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Perception of Competence of Senior Medical Students Using Problem Based Learning and Traditional Learning Models

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Abstract
Background: Problem Based Learning (PBL) has grown in popularity and spread to many parts of the world including Kenya. However, there is still continuing confusion about what PBL is and whether it can replace the traditional curriculum.
Objectives: To compare the perceptions of competence among senior medical students using PBL and traditional teaching methods.
Methods: This was a descriptive, cross-sectional study carried out on the final year medical students at Moi University and University of Nairobi in Kenya. A census was carried out for Moi University and a simple random sampling for the University of Nairobi to obtain a sample of 76 and 77, respectively. A questionnaire was administered.
Results: There were six competence variables tested among medical students. The findings showed that there is significant difference in the perceived level of competence among the medical students using the two different learning/teaching models used on them during the period of medical training. The p-value was statistically significant.
Conclusion: The majority of the medical students who used PBL felt that their curriculum prepared them well for their professional work compared to their counterparts who were trained using traditional teaching methods.

Key Words
Problem Based Learning; Medical Students; Competence; Traditional Teaching Methods; Kenya

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Introduction

The Medical School in the University of Nairobi (UoN) started in 1967 and is the oldest in Kenya. The School of Medicine in Moi University (MU) was started in 1989 and is the second oldest medical school in Kenya. Bachelor of Medicine and Bachelor of Surgery (MBChB) is a six-year programme in both these universities. The curricula used in the two Medical Schools is similar in many aspects. Similar examination regulations apply. The first three years primarily focus on basic sciences, and the last three years mainly comprise of clinical management courses. There is a similar pass mark and grading, but there is no classification of the degree in both Medical Schools. The main difference is on the curriculum implementation model. The learning model in Moi University Medical School is Problem Based Learning (PBL) and in the University of Nairobi is the traditional teaching methods. PBL is a student-centered pedagogy, whereas traditional teaching methods are mainly tutor-centered. For the student, PBL emphasizes the application of knowledge and skills to the solution of problems rather than the recall of facts.[1]

Globally, and according to Barral and Buck (2013), PBL is a pedagogical practice employed in many medical schools. While there are numerous variants of the technique, the approach includes the presentation of an applied problem to a small group of students who engage in discussion over several sessions. A facilitator, sometimes called a tutor, provides supportive guidance for the students. Between meetings of the group, learners research their learning issues and share results at the next meeting of the group.[2]

Faculty members often participate as facilitators. Indeed, the role of the facilitator and the nature of the problem are key to successful implementation. Facilitators must be supportive rather than directive. They ask questions to assist students with identifying the limits of their knowledge, monitor the group process (encouraging participation), and provide a framework for constructing models of understanding. Content expertise on the part of the faculty may be helpful but is not considered necessary for effective facilitation. Deeper

understanding of the topic may allow the facilitator to guide student discussions to be more comprehensive. Traditional teaching is concerned with the teacher being the controller of the learning environment. Power and responsibility are held by the teacher, and he/she plays the role of instructor (in the form of lectures) and decision maker (in regard to curriculum content and specific outcomes). The teacher regards students as having 'knowledge holes' that need to be filled with information. In short, the traditional teacher views that it is the teacher that causes learning to occur.[3]

According to Ngatia and colleagues (2009), teaching methods have been classified as traditional or innovative in nature. PBL falls under the innovative methods. Traditionally, in the training of a doctor, traditional teaching methods have and are still being used.[4] Ngatia *et al.* (2009) classify these teaching methods as follows.[4]

The traditional teaching methods are:
Lectures; Large Demonstrations; Role Plays; Practical/Laboratory Work; Field Practice; Clinical Practice; Simulations; Team Teaching; and Apprenticeship
The innovative learning methods are:
Problem Based Learning; Small Tutorial Groups (STGs); Community-Based Education and Service (COBES); Self-Directed Learning; Independent Study; Project; Case Study; Electives; Computer Assisted Instruction; e-Learning; and SPICES (Student-Centered, Problem-Cased, Integrated, Community-Based, Electives and Systematic).

