

Full Length Research Paper

Quantitative evaluation of third year medical students' perception and satisfaction from problem based learning in anatomy: A pilot study of the introduction of problem based learning into the traditional didactic medical curriculum in Nigeria

L. C. Saalu^{1*}, A. A. Abraham² and W.O. Aina¹

¹Department of Anatomy, Lagos State University College of Medicine (LASUCOM), Ikeja, Lagos, Nigeria.

²Department of Anatomy, College of Medicine, University of Lagos, Lagos, Nigeria.

Accepted 15 February, 2010

Problem-based learning (PBL) is a method of teaching that uses hypothetical clinical cases, individual investigation and group process. In recent years, in medical education, problem-based learning (PBL) has increasingly been adopted as the preferred pedagogy in many countries around the world. Controversy, however, still exists as the potential benefits and overall outcome of PBL over traditional didactic learning (TDL). The present study compared the learning effectiveness of PBL with TDL using both experimental method (students' performance in examination) and observational method (students' responses to questionnaires). The self-administered questionnaires measured learning outcomes and acquisition of interpersonal skills on a 5-point Likert type rating scale of 1 (strongly agree) - 5 (strongly disagree). The study population comprised third year medical students of Lagos State University College of Medicine, Ikeja, Lagos, Nigeria. Half of the new innovative Human Anatomy curriculum was thought using PBL and the other half using TDL. The PBL method resulted in better examination scores than TDL for the same students. A majority of students felt that, the PBL sessions were better at fulfilling learning objectives, gave better factual knowledge of Anatomy, promoted better student participation in the learning process, provided more learning fun, ensured more students team work and interpersonal skills acquisition and enabled more students' reflective/critical thinking and reasoning of anatomy, as compared to traditional teaching methods. Most of the students opined that more such sessions should be organized in the future. The main disadvantage perceived was that, it was time-consuming. We conclude that, based on the examination scores and the responses of the students, PBL are more successful than TDL.

Key words: Problem based learning, Traditional didactic learning, medical students, perception.

INTRODUCTION

The most commonly used pedagogy in Nigeria is the classical or conventional lecture method. It is a live personal method for motivating, sensitizing and stimulating

students. Economical use is made of staff time by this method. It can also save the learner's time by providing an up-to-date summary of the topic from several sources. Difficult concepts can be clarified and emphasis can be laid on the salient features. This is also a good method for pacing the rate of working of a large body of learners (Newble and Clarke, 1986; Patel et al., 1991).

There is growing concern among medical educators

*Corresponding author. E-mail: chiasaalu@hotmail.com. Tel: 234-8033200876.

that, conventional modes of teaching medical students (lecture-based curricula) neither encourage the right qualities in students nor imparts a life-long respect for learning (Kasselbaum, 1989). Fundamental reforms in undergraduate medical education have been advocated for 100 years. In 1899, William Osler, (1913) realized that, the complexity of medicine had already progressed beyond the ability of the teachers to teach everything that students would need to know.

Furthermore, the passive nature of the audience in a traditional learning class and limited opportunity for feedback lead to low receptivity (Kaufman and Mann, 1996).

Lecturing skills of a high caliber (not commonly available) are required to hold the attention of students for the commonly prescribed lecture duration of one hour. Very often, the material covered by a lecture can be more easily acquired from a textbook and has little if any clinical application. Many students attend lecture classes because attendance is mandatory or because they do not want to incur the wrath of the teacher who might be their examiner (Nandi et al., 2000).

The foregone drawbacks resulted in the gradual change of the curricula of many medical schools to problem based (PBL) pedagogy. Beginnings of PBL pedagogy can be traced back to John Dewey's philosophy of education published early in the twentieth century (Dewey, 1938). Dewey advocated engaging the learner in everyday problems to facilitate learning. In order to foster active rather than passive learning, PBL pedagogy diverges from a conventional lecture format to emphasizing small facilitation groups in which all learning is problem-based. Emphasis is placed on inquiry and self-directed, student-centered activities. The essential components to this strategy include advance preparation, team formation, readiness assurance testing, group application exercises and peer evaluation (Ganske et al., 2006). PBL has been touted as one of the best described methods of interactive learning, and many claims that, it is more effective than traditional methods in terms of lifelong learning skills, and is more fun (Dolmans and Schmidt, 1996).

With undergraduate, medical education currently carrying a health warning because of the stress and anxiety caused to students and young graduates, any educational process that promotes enjoyment of learning without loss of basic knowledge and skills must be a good thing (Weatherall, 1994; Dowie, 1994). It is therefore, imperative for teachers to create an appropriate learning environment where these active learning methods can be effectively implemented. In the Nigerian context, it is not possible to implement a full-fledged PBL approach to teaching as this will entail a complete restructuring of the curriculum. Lloyd-Jones et al. (1998) have pointed out that, PBL pedagogy can have a "coat of many colors" and is interpreted and practiced in education with a variety of strategies. It is in this context that, the authors introduced a hybrid PBL curriculum (partly PBL

And partly TDL) to teach Anatomy at Lagos State University College of Medicine, Lagos, Nigeria.

