ASSESSMENT OF TEACHING STAFF TOWARDS PROBLEM BASED LEARNING CURRICULUM AT MULAGO MEDICAL SCHOOL MAKERERE UNIVERSITY

BY

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DECLARATION

This is my original work and has never been published or submitted for any other degree in any institution of learning

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APPROVAL

This dissertation entitled "Assessment of Teaching staff towards Problem Based Learning Curriculum at Mulago Medical School, Makerere University has been submitted for examination with the approval of:

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DEDICATION

This dissertation is dedicated to the Masagazi family, especially to my mother Hajjat Mina Nakachwa Masagazi.

May God bless you all.

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TABLE OF CONTENTS 1

LIST OF TABLES

ABSTRACT

This study was conducted to investigate the Attitude of students and teaching staff at Mulago Medical School towards Problem Based Learning (PBL). Curriculum The study particularly sought both the students and teaching staff's attitudes in form of opinions and views on different issues concerning PBL.

The study was conducted through a cross sectional survey design, data being collected during the month of February 2008 using questionnaire and interview responses from 27 teaching staff and 141students. The sample was randomly and purposively selected from the accessible population. Data was analysed using mean scores of stake holders with the positive and negative attitudes towards aspects of PBL.

The study revealed that at Makerere Medical School, students regardless of their year of study or sex and the staff of all the teaching departments had a positive attitude towards PBL as compared to the traditional content driven teaching.

Considering the findings above, the researcher recommends the following;

1. There is a need to organize seminars for all the members of staff of the medical school to discuss the intricacies of PBL with a view of improving it.
2. There is a need to structure students' assessment based on problems as per the tenets of PBL.
3. The government of Uganda should popularize PBL use to other teaching units of the university. Since it has been found to be supported by all stakeholders at Mulago Medical School, it should be applied in all units which are training human resources.

CHAPTER ONE

1.1 Introduction

This chapter includes the conceptual, theoretical and contextual background of the study, problem statement and purpose of the study, specific objectives, research questions and the hypothesis of the study. The scope and significance of the study is also covered in this chapter.

1.2 Background of the study

(a) Historical Background

According to Long (2000) as a philosophy of learning, Problem Based learning (PBL) can be traced to the 18th Century in the works of Giambattista Vico. It is anchored in the constructivism learning viewpoint in which it is maintained that human beings understand only what they have been personally involved in, initiated and evaluated.

According to Barrows and Tomblyn (1980), PBL as it is generally known today, evolves from innovative health sciences in the early 1950s from McMaster University in Canada. According to them, Medical University, with its intensive pattern of basic science lectures, followed by an equally exhausting clinical teaching programme, was rapidly becoming an ineffective and inhuman way to prepare students given the explosion in medical information and new technology and the rapidly changing demands of future medical practice. This ineffectiveness pushed the Medical Faculty of McMaster University to introduce the tutorial process.

Boud et al (1991), states that since its adoption in the 1950s, it has been refined and implemented in over sixty medical schools world over. The most wide spread application of the Problem Based approach world over has been in the first two years of medical science curricula where it replaced the traditional lecture based approach to subjects like Anatomy, Pharmacology, Physiology. Boud goes on to say that the Problem Based Learning model over the years has been adopted in an increasing number of other areas including Business Schools, School of Education, Architecture, Law, Engineering and Social Work.

According to African Health Science Journal by Makerere Medical School (volume 6, June 2006), the Medical school, of Makerere University, was started in 1924 and has been running a traditional subject based curriculum. It was being delivered mainly using lecture method for 79 years and did not give students the chance to be involved in actual problem solving. In 2003, Mulago Medical School embarked on changing its curriculum from subject based curriculum to Problem Based Learning (PBL) and Community Based Education and Service (COBES) as well as Early Clinical Exposure. This curriculum has been implemented since the academic year 2003/2004.

(b) Theoretical background

This study is based on the constructionist theory which was advanced by Lev Vygotsky (1896-1934) cited in Carlile and Jordan (2005). It states that when students are put in small learning groups in a tutorial system under a tutor, who acts as a facilitator or a coach, they generate learning objectives based on the analysis of the problem. This facilitates their acquisition of knowledge and desirable attributes such as; communication skills, team work, problem solving, independent responsibility for learning and sharing of information. This is in

line with Lea, Stephenson and Troy (2005) who observe that the constructivist view of learning places emphasis on activity, discovery and independent learning and stresses the performance of physical activities, projects and practicals. It describes a shift in power from the expert teacher to the student learner.

In other words, the theory proposes that learning is an active contextualized process in which learners draw their own conclusions through creative experimentation. This implies that when students are given a choice to determine what and how to study it leads them to deep learning. In this case their critical analysis of new ideas, linking them to already known concepts and principles, leads to long-term retention of concepts which could be used for problem solving in the future.

(c) Conceptual background

The term PBL is widely used in the teaching learning process and is reflexive of today's society where choice and democracy are important concepts (Carlile and Jordan, 2005). Many terms have been linked to PBL and they include flexible learning, experiential learning and self directed learning (Carlile and Jordan *op cit)*. Therefore the over used term PBL can mean different things to different people. Howard Barrious & Ann Kelsen (2003) describe Problem Based Learning (PBL) as a total approach to education which is both a curriculum and a process. The curriculum consists of carefully selected and designed problems. The problem demand from the learner acquisition of critical knowledge of problem solving proficiency, that involves a problem solving assignment. The assignment requires one to explore, understand and find a solution that with time, generate into a state of being competent and

skillful. It also calls for self directed learning strategies, which propels students to use their personal calendar to schedule and organize learning tasks and personal workspace.

In other words, a student should actively be involved in determining how and what to learn in a particular lesson. Whenever this is done the student is in position to link ideas to already known concepts and principles leading to long-term retention of thoughts so that they can be used in problem solving.

1.3 Students and teaching staff at the medical school

Glossary of Parliamentary Commissioner for the Environment Reports (2007) defines stakeholders as individuals, groups or organisations that are affected by and/or have interest in a particular issue. Those people and organisations who may affect, be affected or perceive themselves to be affected by a decision or activity are usually said to have a 'stake' in that issue.

The stakeholders in Problem Based Learning at Mulago Medical School are the medical students, medical teaching staff surgical staff and others. This is because they are the reason for the school's existence. Without them, the planning, piloting and implementation of Problem Based Learning Curriculum would be impossible. The Medical school runs five undergraduate programmes which include; Bachelor of Medicine, Bachelor of Surgery, Bachelor of Pharmacy, Bachelor of Nursing, Bachelor of Dentistry and Bachelor of Radiography. These individuals have vested interest in the mode of learning as it determines

the achievement of the objectives and aims of the institution, which is to promote student-centered multi-disciplinary education as a basis for life long learning in professional practice.

1.4 Problem Based Learning

Since the adoption of Problem Based Learning Curriculum by various Medical Universities and Colleges, in several countries there have been extensive, complicated and interrelated influences that have affected people's reaction to Problem Based Learning curriculum. Over the years, positive, neutral or negative feelings have been expressed by many scholars about Problem Based Learning. Germann (1988) and Jonassen & Reeves (1996) support the model, because it fosters active learning, allows students to develop generic skills and also leads students to build on existing conceptual knowledge framework. On the other hand, Hoffman& Richie (1997) oppose the model on grounds that it needs more human resources in its tutoring process.

Other critics include Black (1999) and Simon (1999). They observe that PBL focuses on the individual learner without taking into consideration the needs of the entire class. In other words this implies that PBL takes away the students' social interaction within the class. Simon *op cit* further adds that PBL cannot be used economically in large classes of universities located in developing countries.

The inconsistency in opinion between stakeholders in universities located in other countries could be an indicator that there is a need to undertake a study at Mulago, hence the need for this study.

In Mulago Medical School the curriculum change from traditional based to Problem based leaning was undertaken after a needs assessment. It was noted that Makerere was no longer the sole trainer of health professionals in Uganda as it was facing competition from other training institutions. Curricula for the five programmes were consequently revised and approved by the Faculty of Medicine Board, Makerere University Senate and Council.

Introducing Problem Based Learning into an institution like Mulago Medical School makes new demands and challenges on the teaching staff and students who are the stakeholders and beneficiaries in the long-run. As teaching staff's skills develop, students' performance in their respective courses of study may improve because they are motivated towards learning. They will have a positive attitude towards Problem Based Learning. However this may affect the students and teaching staff's attitudes.

Problem Based Learning, as a new mode of learning, again makes new demands on the teaching staff and students. It requires teaching staff to function as facilitators for small group learning rather than acting as providers of information. Staff development is essential, as it focuses on enabling the Problem Based Learning teaching staff to acquire skills of facilitation and management of group dynamics (including dysfunctional groups).

The question which this study is attempting to answer through collecting and analyzing data is what is the perception of students and teaching staff towards this new approach of learning referred to as problem based learning?

1.5 Statement of the problem

Method of instruction is an important aspect in the teaching-learning process (Carlile and Jordan, 2005). According to Ministry of Education (1989) objective one for higher education is to ensure that highly trained manpower is passed out in tertiary institutions of learning. In relation to curriculum design, PBL is a philosophy of learning in which students have a choice in what and how to study. It thus gives students increased responsibility and accountability in the learning process. This is likely to bring in academic challenges such as: awarding of marks, comparing students with one another, developing formative assessment as a component of feedback in PBL among others.

The foregone analysis indicates that such a mode of operation is likely to affect the academic freedom and objectivity of both the students and lecturers at Mulago Medical School, yet this is important for the proper functioning of the university. If such a situation occurs the school may pass out medical personnel with questionable grades. This study is an attempt to establish the views of the lecturers and students towards PBL.

1.6 Purpose of the study

The purpose of the study was to find out the attitudes of the medical school teaching staff and the male and female medical school students in different years of study towards Problem Based Learning curriculum at Mulago Medical School.

1.7 Objectives of the study

(i) To assess whether year of study influences the attitudes of Mulago Medical School Students towards the Problem Based Learning Curriculum.

(ii) To find out whether gender influences their attitudes towards Problem Based Learning Curriculum.

(iii) To compare the attitudes of the teaching staff from different specialties towards Problem Based Learning Curriculum.