Globally, and according to Nandi and colleagues (2000), the PBL format was first developed at the McMaster University Medical School in Ontario, Canada in the 1960s and has since spread around the world.[3] Maastricht University in the Netherlands offers its whole program in PBL format only, as does St. George's University of London.[5]

According to Vaughan and Baker,[6] effective teaching in medicine requires flexibility, energy and commitment, amidst a busy background of clinical care. Successful medical teaching also requires that teachers are able to address learners' needs and understand the variations in learners' styles and approaches. Teachers can accomplish these requirements while creating an optimal teaching-learning environment by utilizing a variety of teaching methods and teaching styles.[6]

Methods
This study was a cross-sectional study of senior medical students carried out at the schools of medicine of Moi University (MU) and University of Nairobi (UoN) in Kenya. The target population was made up of approximately 400 final year medical students in about a ratio of 1:4 between MU and UoN, respectively.

Due to the small numbers of Moi University Medical School, a census was carried out. However, for the University of Nairobi, a simple random sampling was carried out. A sample of 76 from Moi University and 77 from University of Nairobi was obtained. After obtaining an informed consent, data was collected from the sampled respondents using a similar questionnaire in both medical schools. A 15-question each with a 5-point Likert scale was administered to obtain the perceived competence levels. This questionnaire was filled at almost the same time in both universities at the end of the academic year, before the students sat their final year examinations.

These aspects were six and included: Competence in preparation for internship; Competence in communication skills; Preparedness in teamwork skills; Research; Leadership skills and cultural aspects; and Satisfaction with curriculum. The learning environment is similar. Students in the final clinical year were chosen since they are able to carry out basic patient management, unlike the other clinical and pre-clinical years as far as the two learning/teaching methods were concerned. They were also able to integrate their learning in basic sciences and apply that knowledge in a clinical setting.

Data was analyzed using standard statistical analysis and computing software (STATA) version 10 to obtain descriptive variables such as age and gender. The frequency of the variable ratings of the various competencies in the two learning models was obtained.

We complied with the ethical regulations. We were granted ethical approval by the Institutional Research and Ethics Committee (IREC) of Moi University. We also sought permission from the University of Nairobi so as to collect data from their students.

Results
There was a total of 76 (49.70%) from Moi University and 77 (50.30%) from the University of Nairobi (UoN). Majority (n=97; 63.40%) were female and 56 (36.60%) were male. Most of them (n=115; 75.2%) were in the age range of 21-25 years.

Table 1: Gender and Age Distribution of Medical Students from Both Universities

Variable	Final N=153(%)
Gender	
Female	97 (63.40)
Male	56 (36.60)
Age	
21-25	115 (75.20)
26-30	36 (23.50)
31-35	1 (0.70)
>35	1 (0.70)
University	
MU	76 (49.70)
UON	77 (50.30)

In all the six competencies assessed, the p-value for the variable rating in these two groups was less than 0.001.

The majority of the students rated their learning model in competence preparation to be good (n=91; 59.5%). However, in individual universities, only 31.2% (n=24) of UoN students felt that their learning model prepared them well for competence. Most of the students (68%; n=153) perceived themselves to be good in communication skills.

Teamwork skills preparedness was good in the majority of the students (73.2%; n=153), with the majority from Moi University. In research work, the majority of the students (60.1%) felt that they were poor. Up to 94.8% (n=77) of UoN students felt they were poor in research work.

In leadership skills and cultural aspects, most of UoN students (58.4%) felt they were poor, whereas the majority of their MU counterparts (81.6%) perceived themselves as good. Most students from UoN (75.3%) were not satisfied with their curriculum. However, the majority of MU students (80.3%) were satisfied with their curriculum.