However, the implementation of a PBL curriculum is an interesting pedagogical issue. In that, the major objectives for medical students are different from those of a traditional classroom. A plethora of reports from medical educators and medical curriculum planners across the globe addressing these issues have appeared in the literature (Kasselbaum, 1989; Nandi et al., 2000; Ganske et al., 2006). Unfortunately, however, there are no published reports which explore these questions for the Nigerian and indeed African medical students.

This pilot project was therefore undertaken to assess whether objectives of introducing PBL into the didactic learning curriculum to facilitate acquisition of desirable learning and generic skills had been achieved. The students' perception of the advantages and disadvantages of this new pedagogy was also evaluated.

MATERIALS AND METHODS

Background/settings

The study was carried out in the Anatomy department of Lagos State University College of Medicine (LASUCOM), Ikeja, Lagos, Nigeria. Students enter the medical school after 12 years of pre-university education. The pre-university (primary and secondary) education may be undertaken at public or private institution. They come from varied backgrounds with a majority of the students from the Lagos state as the university is owned by Lagos state. The medical school follows a 6-year undergraduate curriculum.

One and half of this period are dedicated to the teaching of the basic medical sciences of Anatomy, Physiology and Biochemistry. The minimum contact hours allocated to Anatomy is 690 h. The college rules specify the number of hours but do not restrict how these sessions are conducted (LASUCOM curriculum, 2007).

Participants and study design

The student cohort for this investigation comprised 76 third year undergraduate medical students of Lagos State University College of Medicine (LASUCOM), Lagos, Nigeria.

A total of 40 classes were allotted to cover all the areas of Anatomy (Embryology, Histology, Gross Anatomy and Neuroanatomy) over a period of 12 months (December 2008 - December 2009). 20 of these classes were conducted using the traditional didactic lecture method and the other 20 were conducted using the problem based method. A deliberate effort was made to ensure that, the topics selected for PBL pedagogy were those with tremendous clinical correlations. To eliminate bias all the didactic lectures were delivered by the corresponding author, who also served as the chief facilitator for all the PBL sessions.

The 76 students were randomly divided into six groups of 12 students each. The same groups were retained for all the PBL sessions, thus, ensuring a degree of permanence. PBL procedures and processes were painstakingly explained to the students. The PBL materials consisted of 20 written problems involving hypothetical patients. These PBL clinical case histories were designed to stimulate the students to find the anatomical solution to the problems or to find the anatomical basis of the clinical conditions. On each day of the PBL session, the clinical case histories were discussed with emphasis on their anatomical correlation in the presence of the authors.

At the end of the PBL course, the students were asked to evaluate

these sessions by means of self administered 5-point Likert type rating scale questionnaires (Likert, 1932). The questionnaire consists of 18 questions organized in 2 sections: background/demographic (9 questions), Students' perception of PBL as compared to traditional didactic learning (9 questions). Students were asked to fill in the evaluation questionnaire and hand it in as they left the lecture theatre. The questionnaires were all anonymous and completion was not compulsory. This constituted the observational cross-sectional survey component of our study.

Furthermore, an experimental study was also conducted by giving the students a written examination testing their knowledge on topics taught using PBL and TDL. Examination scores in questions on topics using each of the two methods were evaluated. Due to the fact that studies of this nature are regarded as teaching evaluations in line with standard departmental teaching policy, full ethics approval was not deemed necessary (LASUCOM Curriculum, 2007).

Statistical analysis

We used t-test to examine the differences between the mean test scores in the examinations comparing both teaching methods. Data were analyzed by using Statistical Program for Social Scientists.

RESULTS

Demographics

The response rate was 98.70%. One student were absent on the day of the study. The male and female distribution was 63.15 male and 36.84% female, respectively. The mean age of the students was 21.6 years. There was no demonstrable ($p < 0.05$) relationship between our results (perception and examination scores) and the students' gender and age.

Students' examination scores

There was a statistically significant ($p < 0.05$) increase in the mean score obtained from examination questions on topics taught using PBL compared to that obtained with topics treated using TBL (67 and 51% for PBL and TBL, respectively). It was demonstrated that, the PBL method was probably more effective in helping students to learn the material and gain higher scores (Figure 1).

Perception

Figure 2 demonstrates the responses to the first question about students' perception on the questionnaire. Seventy two percent of the students declared that PBL gives better factual knowledge of Anatomy when compared to TDL and an overwhelming majority of the students (87%) perceived that PBL promotes better student participation in the learning process as compared to TDL. Indeed 50% of the respondents even strongly agreed to this assertion

(Figure 3).