1.8 Research Hypothesis

(i) There is no statistically significant difference between the mean score of attitudes of medical students of different years of study, as measured by the Attitudes towards Problem Based Learning Assessment Scale

(ii) There is no statistical significant difference between the mean scores of attitudes of male and female students as measured by their Attitude towards Problem Based Learning Assessment Scale

(iii) There is no statistically significant difference between the mean scores of attitudes of the medical school teaching staff, in different departments as measured by the Attitudes towards Problem Based Learning Assessment scale

1.9 Scope of the study

The study sought to find out the attitudes of medical school students and the teaching staff of Mulago Medical School towards Problem Based Learning curriculum. The study attempted to determine an attitude statistical difference between the male and female students, the staff of

different departments, the students of different years and different courses of study towards Problem Based Learning. It involved the male and female students in the different years of study and teaching staff in the different departments of Surgery, Pharmacy, Nursing, Dentistry and Radiography of Mulago Medical School. The study covered Mulago Medical School in Kampala District, because it is the oldest Medical School and has adequate numbers of staff and students in the different departments. It was further selected because the distance of 240 km from Kampala to Mbarara University of Science and Technology where Problem Based Learning is also used would make inclusion of students and staff from that University too expensive.

1.10 Significance of the study

The study was meant to guide various academicians like students, professors and researchers with reading materials preference in their research and academic endeavors in future.

In finding out the attitudes of different stakeholders towards Problem Based Learning methods, the study shall benefit the instructors or lecturers who will improve on their teaching, basing on the researcher's recommendations and possible solutions to the existing challenges. The designers of the Problem Based Learning curriculum will be provided with best approaches of improving the Problem Based Learning curriculum content and model delivery.

The study was meant to provide information about the attitudes of the students towards Problem Based Learning. If it was positive, this could encourage its adoption to other professions such as education, who might also prefer it as a method of teaching and learning.

CHAPTER TWO

Literature Review

2.1 Introduction

This chapter entailed the review of the related literature of the different objectives studied by the researcher. It dealt with the historical perspective of Problem Based Learning, how Problem Based Learning works and perceptions about Problem Based Learning.

2.2 Theoretical perspective of Problem Based Learning

According to Schon (1987) the constructivism learning theory is based on practice. In this case students are put in small groups under a facilitator. This is aimed at giving such students a standard and universal way of embarking upon academic problems. Therefore during this practical learning process such students are assumed to be free thinkers who could internalize and construct new knowledge basing on past experience. The students should therefore use high level processing skills such as evaluation, analysis and synthesis. This in turn increases their motivation for learning and as such they gain the confidence for completing complicated tasks and even embark on greater challenges.

According to Barrow (1985), the traditional teachers and students roles change. The students assume increasing responsibility for their learning by being given more motivation and more feelings of accomplishment which sets the pattern for them to become successful life-long learners.

Graham & Boud (1997) states that Problem Based Learning courses start with problems rather than exposition of disciplinary knowledge. Courses then move students towards the acquisition of knowledge and skills through a staged sequence of problems presented in context, together with associated learning materials and support from a facilitator.

Barrow and Tomblyn (1980), emphasize that, Problem Based Learning uses a tutorial process which involves learning and teaching in small groups with a tutor whose duty is to facilitate the proceedings, using trigger materials like patients, video clips and photographs. The students subsequently do independent, self directed study before returning to the group to discuss and refine their acquired knowledge. This is meant to increase knowledge and understanding on the part of the students and to promote student-centered multidisciplinary education as a basis for life long learning in professional practice. However in adopting the constructivism theory of learning for this study, the researcher is not ignorant of its shortcomings. It cannot economically work in large classes of universities located in developing countries. The theory also calls for a shared vision between lecturers and students so that both have an idea on what they are trying to accomplish, a task which is not easy.

2.3 How Problem Based Learning works

Graham & Boud (1997) further argue that, although there is no universally agreed upon set of practices which must be found in the Problem Based Learning courses to define them as such, the following features are characteristics of Problem Based Learning as an approach to education:

- It uses appropriate learning material such as a patient, paper based clinical scenarios, photographs, video clips or a family tree showing an individual disorder, to help students discuss important problem questions or issues.
- It presents the problem as a stimulation of professional practice or a real life situation.
- It appropriately guides student's critical thinking which enables them to synthesize, apply and appraise their learning in order to help them define and solve the given problem.
- Students work co-operatively as a group, exploring information in and out of class, with access to a tutor who knows the problem well and can facilitate the group-learning process.
- It gets students to identify their own learning needs and an appropriate use of available resources.

This is in consonance with Dutty (1994:231-232), who also states that the learning issues of PBL are the topics of any sort which are deemed of potential relevance to this problem and which group feels they do not understand as well as they should. A session is not complete until each student has an opportunity to verbally reflect on his/her current beliefs about the diagnosis and assume responsibility for particular learning issues that were identified.There are no pre-specified objectives presented to the student. The students generate the learning issues (objectives) based on their analysis of the problem. After the session, the students all engage in self directed learning. There are no assigned tests. Students are totally responsible for gathering the information from available medical library and computer database resources.

After self-directed learning, the students meet again and begin by evaluating resources to assess what was most useful and what was not so useful. They then begin working on the problem with this new level of understanding as they do not simply tell what they learned. Rather, they use that learning in re-examining the problem. This cycle may repeat itself if new learning issues arise.

2.4 Influence of year of study towards Problem Based learning year of study

Studies carried out on students of different years of study concerning their attitude towards Problem Based Learning produce varying and in some cases inconclusive results. Some studies revealed that students tend to favour PBL model more as they move to higher years of study. For example, Dolmas (1994) in his study entitled 'Students' perceptions of the relevance of Problem Based Learning to clinical practice' state that the model was not appropriate for beginners because it needed somebody with a good grasp of the course content and developed sufficient knowledge. He extensively quoted first year students who participated in the study aimed at finding out the attitude of students towards Problem Based Learning. The participants stated that there was an imbalance in the group due to the fact that individuals in years three and four tended to dominate the linguistic space and could not be challenged by introverts.

Dolmas (1994:27) supports this in the student testimony below.

> It is a good model, but definitely I would not recommend it for use among the first years. It best serves students in the final year as then they would be ready for it

Kauffmann and Mann (1996:82) in support of Dolmas (1994) also quote a study by Prof. Schmidt, entitled, "Effectiveness of PBL curricula: theory and practice." He states that the participants from different years of study reported divergent views about the model. While the years three and four argued that it led to a positive attitude towards lecturers and fellow students, the first years some how detested it. Those in support stated that it was due to the fact that it helped students to identify their own learning difficulties, thereby guiding the tutorial process in a democratic study environment which aimed at solving problems. They also described the model in qualitative terms. They stated that much as it reduced the quantity covered in any given lecture, it had the ability to increase on the retention of what was covered in that particular a lecture.

According to Kauffman and Mann (1996:82) one student had this to say,

> I liked how we investigated, hypothesized and experimented, so as to come up with a solution, like a real scientist would do. I also liked how we figured out things for our selves without a lot of help from lectures.

Another student said,

> It helps you to learn a lot of things because you learn to be more independent so as to find out where to go on your own.

Although being challenged the students also felt a sense of satisfaction after working hard and being able to solve the problem.

My best experience was figuring out in form of diagnosis the cause of the patient's ailment. I was so much proud of myself for figuring out the problem. After I got out, we would talk a lot about it with my fellow students.

Some studies however revealed negative results. Santos Gormez et al (1990) in a study entitled, 'Problem effectiveness in a course design using Problem Based Learning' study conducted among 130 PBL Curriculum medical graduate students at New Mexico School of Medicine, reports that some students disliked the model. They stated that it made them employ complicated and burdensome information seeking skills from online data bases and journals. Such students were normally traditional oriented, who enjoyed knowledge to be passed over to them in a banking concept/lecture method

Murphy (2004) quotes findings made by Moore (1994) in study entitled,' Identification of skills for the problem based model: student and faculty perspectives' carried out among various faculties of Harvard University. The findings were that the participants indicated that they were faced with great hardship in matters such as; summarizing in their own words a case scenario, brainstorming to generate and analyse concepts, connecting, discussing and appraising relevant information, volunteer shared learning objectives through identifying academic gaps, and evaluating evidence collected through separate discussions. It was generally reported that this problem decreased with seniority at university, with fourth year students reporting fewer cases than the first years.

Positive opinions and feelings towards Problem Based Learning were also reported from many students' in general studies conducted by some scholars. Bernstein *et al* (1995), Barrows *et al* (1980) Neufield and Sibley (1989) all state that students from the various years of study overwhelmingly stated that Problem Based Learning was stimulating, engaging and had a psychological effect of reducing academic stress, normally associated with the traditional lecture method. They also stated that it improved clinical practice through changing doctors' and nurses' attitude towards patients. Bernstein (1995) add that the model increased students' information seeking skills because of employing information technology. By so doing, it created trust and working together in groups to ensure that the group is on track in the process.

The above scholars conducted their studies in universities located in developed countries, however they indicate inconsistencies in the students' attitudes towards PBL. Some scholars reported a positive students' attitude, while others show a negative attitude. This indicates that there seems to be other factors influencing students' attitude towards Problem Based Learning which this study endeavours to establish.

In view of the inconsistencies noted from the above studies, Margetson (1999) comes up with a balanced model that cuts across students' years of study, ability, interest and gender. He refers to this model as hybrid Problem Based Learning and it was adopted by Prof Terry Berret of Queensland University Australia.

The model incorporates a case based problem solving approach supplemented with lecturers, tutorials and clinical supervision. Margetson states that, the model involves students in self directed learning and it resolves issues regarding limited financial and human resources. He goes on to state that, it had worked well among both the beginner students and those who had foundational knowledge. Much as Margetson seems to modify the PBL model through introducing an hybrid one, he still up holds the view of other scholars that Problem Based Learning positive attitude among students increases with seniority in the course of study.

In the adult learning theory as cited by Cross (1981) and Vernon (1995), it is stated that adults as learners have personal and situational characteristics that aid or impede their learning. According to this theory, intelligence as a personal factor increases with age and this leads to improvement in decision making, reasoning and vocabulary. Additionally, the proponents of the theory further state situational factors such as; time of study, duration of academic schedules, marital status and age affect adult students' concentration and perception rates. This is due to the fact that in addition to studying, such learners have other responsibilities to execute, in their homes, the community around them and sometimes in their workplaces.

The above studies and views indicate that generally the more time medical students stay in their academic institution, the more they progress into adults hence preferring a Problem Based Learning programme which adequately caters for personal and situational characteristics.

2.5 Influence of gender towards Problem Based Learning

This section reviews literature concerning the influence of gender towards PBL. Venon & Blake (1992) in a study entitled,' Reform undergraduate medical teaching through Problem Based Learning' and Farquhar et al (1986) in another study entitled,' Problem Based Learning instruction and curriculum design' state that male and female students' attitude towards Problem Based Learning was similar. However Venon & Blake (1992) indicated that male students' participants who had been introduced to natural sciences in their lower primary schooling tended to have a higher preference for Problem Based Learning as compared to their female counter parts who had been introduced to Problem Based Learning at a later learning stage.