Table 2: A Summary of Descriptive Analysis for Medical Students

Variable Rating	Freq (%) MU	Freq (%) UON	Total	P-value
Competence in preparation				<0.001
Poor	9 (11.8)	53 (68.8)	62 (40.5)	
Good	67 (88.2)	24 (31.2)	91 (59.5)	
Competence in communication skills				<0.001
Poor	13 (17.1)	36 (46.8)	49 (32)	
Good	63 (82.9)	41 (53.2)	104 (68)	
Preparedness in team work skills				<0.001
Poor	9 (11.8)	32 (41.6)	41 (26.8)	
Good	67 (88.2)	45 (58.4)	112 (73.2)	
Research				<0.001
Poor	19 (25)	73 (94.8)	92 (60.1)	
Good	57 (75)	4 (5.2)	61 (39.9)	
Leadership skills and cultural aspects				<0.001
Poor	14 (18.4)	45 (58.4)	59 (38.6)	
Good	62 (81.6)	32 (41.6)	94 (61.4)	
Satisfaction with curriculum				<0.001
Poor	15 (19.7)	58 (75.3)	73 (47.7)	
Good	61 (80.3)	19 (24.7)	80 (52.3)	

Discussion

In the descriptive analysis of all these competence rating variables, the *p-value* was less than 0.001. Statistically significant level of P< 0.05 was used. This was in comparison to the students who used PBL and those who did not.

Learning model in competence preparation

The majority of the students from Moi University (88%; n=76) felt that their learning model (PBL curriculum) prepared them well in making the right decisions while assisting in patient management. Most of them felt competent for having a high degree of accuracy in the interpretation of laboratory results and imaging studies. However, from UoN, only 31% (n=77) felt that their learning model prepared them well to discuss the right aspects while assisting in patient management.

A study done by Dornan *et al.* (2007) on the model linking the processes and outcomes of medical students' workplace learning suggests that the core condition for clinical workplace learning is supported participation. Furthermore, they state that any reduction in medical students' participation in clinical practice that results from the patient safety agenda and expanded numbers of medical students is likely to have an adverse effect on learning. They also found out that the construct of self-directed learning (SDL), which their respondents too often found synonymous with lack of support, should be applied with very great caution to medical students' learning in clinical workplace.[7]

In our study, the majority of UoN students (68.8%; n=77) felt that their teaching model did not prepare them well in competence acquisition in assisting in patient management. This may be due to the large number of students admitted to the medical school of UoN, with an average of about 380 students per academic year. The UoN uses Kenyatta National Hospital (KNH) as their teaching hospital. KNH has a bed capacity of 1,800. Moi University School of Medicine has an average of 70 students per academic year. Their teaching hospital, Moi Teaching and Referral Hospital (MTRH), has a bed capacity of 800. Most of the learning of a final year medical student is bedside. With fewer students per bed, there is better participation in clinical practice compared to a large group of students.

In a study on the perceptions of final year medical students for competence for internship in the University of Cape Town (UCT), Draper and Louw (2012) observed the perceptions of competence for internship. The UCT uses PBL curriculum for their medical students. Their students felt generally positive and competent to enter internship. They also observed that the perceptions of students regarding competence are an important indicator of the attainment of intended curriculum outcomes and provide valuable information for the improvement of curriculum.[8]

Competence in communication skills

In our study, the majority of the students (78%; n=153) from the two universities felt competent in communication skills. This might be due to the introduction of communication skills early in their training. Most of Moi University students (82.9%; n=76) felt they were competent in communication skills compared to 53.2% (n=77) of students at UoN. One of the components of PBL is small tutorial groups (STGs). In these STGs, each of the students has to present to their peer groups. Since this is done regularly in their learning, it most probably improves their communications skills.

Traditional teaching methods do not have many student-centered activities compared to PBL.

In a study done in the Netherlands on the communication competency of medical students, residents and consultants, the author noted that students acquire a satisfactory level of communication competency in a medical curriculum. The curriculum contains several communication courses dispersed throughout this curriculum. However, they noted that this level is already reached early on in the curriculum and does not increase substantially in later years.[9]

Another study in Portugal by Taveira-Gomes *et al.* (2016) on communication skills in medical students emphasized the importance of patient contact, context and clinical role models on the maintenance of learned skills.[10]

Preparedness in teamwork skills

The majority of the respondents (73.2%; n=153) felt that they were well prepared in teamwork. A study done by Jorge *et al.* (2014) observed that transferrable competencies such as communication, teamwork, time management and critical thinking can be acquired by exposure to teamwork.

Most of the medical students prefer teamwork in handling various aspects of patient management. Students in the PBL curriculum appear to develop teamwork skills early, whilst carrying out small tutorial groups (STGs).

