ]
   15.2 No [ ]

16. If your answer to question 15 is "No", please explain why your library is not adequately equipped.

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17. Is your library adequately equipped, in terms of the collection, to support PBL effectively?

   17.1 Yes [ ]
   17.2 No [ ]

18. If your answer to question 17 is "No", please explain why your library is not adequately equipped.
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19. Do you think collaboration between medical librarians and lecturers in designing courses in relation to PBL is important?

   19.1 Yes [   ]
   19.2 No [   ]

20. If your answer to question 19 is "Yes", please explain why.
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21. Is there any such collaboration between lecturers and medical librarians in your institution?

   21.1 Yes [   ]
   21.2 No [   ]

22. If your answer to question 21 is "Yes", please explain the nature of that collaboration.
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23. If your answer to question 22 is "No", how should such collaboration/partnerships be established?
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24. If you would like to make further comments about PBL and medical libraries, please do so below.
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Thank you for your participation.