According to both scholars it was due to the fact that those male students used their basic and foundational knowledge acquired in the natural sciences to grasp Problem Based Learning concepts better. This in turn affected their attitudes towards the model.

However these scholars did not indicate what type of attitudes did male students who were introduced to Problem Based Learning at higher primary have.

Venon and Blake (1992) in his meta analysis study about Problem Based Learning argues that the intellectual atmosphere of the home the support, given by parents, the parents' aspirations for the children and emphasis given to education, gives a head start to students which either influences them positively or negatively towards Problem Based Learning in their study. Bernstein (1995) upholds this view, and further states that boys in families are subjected to less parental surveillance and less parental dominance than girls. In this case they are likely to

support Problem Based Learning which is a learning programme in which they explore, understand and find solutions through self directed learning. Similarly, girls who are normally subjected to strict surveillance and parental dominance in the homes tend to develop a negative attitude towards Problem Based Learning due that kind of home background/ orientation.

Basing on their independent studies conducted among mainly male medical university students in European and American universities, Farquhar (1986), Neufield and Sibley (1989) and Barrows et al (1980) all observed that there are different levels of self esteem between boys and girls. They further state that this affects their academic self concept and self confidence. According to the above scholars, boys compared to girls, tend to have a firmer belief that one can control the outcome of one's learning. With this in mind, this leads to a possibility of male students to have better positive attitude towards Problem Based Learning as compared to their female counterparts.

The fact that their independent studies were conducted among students selected in various medical schools located in different geographical areas brings us to a possibility of unequal selection and participation of respondents in the different groups. There is therefore a possibility of a high rating of positive attitude by students who had bigger sub samples in their study. With this in mind the researcher tend to observe the applicability and generalisibility of these findings at Mulago Medical School, among fairly distributed female and male sub-samples.

2.6 Problem Based Learning visa vis staff specialty/department a comparative approach.

Problem Based Learning seems to be enormously supported by most lecturers across their disciplines and specialty. In a study that was conducted at University College of Dublin quoted by Wilkerson (1991), Davis (1994) and Dolman & Schmidt (1996) and Kauffman and Mann, (1996). The study was undertaken by 21 lecturers who were pursuing a Higher Diploma in University teaching and learning, and it was entitled, "Theories of teaching and learning in institutions of learning"

The participants were lecturers from a variety of disciplines which included; veterinary, medicine, computer science, engineering, arts, adult education and Geography. The study followed the 7 step Maastricht model known as the Problem Based Learning process. This model had six problems all of which addressed issues about contemporary education theories.

According to Wilkerson (1991), Kauffmann and Mann (1996) Davis (1994) and Dolman and Schmidt (1996) the 21 participants were randomly divided into three Problem Based Learning groups. They were all guided by a module which had six problems all of which addressed issues about contemporarily education theories.

Data was collected using semi structured interviews that were audio taped and participants were encouraged to talk freely about their experiences of Problem Based Learning. Data was analysed using Nvivo soft ware package.

Findings indicated that most of the lecturers from those different departments/ specialties enjoyed the experience and supported it due to its having the ability to be reflexive, critical and active in learning. They further stated that they achieved much in the exercise and had gained much on several different levels. This was because the model led to the development of interpersonal and communication skills plus the ability to discuss issues in an academic/scholarly environment. Additionally, it led to participants' ability to challenge others in a constructive and non threatening way.

The lecturers also stated that in the model, knowledge was contextual rather than being discipline oriented. This was stressed by Davis (1994: 38)

> The very first day 1 did not like it all. I was not comfortable in the setting, particularly in terms of interaction with other lecturers. I can honestly say that by the end, I was enjoying it very much and was comfortably talking in public and had no problem in challenging others on certain points.

Wilkerson (1991), Davis (1994) and Dolman (1996)'s views concerning lecturers' attitudes towards Problem Based Learning compare favourably with those of students, as given by Murphy (2004) and Dolmas (1994) cited earlier on. They both indicate that the majority of the teaching staff and students support the model as one which fosters active learning. It is on the above note that the researcher intends to extend the study to Mulago Medical School, to compare the attitudes of the teaching staff across departments and students towards Problem Based Learning.

Santos Gormez et al (1990) indicate that conservative tutors and students were both opposed to the model. This was due to the fact that the former enjoy passing on their knowledge to the later in a lecture method of teaching. Santos Gormez goes on to argue that the most progressive and modern lecturers/students supported the model**.**

Burrows (1989) states that, in medicine the mission is to transform enrolled students into nurses or doctors. This can best be done using what he terms as Faculty Hours per Year per Graduate (F.H.Y.G). Basing his study in Mercer University School of Medicine, he argued that both students and lecturers equally showed positive attitude towards Problem Based Learning. For example, Burrows stated that 132 Problem Based Learning curriculum students of Pathology in Mercer University reported an average of 17.4 F.H.Y.G. Yet when they were subjected to the lecture method of teaching, the recorded rate was 4.8 F.H.Y.G. He concludes by stating that the method was beneficial to both students and lecturers and both indicated increased positive attitudes towards it.

Lecturers' students' relationship indicate that for Problem Based Learning, to record increased positive attitude from lecturers and students, should be made on a firm social background which considers both stakeholders to be colleagues.

For example, Margetson (1999) stated that a tutor should consider him/herself as a coach, whose duty is to facilitate knowledge through probing, encouraging and suggesting. He thus cautions lecturers to avoid authoritarianism, though they could exercise some authority in the process. This is due to the fact that authoritarianism can derail students' self motivation or lead to psychological tension. In cases where those guidelines were followed Margetson argued that

both students and lecturers attitudes towards Problem Based Learning were reportedly high. For example 72% and 95% of the McMaster University Problem Based Learning curriculum students and lecturers respectively were in support of the model if conducted following the above stated guidelines.

In other words, Margestson is stressing the importance of group dynamics in a Problem Based Learning tutorial system, whereby the coach ensures effective leadership which satisfies students' needs through effective participation and sound conflict management.

In summary, the studies cited above indicate that while some students favour the Problem Based Learning model in general, their support is more as they progress through the course. The teaching staff tends to support it across their specialty. The model looks best when both students and lecturers work as participants.

CHAPTER THREE

Methodology

3.1 Introduction

This chapter highlights how the research was conducted. It identifies the research design, the institution and population of study, the study sample size, the sampling procedure, teaching staff and the constructed data collection instruments.

3.2 Research design

The study was conducted through, a cross sectional survey design. This design best attempts to describe events or discern characteristics of behaviour exhibited by an individual or groups of people. It is best suited for finding out opinions or facts of people concerning the current status and nature of the problem at the time of investigation.

Therefore, information was collected from a sample that was drawn from different categories of subjects being studied at one point in time. Views, opinions, and feelings of students and the teaching staff were sought on the research question under investigation.

3.3 Institution and population of study

This comprised of all the teaching staff from Mulago Medical School and students both male and female in each of the five years of study at the school. As per the Medical school Personnel office the students' population in each year is indicated in Table3.1 below.

Table 3.1: Target population of students' sample as per year of study

Year of study	Female	Male	Total
1	144	80	224
2	142	105	247
3	134	66	200
4	81	54	135
5	69	42	111
TOTAL	**570**	**347**	**917**

In Table 3.1 above it is indicated that there are 917students medical students of which 570 were female and 347 were male. It is also indicated that there were 224 year one students, of which 144 and 80 were female and male respectively. There were also 247 year two students, of which 142 and 105 were female and male respectively. Further to that, it is also indicated that there were 200 year three students, of which 134 and 66 were female and male respectively. Additionally there were 135 year four students, of which 81 and 54 were female and male respectively. Lastly, there were 111 year five students, of which 69 and 42 were female and male respectively.

3.4 Sampling procedure

Simple random sampling was used to select the students' respondents who provided the necessary information from Mulago Medical School. This procedure helped to select a representative sample of students in which each member of the target population had an independent chance of selection and inclusion in the study. This was done by marking papers

into two categories indicating as to whether a potential respondent will be a selected respondent or not. The two pieces of paper were folded to conceal the information in it and a potential respondent was asked to pick at random a piece of paper in order to determine as to whether he or she would be part of the sampled respondents.

3.5 The study sample size

The study covered a sample size of one hundred and forty one students in the different years of study and in different degree courses, which is 57% of the total population (See Table 3.2 below for details). The 27 lecturers from different departments, as indicated in Table 3.4 that follows, were also purposively included for the study. This was based on the principle of sample size required for the given population (Amin, 2005:454). For details refer to Appendix H.

The lecturers were selected because they are knowledgeable about the subject under investigation.

Table 3.2: Students Participation in the study as per year of study and course

Department	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Medicine	25	41.6	18	30	12	20	06	10	10	16.6	70	49.6
Pharmacy	08	30.7	10	38.4	06	23	02	7.6	00	00	26	18.4
Nursing	06	31.5	07	36.8	03	15.7	02	10.5	00	00	19	13.4
Radiography	02	33.3	02	33.3	02	33.3	00	00	00	00	06	4.2
Dentistry	02	10	07	35	04	20	03	15	04	20	20	14.1
Total	43	100	43	100	28	100	13	100	14	100		

Source: primary data

Forty three (30.4%) of the respondents were in year 1, 43(30.4%) were in year 2, 28(19.8%) were in year 3, 13(9.2%) were in year 4 while 14(9.9%) were in year 5 (see table one above). Furthermore, 06(4.2%) were Radiography students, 26(18.4%) were for Pharmacy, 70(49.6%) were for Medicine, 20(14.1%) were for Dentistry, while 19(13.4%) were for Nursing (see table 3.2 for details). According to the Dean Medical School there were no Pharmacy, Nursing and Radiography students in year five because the duration for their course of study is four academic years.

Table 3.3: Students' participation in the study as per sex

Course	Respondents		
	Male	**Female**	**Total**
Medicine	53	17	70
Nursing	08	11	19
Pharmacy	17	09	26
Dentistry	06	14	20
Radiography	04	02	06
Total	88	53	141

Source: primary data

Fifty three out of 141(37.5%) were female, while 88(62.4%) were male. In terms of course cluster distribution, 53 out of 70(88.3%) of the medicine course students were male while 17(28.3%) were female. Eight out of 19(42.1%) of Nursing course were male, while 11(57.8%) were female. Seventeen out of 26(65.3%) of the course of Pharmacy were male, while 09(34.6%) were female. Six out of 20(30%) of those offering Dentistry were male, while 14(70%) were female. Four out of six (66.6) of Radiography students were male, while 02(33.3%) were female (see table 2 above).