Seventy-six percent, 83, 79 and 86% of the students felt that, the PBL sessions were better than TDL at promoting students' reflective/critical thinking of Anatomy, providing more learning fun, promoting students' interpersonal skills acquisition and fulfilling the learning objectives, respectively (Figures 4 - 7). However as Figure 8 demonstrates, only a small majority (55%) of the responding students agreed that, more PBL sessions should be organized.

Furthermore, 92% of the students declared that heavy workload and time consumption on the part of the learner were the main drawbacks of the PBL pedagogy.

DISCUSSION

Problem based learning is based on the messy, complex problems encountered in the real world as a stimulus for learning and for integrating and organizing learned information in ways that will ensure its recall and application to future problems. The problems in PBL are also designed to challenge learners to develop effective problem-solving and critical thinking skills (Walsh, 2008).

Traditional education practices from kindergarten through medical school produce students who are disenchanted and bored with their education. They are faced with a vast amount of information to memorize much of which seems irrelevant to their future as it exists outside of school. They forget much of what they learned and what is remembered cannot be applied to the problems and tasks they later face (Ho and Tani, 2007). This explains why college courses that one studied is hard, got an "A", and later remembered almost nothing from it.

The use of PBL has been established in response to a set of perceived problems in medical education. These problems include emphasis on fact memorization over problem solving skills, the limited direct orientation of basic science education to clinical career, and the need to develop habits of life long learning (Walton and Matthews, 1989; Donner and Bickley, 1990; Fisher, 1994).

The Department of Anatomy, Lagos State University College of Medicine, Lagos, in keeping with the vision of the college aspires to be an exemplary department in teaching and training medical students to be efficient, knowledgeable, community-oriented and caring doctors of medicine. Confronted with these challenges, the department has begun to use problem-based learning techniques in its courses.

In this study, the authors demonstrated that PBL is an effective way of improving cognitive thinking, enhancing long-term memory of information and acquiring better factual knowledge of anatomy. This is evidenced by the significant ($p < 0.05$) increase in the mean examination scores in topics taught using PBL when compared with

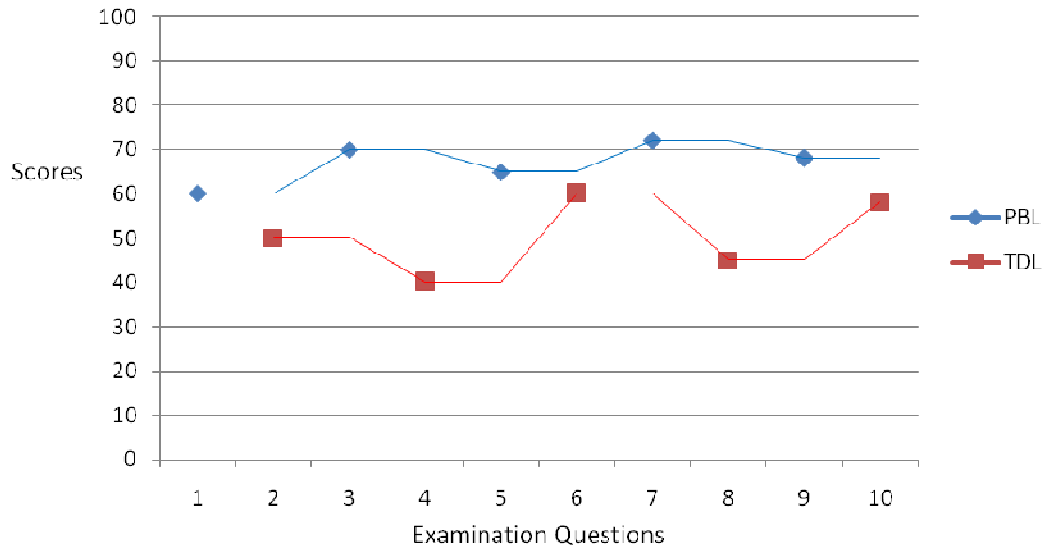


Figure 1. Students score following problem-based learning (PBL) and traditional didactic learning (TDL). Questions 1, 3, 5, 7 and 9 were on topics taught using PBL. Questions 2,4,6,8 and 10 were on topics taught using TDL.