The students who use traditional teaching also develop teamwork skills early as most of them engage in teamwork group discussions.[11]
In a study done by Petty *et al.* (2016) on nursing and

medical students, both sets of students were noted to practice team member and leadership roles, while faculty acted as clinical coaches. Faculty and students creatively working together can provide collaborative learning experiences that overcome interprofessional educational barriers.[12]

Research Work

The majority of the students felt they were poor in research (60%; n=153). However, in the individual universities, the majority of the Moi University students (75%; n=76) felt they were good in research. Only 5.2% (n=77) of UoN students felt they were good in research. This may be attributed to Moi University students being introduced early in their training to the Community Based Education and Services (COBES). COBES has a research component. Some of them by the time they are in the fifth year will have published their COBES research projects. Those from the UoN carry out their Community Health Program in the fifth year. Community Health is the main area where UoN students are introduced to research. They also carry out this research in less than one month. This might be the reason most of the UoN students (94.8%; n=77) felt poor in terms of research.

In a study done by Adkison and Glaros (2012), it was noted that the goals of undergraduate medical student research experiences are extremely variable. They noted that the competencies achieved include medical knowledge, interpersonal and communication skills, and professionalism.[13]

In a participation of medical trainees in short-term educational experiences in global health, there was an increasing interest in conducting research. In this case, the competencies identified outline basic knowledge, attitudes and skills necessary.[14]

Leadership Skills and Cultural Aspects

The majority of Moi University students (81.6%) rated themselves good in leadership skills and cultural aspects. From UoN, only 41.6% rated themselves good. In Moi University, students carry out small tutorial groups (STGs) where, in every course, they choose a different leader to steer the group. This probably helps in leadership training. During COBES learning, the Moi University students encounter various cultural aspects in the rural areas. This most likely assists them to learn various cultural aspects.

A study was done by Isayeva (2014) on the modeling cultural competence in teaching humanities to medical students. In this study, the author found that the most important point in modeling culture competence is the teacher's communication, spirituality, attitude and culture. The author recommends the introduction of culture competence programs into the curriculum of medical students as a separate subject.[16]

A study was done on leadership and management in the undergraduate curriculum by Quince *et al.* (2014). From their findings, they concluded that the insights offered into how students view possible developments in leadership and management opportunities can be learned within existing curricular experiences.[17]

Chen (2018) carried out a study on medical leadership. In this study, the author asserts that good medical leadership is the key to building high-quality healthcare. Being a physician requires not only management and leadership but also the need to transfer competencies in communication and critical thinking.[18] Therefore, medical students are expected to develop skills to deal with and resolve conflicts, learn to share leadership, prepare others to help and replace them, take mutual responsibility, and discuss their performances.

Satisfaction with Curriculum

The majority of the Moi University students (80.3%; n=76) were satisfied with the curriculum. However, a minority of UoN students (24.7%; n=77) were satisfied with the curriculum. A study was done by Vahid Ziaee *et al.* (2004) at the Tehran University of Medical Sciences on an evaluation of medical students' satisfaction with clinical education and its effective factors. In this study, overall satisfaction with clinical education was 38.8%, outpatient and bedside teaching 52% each, and theoretical education 70.8%.

In this study, the authors suggested that clinical education should be re-evaluated in their university with specific attention to class size, variety of diseases and course planning considered for each session in clinical education.[19] The Moi University students may have been more satisfied with their curriculum due to their small numbers in the bedside teaching, compared to the UoN students.

Conclusions

The majority of the respondents were female (63.4%; n=153). Most of the medical students (75.2%; n=153) were in the age range of 21-25 years. The majority of the medical students who used the PBL model felt that their curriculum prepared them well for their professional work and their next assignment in doing their internship. They also perceived themselves as good and competent in communication skills, teamwork skills, research, leadership, and cultural aspects. The majority of their counterparts who used the traditional teaching methods felt competent in communication and teamwork skills. Most of the students who were

using traditional teaching methods were not satisfied with their curriculum, but they felt that it prepared them well in competence of their next assignment of internship. The majority of the students who were trained using traditional teaching methods perceived themselves as poor in research, leadership skills, and cultural aspects.

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Conflict of Interest
The authors declare that they have no conflicts of interest.

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