Table 3.4: The teaching staff that participated in the study

Department	**Number of Lecturers**	**Percentage%**
Surgery	10	37.0
Pharmacy	05	18.5
Nursing	04	14.8
Dentistry	04	14.8
Radiography	04	14.8
Total	**27**	**100**

Source: primary data

Ten teaching staff out of 27 (37%) were in the Department of Medicine,05(18.5%) were in Pharmacy, 04 (14.8%) were in Nursing in Dentistry and in Radiography.

3.5 Data collection instruments

In order to have justifiable conclusions the researcher used a multi-modal approach referred to as triangulation. Triangulation is the use of two or more instruments in a study (Bell, 1993). This is done to provide checks and balances in such a way that the outcomes from one instrument should correspond to those of another. This in turn makes the researcher to be confident of the findings. Triangulation was done to provoke, contrasts, similarities and comparisons of items and responses from questionnaire and interview.

a. Interview schedule

The researcher held separate face-to-face interview with 15 students and 3 teaching staff who were purposively sampled. This was done because the researcher believed that these were better placed to give a clear picture concerning the subject under investigation in the institution. The interviews were conducted on individual basis immediately a rapport with the key informants was established. This was normally done after lectures and the average duration for an interview schedule was 30-45 minutes. The researcher interviewed only 18 respondents because they seemed to be so elusive.

Face-to-face interviews brought the researcher and the respondents closer. This facilitated the collection of first hand information. It also enabled the researcher an opportunity to re phrase questions to enhance clarity and accuracy.

Unstructured questions were used to interview the teaching staff and students during data collection to assess the attitudes of students and teaching staff towards Problem Based Learning curriculum at Mulago Hospital. The interview guide is hereby presented in Appendix B.

b. Problem Based Learning attitude assessment scale

According to Norman E. Gronlund (1971), a Likert Attitude scale, is a verbal expression of feelings and opinions that individuals are willing to make known to others concerning an issue under investigation. In this case the researcher used a 7 point attitude Likert scale. This had clearly favourable and unfavourable items, in which the teaching staff and students were required to respond to each of the 25 items using the guideline below. Very strongly Agree (7), Strongly Agree (6), Agree (5), Undecided (4), Disagree (3) Strongly Disagree (2) and Very Strongly disagree (1).

The Problem Based Learning assessment scale was constructed by the researcher. He discussed them with colleagues on the MEd programme, and they were after modified by the supervisor.

3.6 Validity

According to Cronbach (1971) validity means the ability to produce findings that are in agreement with theoretical or conceptual values. In other words, to produce accurate results and measure what is supposed to be measured.

(a) Content validity

For purposes of this study content validity is the degree to which the Problem Based Learning assessment scale items represent the attitudinal content that it is intended to assess.To ensure content validity of the instrument, the researcher selected items which would ensure an accurate assessment of opinions and views basing on the study objectives. He used a table of specification to ensure that all the determinants of Problem Based Learning were adequately covered by the instrument. This table of specification was developed by the researcher in close consultation with the supervisor. The table of specification is represented in Table 3.4 below.

Table 3.5: Table of specification for determining validity of the instrument

Problem Based Learning issues	**Number of statements**
Ease of use	04
Time required	04
Cost involved	03
Mode of use	02
Suitability	03
Motivation aspect	02
Quality of products	03
Perception by stake holders	04

(b) Construct validity

For purposes of this study construct validity is the extent to which the Problem Based Learning assessment scale measures the extent to which the constructivism learning theory

applies to this study. In this case it is assumed that the Problem Based Learning model is supported more by students as they progress through their course.

3.7 Data collection Procedure

After the proposal had been approved by the School of Education, Makerere University the researcher proceeded to the field to collect data, using the letter of introduction from the Dean, School of Education which introduced her to the respondents so as to seek for permission to carry out the study.

He thereafter proceeded to the office of the Dean Medical School, to seek permission for conducting the study in the school. The dean thereafter introduced the researcher to other respondents. The researcher distributed the questionnaires to the students at the Medical School for filling in, which he could collect after an unspecified interval. Some corrections in the data received were done immediately using triangulation. Data was thereafter recorded ready for analysis.

Most interviews were conducted immediately the researcher got a chance of meeting the interviewee. Very few appointments in this case were fixed. Respondents were interviewed individually and the most convenient time which was used was lunch time or after lectures. Interview data was captured through recording using the researcher's cellular phone. It was thereafter organized by transcribing it into themes. The themes were coded into categories that were labeled before deciding on how those themes will be represented in the final

analysis. This was done at the end of each day of research. The interview guide is hereby presented in Appendix B.

3.8 Data analysis

(a) Problem Based Learning assessment scale

When analyzing the 25 statements of this scale, each question was correlated with the total score. In negative statements scores were reversed and scored in an ascending order from 1 to 7. In positive statements alternatives were weighed in descending order from 7 to 1.

In each case, the total score for a respondent reflecting his/her attitude towards Problem Based Learning consisted of the sum of scores which were obtained from all the items. For example, a respondent who scored very strongly agree on all the items, his/her total scores are, 7x25= 175 , for very strongly disagree throughout they are, 1x25= 25, while for undecided throughout it is 4x25= 100

The mean score was computed from each category of respondents using this formula; $X = \frac{\sum x}{n}$

The researcher then used the t-test for independent groups for hypothesis one and f-test for sample means with analysis of variance to determine for hypothesis three using this formula

$$t = \frac{\overline{X}_3 - \overline{X}_4}{S_1^2 / n_i + S_2^2 / n_2}$$

Where

$X = \overline{X}_1 - \overline{X}_2$ = score deviation

$df = n_1 + n_2 - 2$

n = number of participants

Thereafter the quantitative data was presented using unvariate and bivariate tables in form of quantified responses. This was after it had been arranged into topics or themes with the guidance of study objectives.

Qualitative data obtained from interview schedules was edited to ensure consistency in information given by respondents. Deeper and clear descriptions from informants' generated views regarding the attitudes of students and teaching staff towards Problem Based Learning were consequently recorded. Data from interviews was edited to detect errors and omissions. It was coded so that there was a class/category for every item. It was then assembled around certain themes and categorized in more specific terms. Finally patterns and irregularities were identified to help refine the data and test the validity of the conclusion that was drawn.

3.9 Ethical issues

The ethical considerations surrounding the interview process such as; confidentiality, anonymity and the ability of the respondents to exercise their right to participate, withdraw or abstain from the study were implemented throughout the process. The researcher was not biased as he believed that all participants would give him the required information.

3.10 Limitations

Ideally according to Krejcie and Morgan (1970) cited in Amin (2005: 87) this study with a target population of 917 students required 269 respondents. However due to time factor and procrastination among students the response rate was reduced to 141. This could limit the generalisibility of the results of this study to other institutions.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction

In this chapter, the findings obtained from the data analysis for each of the three hypotheses are presented, interpreted and discussed.

This chapter is divided into two parts. In the first part, sex characteristics of the sample are presented. In the second part, the presentation, interpretation and discussion of the hypothesis are done objective by objective. Details of statistical analysis are given in appendices A-D

4.1 Sex characteristics

The sex characteristics of the sample are indicated in the table below. This information was sought because sex and qualification of the respondents do play significant role in influencing ones' behaviour at any institution of higher learning and eventual perception and answers to the set questions.

Table 4.1: Distribution of Sex of the respondents per year of study

Year	Male		Female	
	f	%	f	%
1	53	75.7	17	24.2
2	08	42	11	56
3	17	65.3	09	34.7
4	06	30	14	70
5	04	66.6	02	33.4
Total	88	62.4	53	37.5

Source: Primary data

Table 4.1 above indicates that there are 88 (62.4%) and 53 (37.5%) male and female students across the years of study.

4.2 Objective one: To find out whether year of study influences the attitude of Mulago Medical School students towards Problem Based Learning Curriculum

Respondents of different years were asked to give their views about Problem Based Learning Curriculum and findings were tested using studendised to distribution test.

Table 4.2: Showing the students in each year and their mean scores of attitudes towards Problem Based Learning

Year	Mean
1	115.79
2	114.07
3	119.08
4	124.23
5	110.62

Source: Primary data

The mean scores are higher than the neutral score of 117.3. This indicates that students in each year had a positive attitude towards Problem Based Learning.

4.2.1 H_o: there is no statistically significant difference between the mean scores of attitudes of medical students of different years of study, as measured by the attitude towards Problem Based Learning assessment scale.

H_1: There is a difference in at least two mean scores of attitude of medical students of different years of study, as measured by the attitude towards Problem Based Learning assessment scale.

The F-test had shown that at least two mean scores were statistically different. The t-test was then used to determine the pairs which were statistically significantly different using significance test level of 5% that is to say, $\alpha = 0.005$

Each pair of the ten mean scores in different years is summarized in table 3 below.

Table 4.3: Showing the t-values for the different pairs of scores per year

	Year				
	1	2	3	4	5
1	**	$t_{12} = 0.088$	$t_{13} = 0.780$	$t_{14} = 1.640$	$t_{15} = 0.988$
2	**	**	$t_{23} = 1.030$	$t_{24} = 1.890$	$t_{25} = 0.760$
3	**	**	**	$t_{34} = 1.216$	$t_{35} = 1.950$
4	**	**	**	**	$t_{45} = 2.578$
5	**	**	**	**	**

The findings reveal that, the mean scores of year four and year five are statistically significantly different, tested at both 5% level of significance.

In order to determine if one year of study differed from other, a total of ten other null hypotheses were formed under hypothesis one. The origin of the ten sub hypotheses are summarized in Table 5.1 below, which shows which mean scores will be compared through a t-test.

Year	1	2	3	4	5
1	**	t_{12}	t_{13}	t_{14}	t_{15}
2	**	**	t_{23}	t_{24}	t_{25}
3	**	**	**	t_{34}	t_{35}
4				**	t_{45}
5					**

The findings are consistent with those of (Crandall and Sonia, 2007) in which the linear mixed effects regression analysis examined changes in factor scores over time and whether these changes differed between Problems Based and traditional students and males and females.

Findings from the study revealed that commitment to type of curriculum for the medical students was greater when students entered medical school than when they graduated or when they were about to graduate.

There is no statistical significant difference between year four and year three, no statistical significance difference between year three and that of year two that is to say, all the other means are not statistical significantly different for instance the critical region for year three and year four was $t_{0.0520} > 2.086$ while the $t_{computed} = 1.216$ hence no sufficient reason of rejecting the null hypothesis. This therefore implies that while year four appreciate the benefits of Problem Based Learning like other year students, year five students had more negative attitudes towards Problem Based Learning. This could be because the concept pf Problem Based Learning was introduced later in their course.

The researcher also conducted interviews among 15 categories of respondents. They included three teaching staff and 12 students. The three teaching staff unanimously stated that Problem

Based Learning was a very good type of curriculum which was fit for this computer millennium. They also stated though it was costly in terms of buying and servicing computers, plus buying the relevant textbooks, its advantages outweighed the cost. It was a widely held view from lecturers that Problem Based Learning makes students active participants who do a lot of research leading to generation of ideas some of which cannot be found in textbooks.

They further stated that the failing of medical students who are under this programme was due to under facilitation of the programme by the government. It is on that note that they advised the government to increase the funding of this programme. In conclusion, they stated that considering the big tax base of the government they believe that it can afford paying for the programme, if it gets its priorities right.

Albanese & Mitchell (1993) asserts that, much of the medical school research shows that student attitudes towards learning do change. Students in Problem Based Learning courses often report greater satisfaction with their experiences than non- Problem Based Learning students. For example, Problem Based Learning medical students at Harvard reported their studies to be more engaging, difficult and useful than did non- Problem Based Learning students, that students who experience Problem Based Learning have substantially more positive attitudes toward the instructional environment than do students in more traditional programs. Problem Based Learning students tend to give high rating for their training whereas students in traditional programs are more likely to.

The researcher contends that, the three factors highlighted above, which are; time spent using Problem Based Learning, commitment towards it and stakeholders' perception must have contributed to difference in response because year four and that of year five. Therefore year five had a statistically significant positive mean than the other years of study.

In summary, the medical students in all the years of study had a comparable positive attitude towards Problem Based Learning, except the year fives which had the highest attitude.

4.3 There is no statistical significant difference between the mean scores of attitudes of male and female students as measured by their Attitude towards Problem Based Learning Assessment Scale

The mean scores of different attitude levels of males and females were analyzed.

Given that the samples of males and females were all greater than thirty (30) in numbers, the t-test could not be used since the samples are considered to be large (Saleemi, 1997). Against this background the two samples were taken to be approximately normally distributed.

4.3.1 Hypothesis two

$H_{o:}$ $X_m = X_f$ that is, there is no statically significant difference between the mean scores of males (X_m) and means of females (X_f) against the alternative hypothesis that;

$H_{1:}$ $X_m \neq X_f$ that is, there is statistically significant difference between the mean scores of males (X_m) and means of females (X_f), testing at a 5% level of significance. The findings are summarized in Table 4.3 that follows

Table 4.4 The mean attitude scores of male and female students

Sex	Mean
Male	117.581
Female	114.071

Source: Primary data

The findings using that test reveal that there was no statistically significant difference between the attitudes of males from the attitude of females about Problem Based Learning curriculum. Dorup (2004) contended that, communicating with the medical students indicated that most female students are not directly opposed to problem based supported teaching and learning curriculum; however, female students may be more pragmatic and more focused on exams, whereas some male students may favour the freedom of time and space offered by traditional lecture methods.

The researcher's findings can be attributed to the findings of Phye (2001) who argues that Problem Based Learning was regarded by both male and female students as one of the most important cognitive activities in every day life and a primary goal of the education process. Similar to this are the findings of (Hepper, 1997) who contended that Problem Based Learning curriculum was adaptable, flexible and the scholars were able to develop suitable methods to solve problems and teach personal goals. Against this background it is probable that both male and female students alike have embraced Problem Based Learning as a way forward to solving academic problems in the medical school and both sexes could have realized that they

reach their personal goals as medical students more using Problem Based Learning methodologies.

The interviewed students regardless of sex supported Problem Based Learning use in the medical school though they had reservation for its use in social sciences and humanities since in these programmes students were used to lecturers and copying notes. They thus suggested that Problem Based Learning should be fully funded by the government. They cited an outreach academic programme called Community Based Education (COBES), in which medical students were sent to do clinical work in district, hospitals for 6 months, as a vital programme needing special consideration in terms of funding.

4.4 There is no statistically significant difference between the mean scores of attitudes of the medical school teaching staff, in different departments as measured by the Attitudes towards Problem Based Learning Assessment scale

Medical staff in the five different departments of the medical school were asked to give their views about Problem Based Learning curriculum. This was intended to establish as to whether there was a statistically significant difference in the attitude about Problem Based Learning of staff in the various departments. The findings are summarised in Table 4.4 below: The means were compared using F-test.

Table 4.5: The mean attitude scores of teaching staff in different departments

Specialty	**Mean**
Medicine	114.4
Pharmacy	113
Nursing	114
Dentistry	118.25
Radiography	115.25

Source: Primary data

4.4.1 H_0: There are no statistically significant differences between the mean scores of medical school teaching staff in different departments

H_1: There are statistically significant differences in at least two pairs of mean scores of medical school teaching staff in different departments, with a significant test level of 5% and a critical region of f >2.82. The findings are summarized in Table 4.6 below

Table 4.6: Showing F-test values

Source of variation	Sum of squares	Degrees of freedom	Mean squares	Computation
Column means	68.77	4	17.19	**1.22**
Error	309.90	22	14.09	
Total	**378.67**	**26**		

The findings reveal that there was no statistically significant differences between staff mean scores at the different five departments of the medical school concerning Problem Based Learning curriculum, although all of them were positive

This means that the staff of different departments holds similar positive views about Problem Based Learning curriculum. The researcher's view is that the tutors/lecturers have a grater role to play in determining the correct and valuable curriculum that will support any methodology adopted in the learning process and they have a big role to play in the guidance of learners for attainment of curriculum aims and objectives in the medical school. The researcher also contended that the role should cut across all departments in the medical school which may be synonymous with the findings.

The researcher also interviewed 12 students. The students who were interviewed included; three for year I, four for year 2 , two for year 3 and three for year 5. They all supported the programme as being good because of its ability to enforce hard work and commitment among the students. They all stated that Problem Based Learning encouraged students to utilize their time fully. It also fostered critical thinking because it leads students to constant search of knowledge as one needs to consult many books and internet sources. They gave the following as areas of improvement.

The year ones suggested that lecturers should improve on their presence in the tutorials because they are needed by the students for constant consultations and advice. The year three suggested that the medical school needs to set up a proper academic time table so as to guide

the students in their study. Otherwise the existing timetable was amorphous and left students to take their own course in studying. They further stated that practicing doctors, who were not necessarily lecturers need to be cooperative and respond to the learners' needs whenever they were approached by the students.

For the year five students they stated that there was a need to increase the human resources and also to popularize the programme. They noted areas such as; pathology, microbiology and behavioural sciences as special areas deserving expert assistance.

In summary, it was established that attitudes of staff of different specialty towards Problem Based Learning had insignificant difference. They were all found to be positive towards Problem Based Learning.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The main purpose of this study was to find out the attitudes of the medical school teaching staff and the male and female medical school students towards Problem Based Learning curriculum at Mulago Medical School. The problem this study investigated was the attitudes of students and teaching staff towards this new approach of learning referred to as PBL. Traditionally medical students were taught through using a content driven curriculum. In 2003 another approach called Problem based learning was introduced in Mulago Medical School. This study set out to determine the attitude of both students and teaching staff towards PBL.

The Objectives of the study were; to find out whether year of study influences the attitudes of Mulago Medical School students towards the PBL Curriculum. To find out whether students' sex influences their attitudes, towards Problem Based Learning Curriculum. To compare the attitudes of the teaching staff from different specialties, towards Problem Based Learning Curriculum. The research hypotheses were; There is no statistically significant difference between the mean scores of attitudes of medical students of different years of study, as measured by the Attitudes towards PBL Assessment Scale. There is no statistical significant difference between the mean scores of attitudes of male and female students as measured by their Attitude towards PBL Assessment Scale. And there is no statistically significant difference between the mean scores of attitudes of the medical school teaching staff, in different departments as measured by the Attitudes towards PBL Assessment scale. Data was

collected using attitude assessment scale and interview. Data was analyzed using F-test and T-test

The findings were as follows

5.1 There is no statistically significant difference between the mean scores of attitudes of medical students of different years of study, as measured by the attitudes towards Problem Based Learning assessment scale

In order to determine if year one of study differed from the other years of study, a total of ten other null hypothesis were formed unsed hypothesis one. The findings indicated that all students had a positive attitude towards Problem based learning. The magnitude of attitude was comparable across the five years regardless of sex. This finding is related to the Constructionist theory of Lev Vygotsky (1896-1934).

It states that," learning is an active contextualized process in which learners draw their own conclusions through creative experimentation. When students are put in small learning groups in a tutorial system under a tutor, who acts as a facilitator or a coach, they generate learning objectives based on the analysis of the problem. This facilitates their acquisition of knowledge and desirable attributes such as; communication skills, team work, problem solving, independent responsibility for learning, sharing of information and respect for others".

This is because students solve the problem under the line of the tutor. In this case students tend to be more motivated because learning is more meaningful to them than when they start with content whose value may not be apparent at the beginning

These findings indicate that the students have the same attitudes towards Problem Based Learning even when they progress more to higher levels of study. This can be due to the fact that students' group had students with the same academic/intellectual ability. In this case there was no imbalance in the group whereby students who could have more expertise could be more vibrant than introverts (Dolmas, 1994).

These findings are consistent with those of (Khan, 2007) who contend that two groups which are compared at different point in time may have differences in their perception about Problem Based Learning. According to the researcher the lack of statistical difference between mean scores of years may have been due to the fact that factors like teaching facilities at the medical school and facilities available for students in health research remained fairly constant over the years. If there had been changes in the above mentioned factors during the years, it could have influenced the knowledge and attitude of the students.

5.2 There is no statistical significant difference between the mean scores of male attitudes from that of females.

A t-test for dependent groups was used to test the null hypothesis above that concerned the attitudes of both the male and female students who participated in the study. It was tested at 05 degrees of freedom. The computed result was greater than the critical value. The hypothesis was not rejected. This indicated that there was no significant difference between males and female students at the medical school. Both male and female students in the Mulago Medical School had a positive attitude towards Problem based learning as a mode of

instruction. Findings from the interviews also supported that fact that attitude of students towards Problem Based Learning was not influenced by sex.

The results are in line with Venon & Blake (1992) and Farquhat et al (1986) cited in Chapter 2, who indicated that male and female students' attitudes towards Problem Based Learning was similar. The findings above in which both category of students have similar attitudes could owe to the fact that these students go through the same secondary school education curriculum. They are exposed to similar teaching methods, instructional materials and teachers' personal/situational characteristics. They join the course with the best results in Biology Physics and Chemistry combinations. They are focused, committed, determined to succeed and can cope with Problem based learning which is more challenging and requires more independent individual effort than the traditional content led/driven instructional methods. This means that Problem based learning as a method, will not affect students' performance on the basis of sex

5.3 There is no statistically significant different between the mean scores of the teaching staff in different department/specialty

The hypothesis was retained and we therefore concluded that there was no significant statistical difference between the mean score of teaching staff in the five departments at the medical school.

These findings indicate that the teaching staff supports the use of the method. This could owe to the fact that the staff realize that there are many new medical challenges in this millennium age which need problem solving methods of teaching.

The results are in line with the African Health Science Journal (2006) earlier on cited, in which it is argued that the curriculum change at Mulago Medical School was undertaken after discovering that Makerere Medical School was competing with other school in the training of doctors. In this case there was a need to come up with a new teaching method that could cope with the contemporary medical age.

5.4 Conclusions

According to the findings of the study the following conclusions were made.

The study findings indicated that at Makerere Medical School, students regardless of their year of study or sex and the staff of all the teaching departments had a positive attitude towards Problem based learning as compared to the traditional content driven teaching. This implies that they are ready to find solutions to any health problems as they occur. Problem based learning is a feasible approach supported by all stakeholders which could even be implemented in other university teaching units.

5.5 Recommendations

Considering the findings and conclusions above, the researcher recommends the following;

1. There is a need to organize seminars for all the members of staff of the medical school to discuss the intricacies of PBL with a view of improving it.
2. There is a need to structure students' assessment based on problems as per the tenets of PBL.

3. The government of Uganda should popularize PBL use to other teaching units of the university. Since it has been found to be supported by all stakeholders at Mulago Medical School, it should be applied in all units which are training human resources.

5.6 Suggestions for further research

Conduct studies into the feasibility of the use of PBL into all institutions of learning in Uganda in general and Makerere University in particular.

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APPENDICES

APPENDIX A: QUESTIONNAIRE

A STUDY OF THE STAKEHOLDERS' ATTITUDE TOWARDS PROBLEM BASED LEARNING CURRICULUM

MAKERERE UNIVERSITY
DEPARTMENT OF CURRICULUM STUDIES
SCHOOL OF EDUCATION

Dear Respondent,

The purpose of this study is purely for educational purposes. It is used to collect honest and sincere views of the users of Problem Based Learning approach to teaching and learning with a view of improving its effectiveness in the Medical School and popularizing its use in other faculties, institutes and schools of the university. Please respond to this Assessment Scale kindly. Matters of confidentiality and use of the information shall be handled with utmost faith.

Please indicate your responses with either a tick [√] writing to each of the items in sections A and B

SECTION A: BACKGROUND INFORMATION

1. Sex
   (i) Male ☐ (ii) Female ☐
2. Designation
   (a) Student ☐ (b) Teaching staff ☐
3. If student (a) indicate the year of study
   (i) Year one ☐ (ii) Year two ☐ (iii) Year three ☐
   (iv) Year four ☐ (v) Year five ☐
4. State the course being studied
   (i) Bachelor of Pharmacy ☐
   (ii) Bachelor of Nursing ☐
   (iii) Bachelor of Surgery ☐
   (iv) Bachelor of Dentist ☐
   (v) Bachelor of Radiography ☐
5. If lecturer indicate the department

   _____

SECTION B: Attitude of Stakeholders towards Problem Based Learning Curriculum.

Assessment Scale

Please indicate (by ticking) whether you; Very Strongly agree(VSA), Strongly agree (SA), Agree (A), Undecided (UD), Disagree (D), Strongly disagree (SD) ,Very Strongly disagree (VSD) with each of the statements.

	ITEMS	**VSA**	**SA**	**A**	**UD**	**D**	**SD**	**VSD**
1.	Iam comfortable with the use of Problem Based Learning							
2.	Problem Based Learning is affordable to a university in a developing country like Uganda							
3.	Problem Based Learning produces competent health personnel							
4.	The Medical school should revert back to the lecture method of learning							
5.	Problem Based Learning should not be used in all the 5 years at Medical School							
6.	Problem Based Learning does not use time effectively.							
7.	Problem Based Learning is suitable to students with different abilities.							
8.	Problem Based Learning is responsible for the high failure rate in the medical school.							
9.	Problem Based Learning teaches students to make their own notes.							
10.	Problem Based Learning should be maintained in the Medical School.							
11.	Problem Based Learning motivates student to learn better.							

12.	Problem Based Learning promotes student centred multidisciplinary education as a basis for life long learning in professional practice.							
13.	Problem Based Learning uses time effectively							
14.	Problem Based Learning should be used in all the courses of the university							
15.	Problem Based Learning helps to maintain the importance of the teaching staff							
16.	A combination of Problem Based Learning and the traditional subject based lecture method produces better medical products.							
17.	The subject based curriculum was better than the Problem Based Learning one							
18.	Problem Based Learning is liked by students							
19.	Problem Based Learning as it is currently used has room for improvement in the medical school							
20.	The use of Problem Based Learning in all the faculties will substantially increase the university budget							
21.	The use of Problem Based Learning negatively affects the acquisition and retention of clinical knowledge and skills at the school.							
22.	Problem Based Learning saves lecturers time.							
23.	Problem Based Learning uses funds effectively							
24.	Problem Based Learning does not cater for lecturers' individual differences in a group							
25.	Problem Based Learning method is time consuming							

APPENDIX B

DATA ANALYSIS

Test of hypothesis

The studendised test is adopted because the majority of years have their students numbers less than thirty (30) hence being regarded to as small samples (Saleemi, 1997).

Hypothesis one: There is no statistical significant difference between the mean scores of attitude of students of different years as measured by the attitude towards Problem Based Learning assessment scale.

Considering the mean of year four (X_4) and that of year five (X_5)

$H_o: \overline{X}_4 = \overline{X}_5$ there is no significant difference between the mean scores attitude of year four from that of year five

$H_o: \overline{X}_4 \neq \overline{X}_5$ there is a difference in attitude

$\alpha = 0.025$

d.f $= \{(13.27^2/13) + (13.65^2/13)\} / \{(13.27^2/13)^2/12 + (13.65^2/13)^2/12\} = 24$

$t_{0.02524} = 2.06$

$t = (\overline{X}_4 - \overline{X}_5)/ \sqrt{(S^2_1/n_1 + S^2_2/n_2)}$

$t = (124.23 - 110.62)/ \sqrt{(113.27^2/13 + 113.65^2/13)}$

$= 2.578$

Since t is greater than 2.06, we reject the null hypothesis and conclude that the mean score of attitude of year four is not the same as that of year five at 5% level of significance.

Considering the mean of year three (X_3) and that of year five (X_5)

$H_o: \overline{X}_3 = \overline{X}_5$ there is no significant difference between the mean scores attitude of year three from that of year five

$H_o: \overline{X}_3 \neq \overline{X}_5$ there is a difference in attitude

$\alpha = 0.025$

d.f $= \{(10.69^2/26) + (13.65^2/13)\}^2 / \{(10.69^2/26)^2/25 + (13.65^2/13)^2/12\} = 20$

$t_{0.025,20} = 2.086$

$t = (\overline{X}_3 - \overline{X}_5)/ \sqrt{(S^2_1/n_1 + S^2_2/n_2)}$

$t = (119.08 - 110.62)/ \sqrt{(10.69^2/26 + 113.65^2/13)}$

$= 1.948$

Since t is less than 2.086, we fail to reject the null hypothesis and conclude that there is no statistically significant difference between mean attitude of year three from that of year four at 5% level of significance.

Considering the mean of year one (X_1) and that of year five (X_5)

$H_o: \overline{X}_1 = \overline{X}_5$ there is no significant difference between the mean scores attitude of year one from that of year five.

$H_o: \overline{X}_1 \neq \overline{X}_5$ there is a difference in attitude

$\alpha = 0.025$

d.f $= \{(378.3^2/29) + (186.32^2/13)\}^2 / \{(378.3^2/29)^2/28 + (186.32^2/13)^2/12\} = 32$

$t_{0.025,inf} = 1.96$

$t = (\overline{X}_1 - \overline{X}_5)/ \sqrt{(S^2_1/n_1 + S^2_2/n_2)}$

$t = (115.79 - 110.62)/ \sqrt{(378.3^2/29) + 186.32^2/13)}$

$= 0.988$

Since t is less than 1.96, we fail to reject the null hypothesis and conclude that there is no statistically significant difference between mean attitude of year one from that of year five at 5% level of significance.

Considering the mean of year three (X_3) and that of year five (X_1)

$H_o: \overline{X}_3 = \overline{X}_1$ there is no significant difference between the mean scores attitude of year three from that of year one

$H_o: \overline{X}_3 \neq \overline{X}_1$ there is a difference in attitude

$\alpha = 0.05$

d.f $= \{(114.3^2/26) + (378.3^2/29)\}^2 / \{(114.3^2/26)^2/25 + (378.3^2/29)^2/28\} = 44$

$t_{0.025,44} = 1.96$

$t = (\overline{X}_3 - \overline{X}_1)/ \sqrt{(S^2_1/n_1 + S^2_2/n_2)}$

$t = (119.08 - 115.79)/ \sqrt{(378.3^2/29 + 114.3^2/26)}$

$= 0.78$

Since t is less than 1.96, we fail to reject the null hypothesis and conclude that there is no statistically significant difference between mean attitude of year three from that of year one at 5% level of significance.

Considering the mean of year three (X_4) and that of year five (X_2)

$H_o: \overline{X}_4 = \overline{X}_2$ there is no significant difference between the mean scores attitude of year four from that of year two

$H_o: \overline{X}_4 \neq \overline{X}_2$ there is a difference in attitude

$\alpha = 0.025$

d.f $= \{(176.1^2/13) + (244.6^2/29)\}^2 / \{(176.1^2/13)^2/12 + (244.6/29)^2/28\} = 27$

$t_{0.025,27} = 2.052$

$t = (\overline{X}4 - \overline{X}_2)/ \sqrt{(S^2_1/n_1 + S^2_2/n_2)}$

$t = (124.23 - 115.38)/ \sqrt{\{(244.61/29) + (1176.1/13)\}}$

$= 1.89$

Since t is less than 2.052, we fail to reject the null hypothesis and conclude that there is no statistically significant difference between mean attitude of year three from that of year two at 5% level of significance.

Considering the mean of year three (X_4) and that of year five (X_3)

$H_o: \overline{X}_4 = \overline{X}_3$ there is no significant difference between the mean scores attitude of year four from that of year five

$H_o: \overline{X}_4 \neq \overline{X}_3$ there is a difference in attitude

$\alpha = 0.025$

d.f $= \{(13.27^2/13) + (10.69^2/26)\}^2 / \{(13.27^2/13)^2/12 + (10.69^2/26)^2/25\} = 20$

$t_{0.02520} = 2.086$

$t = (\overline{X}_4 - \overline{X}_3)/ \sqrt{(S^2_1/n_1 + S^2_2/n_2)}$

$t = (124.23 - 119.08)/ \sqrt{\{(13.27^2/13 + 10.69^2/26)\}}$

$= 1.216$

Since t is less than 2.086, we fail to reject the null hypothesis and conclude that there is no statistically significant difference between year four and year five 5% level of significance.

Considering the mean of year three (X_4) and that of year five (X_1)

$H_o: \overline{X}_4 = \overline{X}_1$ there is no significant difference between the mean scores attitude of year four from that of year five

$H_o: \overline{X}_4 \neq \overline{X}_1$ there is a difference in attitude

$\alpha = 0.025$

d.f $= \{(176.1/13) + (378.3/29)\}^2 / \{(176.1/13)^2/12 + (378.3/29)^2/28\} = 33$

$t_{0.025,33} = 1.96$

$t = (\overline{X}_4 - \overline{X}_1)/ \sqrt{(S^2_1/n_1 + S^2_2/n_2)}$

$t = (124.23 - 115.79)/ \sqrt{(176.1/13 + 378.3/29)}$

$= 1.64$

Since t is less than 1.96, we fail to reject the null hypothesis and conclude that there is no statistically significant difference between year four and year one at 5% level of significance.

Considering the mean of year three (X_1) and that of year five (X_2)

$H_o: \overline{X}_1 = \overline{X}_2$ there is no significant difference between the mean scores attitude of year one from that of year five

$H_o : X_1 \neq X_2$ there is a difference in attitude

$\alpha = 0.025$

d.f $= \{(378.3/29) + (244.61/29)\}^2 / \{(378.3/29)^2/28 + (244.6/29)^2/28\} = 53$

$t_{0.025,inf} = 1.96$

$t = (\overline{X}_1 - \overline{X}_2)/ \sqrt{(S^2_1/n_1 + S^2_2/n_2)}$

$t = (115.79 - 115.38)/ \sqrt{(378.3/29 + 244.6/29)}$

$= 0.088$

Since t is less than 1.96, we fail to reject the null hypothesis and conclude that there is no statistically significant difference between year one from that of year two at 5% level of significance.

Note: It is pertinent to point out that for consistency and comparability purposes of the means, t distribution test was adopted. For observations which were above 30 in number, a random sample of 30 in each case was taken. It was observed that even if all the observations were considered and tested as an approximation to a normal distribution for observations of over thirty, the same conclusion could be arrived at.

4.3.1 Hypothesis two

$H_o : \overline{X}_m = \overline{X}_f$ that is, there is no significant difference between the mean scores males (X_m) and mean of females (X_f)

$H_o : \overline{X}_m \neq \overline{X}_f$ that is, there is statistically significant difference between mean scores of males (X_m) with mean of females (X_f), testing at a 5% level of significance.

Since the sample of males and females is greater than 30 in number, they are considered to be large. Hence studendised t distribution test is not appropriate model for test (Saleemi, 1997). Against the above background the samples are taken to be approximately normally distributed

α = 5% that is, the level of significance is 0.005

Critical region is $Z \geq 1.96$ or $Z \leq -1.96$

$$Z = (\overline{X}_m - \overline{X}_f)/ \sqrt{(S^2_1/n_1 + S^2_2/n_2)}$$

$$= (117.581 - 114.071)/ \sqrt{(253.587/86 + 184.64/56)}$$

$$= 1.404$$

Since Z = 1.404 is less than 1.96, we fail to reject the null hypothesis and conclude that mean of males and that of females are not statistically significant difference at 5% level of significance.

4.4.1 Hypothesis three

H_o: there is no significant difference between the mean scores of medical school teaching staff in different departments.

H_o: there is statistically significant difference in atleast two pairs of mean scores of medical school teaching staff in different departments with a significant test level of 5and critical region of f > 2.82.

The F test is adopted because it gives the researcher an over view of establishing out as to whether there is statistically significant difference in at least any two pairs of means within the five different departments.

Computations

Medicine	Pharmacy	Nursing	Radiography	Dentistry
116	105	112	115	123
110	120	113	115	121
116	110	111	114	111

116	115	120	117	118	
115	115				
115					
114					
113					
117					
112					
1144	**565**	**456**	**461**	**473**	**3099**

Let the mean of medicine = $\overline{X_1}$, mean of pharmacy = $\overline{X_2}$, mean of nursing = $\overline{X_3}$, mean of radiography = X_4 and mean of dentistry = X_5.

H_o : $\overline{X_1} = \overline{X_2} = \overline{X_3} = \overline{X_4} = \overline{X_5}$

H_1 : at least one pair of the means is statistically significantly different

$SST = 116^2 + \ldots\ldots\ldots\ldots\ldots\ldots + 118^2 - 3099^2/27 = 378.667$

$SSC = 1144^2/10 + 565^2/5 + 456^2/4 + \ldots\ldots\ldots\ldots 473^2/4 - 355696.33 = 68.767$

SSE = SST – SSC

= 309.8997

ANOVA table:

Source of variation	Sum of squares	Degrees of freedom	Mean squares	Computation
Column means	68.77	4	17.19	1.22
Error	309.90	22	14.09	
Total	**378.67**	**26**		

The findings reveal that there is no statistically significant differences between staff mean scores at the different five departments of the medical school concerning Problem Based Learning curriculum.

APPENDIX C

ANALYSIS OF PILOT STUDY

RAW SCORES FOR DETERMINING RELIABILITY OF INSTRUMENTS (RAW SCORES FOR PILOT TESTING)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	∑(X)	$\sum X^2$
1	4	3	4	1	4	4	4	4	4	4	4	4	4	4	3	2	2	4	4	4	4	4	4	3	3	4	4	107	11449
2	3	2	3	2	4	4	4	1	4	4	3	3	4	4	3	1	1	3	4	2	3	4	4	2	2	4	4	79	6241
3	2	1	1	4	4	4	4	4	4	4	1	4	4	4	1	1	1	1	4	3	3	4	4	4	1	4	4	80	6400
4	2	1	3	3	4	4	4	4	4	4	2	3	4	4	4	2	2	4	4	4	3	4	4	2	1	4	4	88	7744
5	4	2	4	2	4	4	4	3	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	1	4	4	4	77	5929
6	3	2	3	1	4	4	4	4	4	4	4	4	4	4	3	1	2	4	4	3	3	4	4	3	2	4	4	90	8100
7	3	2	3	3	4	4	4	3	4	4	2	3	3	4	2	1	2	4	4	2	3	4	4	3	1	4	4	80	6400
8	4	3	3	2	4	4	4	3	4	4	3	3	3	4	3	3	3	3	4	1	3	4	4	3	3	4	4	88	7744
9	3	2	3	1	4	4	4	3	4	4	4	3	4	4	3	1	2	3	4	3	3	4	4	3	3	4	4	88	7744
10	2	1	3	3	4	4	4	2	4	4	2	2	4	4	2	1	1	4	4	2	2	4	4	2	1	4	4	78	6084
11	3	1	4	1	4	4	4	4	4	4	3	3	3	4	3	2	2	4	4	3	3	4	4	2	2	4	4	87	7569
12	3	2	3	1	4	4	4	2	4	4	4	3	4	4	2	1	1	4	4	3	4	4	4	3	1	4	4	85	7225
∑(X)	36	22	38	24	45	45	45	37	45	45	36	39	45	45	33	20	20	42	45	31	38	45	45	31	24	45	45	1027	82869
$\sum X^2$	114	46	124	60	192	192	192	125	192	192	80	97	171	192	99	51	38	156	192	91	124	192	192	87	59	192	192		

Calculation of questionnaire reliability using Cronbatch Alpha coefficient

$$a = k/k-1\left(1-\sum \frac{SD^2i}{SD^2t}\right)$$

Where a = Cronbatch's alpha co-efficient

k = number of items in the instrument

SD^2i = variance of scores on individual item

SD^2t = variance of scores for the total items calculation of variance for each item.

Calculation of variance for each item formula = $\sum x^2 - \sum\left(x/n\right)^2_n$

Where n = total number of respondents

$\sum(x)$ sum of scores

$\sum(x)^2$ = square of sum of scores

Item 1

$$114 - \frac{(36)^2}{27}$$
$$27$$

= 52 – 48 = 04

= 04

27

= 0.15

Item 2

$$46 - \frac{(22)^2}{27}$$
$$27$$

= 46 – 17.9 = 28.1

= 28.1

27

= 1.04

Item 3

$$124 - \frac{(38)^2}{27}$$
$$27$$

= 124 – 53.4 =70.6

= 70.6

27

= 2.61

Item 4

$$60 - \frac{(24)^2}{27}$$
$$27$$

= 60 – 21.3 = 38.6

= 38.6

27

= 1.42

Item 5

Item 6

$$192 - \frac{(45)^2}{27}$$
$$27$$

$= 192 - 75 = 117$

$= \underline{117}$
27

= 4.3

$$192 - \frac{(45)^2}{27}$$
$$27$$

$= 192 - 75 = 117$

$= \underline{117}$
27

= 4.3

Item 7

$$192 - \frac{(45)^2}{27}$$
$$27$$

$= 192 - 75 = 117$

$= \underline{117}$
27

= 4.3

Item 8

$$125 - \frac{(37)^2}{27}$$
$$27$$

$= 125 - 50.7 = 74.2$

$= \underline{74.2}$
27

= 2.75

Item 9

$$192 - \frac{(45)^2}{27}$$
$$27$$

$= 192 - 75 = 117$

$= \underline{117}$
27

= 4.3

Item 10

$= 192 - 75 = 117$

$= \underline{117}$
27

= 4.3

$$192 - \frac{(45)^2}{27}$$
$$27$$

Item 11

$$80 - \frac{(36)^2}{27}{27}$$

$= 80 - 48 = 32$

$= \underline{32}$

27

$= 1.18$

Item 12

$$97 - \frac{(39)^2}{27}{27}$$

$= 97 - 56.3 = 40.7$

$= \underline{40.7}$

27

$= 1.50$

Item 13

$$171 - \frac{(45)^2}{27}{27}$$

$= 171 - 75 = 96$

$= \underline{96}$

27

$= 3.5$

Item 14

$$192 - \frac{(45)^2}{27}{27}$$

$= 192 - 75 = 117$

$= \underline{117}$

27

$= 4.3$

Item 15

$$99 - \frac{(33)^2}{27}{27}$$

$= 99 - 40.3 = 58.6$

$= \underline{58.6}$

27

$= 2.17$

Item 16

$$51 - \frac{(20)^2}{27}{27}$$

$= 51 - 14.8 = 36.1$

$= \underline{36.1}$

27

$= 1.34$

Item 17

$$38 - \frac{(20)^2}{27}{27}$$

Item 18

$$156 - \frac{(42)^2}{27}{27}$$

= 38 – 14.8 = 23.1

= 23.1

27

= 0.85

= 156 – 65.3 = 90.6

= 90.6

27

= 3.35

Item 19

$$192 - \frac{(45)^2}{27}$$

27

= 192 – 75 = 117

= 117

27

= 4.3

Item 20

$$91 - \frac{(31)^2}{27}$$

27

= 91 –35.5 = 55.4

= 55.4

27

= 2.05

Item 21

$$124 - \frac{(38)^2}{27}$$

27

= 124– 53.4 = 70.5

= 70.5

27

= 2.61

Item 22

$$192 - \frac{(45)^2}{27}$$

27

= 192 – 75 = 117

= 117

27

= 4.3

Item 23

$$192 - \frac{(45)^2}{27}$$

27

= 192 – 75 = 117

= 117

27

= 4.3

Item 24

$$59 - \frac{(24)^2}{27}$$

27

= 59 – 21.39 = 37.6

= 37.6

27

= 1.39

Item 25

$$59 - \frac{(24)^2}{27}$$
$$27$$

= 59 – 21.3 = 37.6

= 37.6

27

= 1.39

Item 26

$$192 - \frac{(45)^2}{27}$$
$$27$$

= 63 – 27 = 36

= 117

27

= 4.3

Item 27

$$192 - \frac{(45)^2}{27}$$
$$27$$

= 192 – 75 = 117

= 117

27

= 4.3

STEP 1

SD^2i = 0.15 + 1.04 + 2.61 + 1.42 + 4.3 + 4.3 + 4.3 + 2.75 +4.3 + 4.3 + 1.18 + 1.50 + 3.5 + 0.80 + 2.17 + 1.34 + 0.85 + 3.35 + 4.3 + 2.05 + 2.61 +4.3 + 1.90 + 1.39 + 4.3 + 4.3 = 75.21

SD^2i =75.21

STEP 2

Calculation of variance on total scores

$$SD^2i = \sum x^2 - (\sum \frac{x}{n})^2$$
$$n$$

$$= 82869 - \frac{(1027)^2}{27}$$
$$27$$

$= 1027 x 1027 = 1054729$

$= \frac{1054729}{27} = 39064.03$

$= 82869 - 39064.3$

$= 43805$

$= \frac{43805}{27}$

$= 1622.4$

STEP 3

$$a = \frac{k}{k-1} x \left(1 - \sum \frac{SD^2 i}{SD^2 t}\right)$$

$$a = \frac{27}{26} x 1 - \frac{75.2}{1622.4}$$

$$a = \frac{27}{26} \text{ x } 0.95$$

$a = 1.0\,38 \text{ x } 0.95$

$a = \mathbf{0.98}$

APPENDIX D

YEARS OF STUDY																			
Year One						Year Two						Year Three				Year Four		Year Five	
X_1	X_1^2	X_1	X_1^2	X_1	X_1^2	X_2	X_2^2	X_2	X_2^2	X_2	X_2^2	X_3	X_3^2	X_3	X_3^2	X_4	X_4^2	X_5	X_5^2
77	5929	121	14641	107	11449	107	11449	144	20736	106	11236	105	11025	125	15625	109	11881	108	11664
91	8281	130	16900	111	12321	113	12769	130	16900	108	11664	106	11236	130	16900	107	11449	108	11664
98	9604	146	21316	75	5625	73	5329	125	15625	115	13225	103	10609	120	14400	109	11881	108	11664
96	9216	130	16900	110	12100	104	10816	125	15625	122	14884	111	12321	123	15129	134	17956	103	10609
129	16641	136	8496	109	11881	104	10816	125	15625	125	15625	114	12996	136	18496	122	14884	109	11881
134	17956	136	8496	79	6241	114	12996	130	16900	-	-	107	11449	136	18496	123	15129	101	10201
134	17956	120	14400	99	9801	103	10609	140	19600	-	-	115	13225	128	16384	125	15625	108	11664
115	13225	121	14641	109	11881	85	7225	135	18225	-	-	114	12996	133	17689	131	17161	99	9801
105	11025	127	16129	138	19044	106	11236	124	15376	-	-	117	13689	120	14400	132	17424	148	21904
103	10609	117	13689	123	15129	104	10816	134	17956	-	-	116	13456	-	-	145	21025	131	17161
117	13689	118	13924	130	16900	109	11881	122	14884	-	-	113	12769	-	-	132	17424	103	10609
123	15129	71	5041	126	15876	108	11664	120	14400	-	-	107	11449	-	-	141	19881	104	10816
126	15876	103	10609	-	-	113	12769	133	17689	-	-	104	10816	-	-	105	11025	108	11664
110	12100	110	12100	-	-	116	13456	122	14882	-	-	128	16384	-	-	-	-	-	-
115	13225	115	13225	-	-	106	11236	136	18496	-	-	122	14884	-	-	-	-	-	-
75	5625	116	13456	-	-	103	10609	109	11881	-	-	139	19321	-	-	-	-	-	-
137	18769	84	7056	-	-	124	15376	105	11025	-	-	124	15376	-	-	-	-	-	-

$\sum = 5212$ $\sum = 4660$ $\sum = 3096$ $\sum = 1615$ $\sum = 1438$

$\sum \overline{x^2}_1 = 572{,}295$ $\sum \overline{x_2^2} = 500{,}301$ $\sum \overline{X}^3_3 = 336{,}293$ $\sum \overline{X^4}_4 = 192{,}845$ $\sum \overline{X^5}_5 = 141{,}592$

Computations for t-test the hypothesis

Year of study	**Total**	**Average**
One	5212	5212 ÷ 46 = 113.3
Two	4660	4660 ÷ 39 = 119.4
Three	3096	3096 ÷ 26 = 119.0
Four	1615	1615 ÷ 13 = 124.2
Five	1438	1438 ÷ 13 = 110.6

$\sum \ \overline{X}_1 \ \overline{X}_2 \ \overline{X}_3 \ \overline{X}_4 \ \overline{X}_5 = 586.5$

$\overline{X} = 117.3$

APPENDIX E: SEX OF RESPONDENTS

SEX OF RESPONDENTS													
MALE								FEMALE					
xm	$(xm)^2$	xm	$(xm)^2$	xm	$(xm)^2$	xm	$(xm)^2$	xf	$(xf)^2$	xf	$(xf)^2$	xf	$(xf)^2$
113	12769	105	11025	109	1881	136	18496	107	11449	114	12995	110	12100
104	10816	114	12995	148	21904	121	14641	73	5329	117	13689	116	13456
114	12996	116	13456	131	17161	127	16127	104	10816	104	10816	79	6241
113	12769	113	12769	105	11025	118	13924	103	10609	124	15376	99	9801
113	12769	107	11449	104	10816	71	5041	106	11236	125	15625	109	11881
116	13456	128	16384	108	11664	103	10609	104	10816	126	15876	138	19044
106	11236	122	14884	77	5929	115	13225	109	11881	136	18496	123	1512
103	10609	139	19321	91	8281	84	7056	108	11664	128	16384	130	16900
124	15376	130	16900	98	9604	107	11449	130	16900	133	17689	-	-
144	26736	120	12240	96	9216	111	12321	130	16900	109	11881	-	-
125	15625	123	15129	129	16641	75	5625	124	15376	134	17956	-	-
125	15625	136	18496	134	17956	110	12100	109	11881	141	19881	-	-
125	15625	120	12240	134	17956	109	11881	105	11025	108	11664	-	-
140	14560	107	11449	105	11025	126	15876	106	11236	108	11664	-	-

135	18225	109	11881	113	12769	-	-	108	11664	108	11664	-	-
134	17956	122	14884	117	13689	-	-	122	14884	101	10201	-	-
120	12240	123	15129	123	15129	-	-	106	11236	108	11664	-	-
120	12240	125	15625	126	15876	-	-	108	11664	99	9801	-	-
133	17689	131	17161	115	13225	-	-	122	14882	115	13225	-	-
122	14884	132	17424	75	5625	-	-	106	11236	110	12100	-	-
122	14884	145	21025	121	14641	-	-	103	10609	137	18769	-	-
136	18496	132	17424	130	16900	-	-	111	12321	136	18496	-	-
115	13225	105	11025	146	21316	-	-	107	11449	120	12240	-	-
125	15625	103	10609	130	16900	-	-	115	13225	117	13689	-	-

$\sum = 9891$ $\sum = 6388$

$\sum (xm)^2 = 1,184,738$ $\sum (xf)^2 = 719,781$

Computations for t-text to test the hypothesis

Sex of respondents	**Total**	**Mean**
Male	9891	9891 ÷ 86 = 115.0
Female	6388	6388 ÷ 56 = 114.0

$\sum X_1, X_2 = 229$

$= 229 \div 2$

$\overline{X} = 114.5$

APPENDIX F

DEPARTMENT/ SPECIALTY

Medicine and Surgery	**Pharmacy**	**Nursing**	**Radiography**	**Dentistry**	
116	105	112	115	123	
110	120	113	115	121	
116	110	111	114	111	
116	115	120	117	118	
115	115				
115	115				
114					
113					
117					
112					
115					
1144	565	456	461	473	3099

$$SST = \frac{3099^2}{27} = 356{,}075 - 355{,}696.333 = 378.6667$$

$$SSC = \frac{1144^2}{10} + \frac{565^2}{5} + \frac{456^2}{4} + \frac{461^2}{4} + \frac{473^2}{4} - 355696.333$$

$$\Rightarrow 1308 + 3.6 + 63845 + 51984 + 1984 + 53130.25 - 355696 = 68.767$$

$$SSE = SST - SSC$$

$$= 378.6667 - 68.767$$

$$= 309.8997$$

Computations for f-test and analysis of variance for hypothesis three

Departments	**Total**	**Mean**
Medicine and Surgery	1144 ÷	1144 ÷ 10 = 114.4
Pharmacy	565	565 ÷ 5 = 113
Nursing	456	456 ÷ 4 = 114
Radiography	461	461 ÷ 4 = 115.25
Dentistry	473	473 ÷ 4 = 118.25

$\sum \quad \overline{X}_{1,} \overline{X}_{2,} \overline{X}_{3} \overline{X}_{4,} \overline{X}_{5} = 574.9$

574.9 ÷ = 114.98

APPENDIX G

INTERVIEW GUIDE

1. Do you like Problem Based Learning to be used in Mulago Medical School?
2. What factors impede the successful use of Problem Based Learning in Mulago Medical School?
3. What advantages has Problem Based Learning over the traditional lecture method of teaching?
4. How can Problem Based Learning be improved for better results?
5. What special areas in Problem Based Learning use would you recommend for improvement and why?