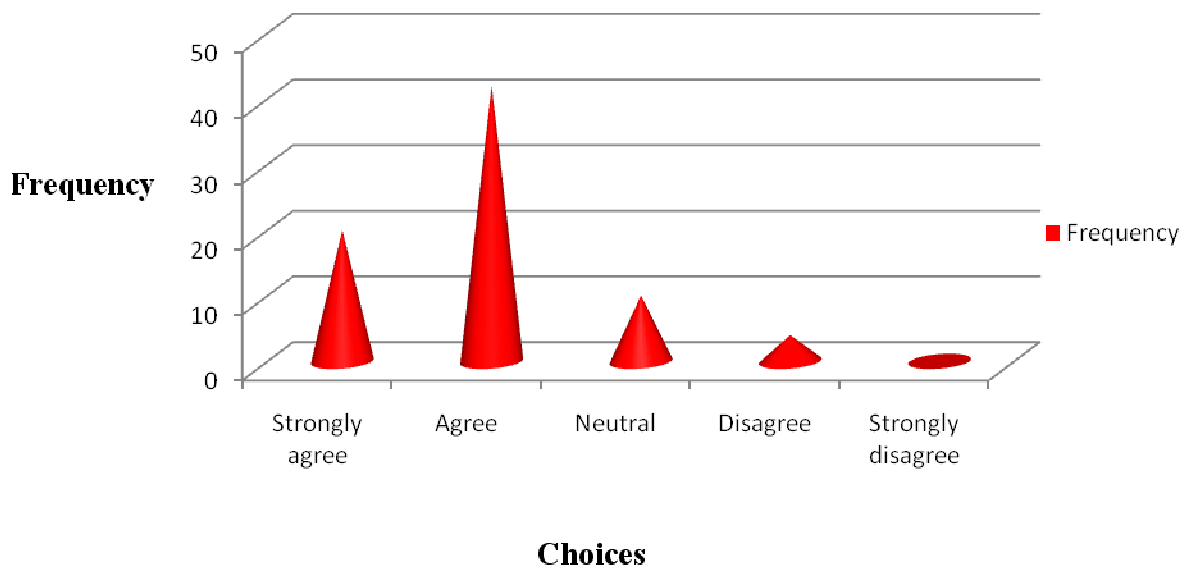


Figure 2. PBL gives better factual knowledge of anatomy when compared to TDL.

the mean scores in anatomy topics that were taken using the conventional teaching method. Our findings in this regards are in complete agreement with reports by many other medical educators and curriculum experts (Verhoeven et al., 1998; Hinduja et al., 2005; Ganske et al., 2006; Ho and Tani, 2007).

Furthermore, the p values obtained from our questionnaires demonstrated that the PBL improved student's perception regarding their anatomical knowledge, fulfilling learning objectives, participation in the learning process,

reflective/critical thinking, learning fun and interpersonal skills acquisition. These findings are comparable to those of other authors (Musal et al., 2004; Abu-Hijleh et al., 2005; Hinduja et al., 2005).

According to our results, a majority of them preferred the PBL method to the traditional lecture method and wanted more of these sessions to be organized in the future. Despite this overwhelming approval, a vast majority of our respondents still enumerated time-consumption and heavy workload as the main drawbacks of PBL.

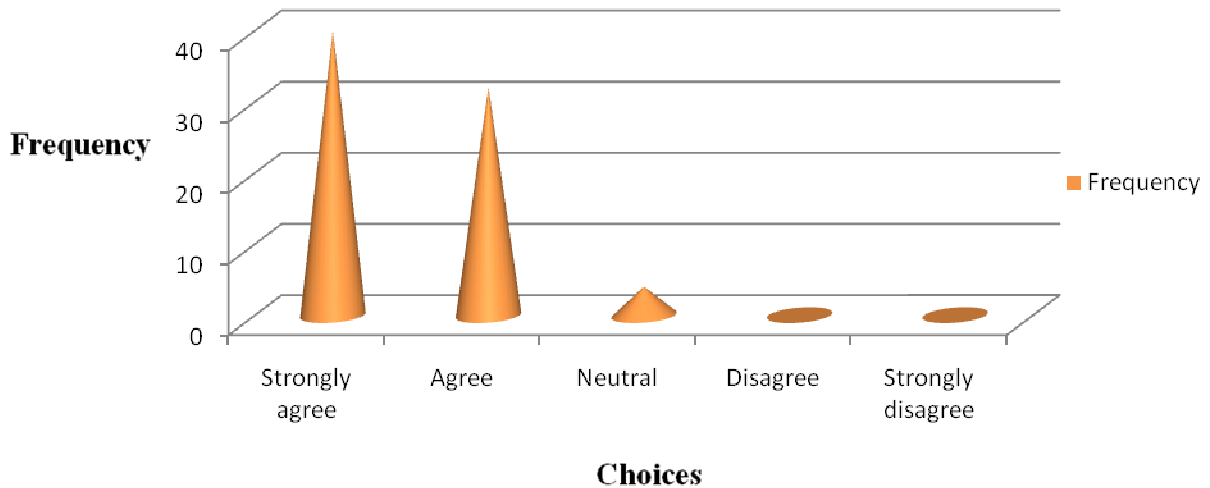


Figure 3. PBL promotes better student participation in the learning process when compared with TDL.

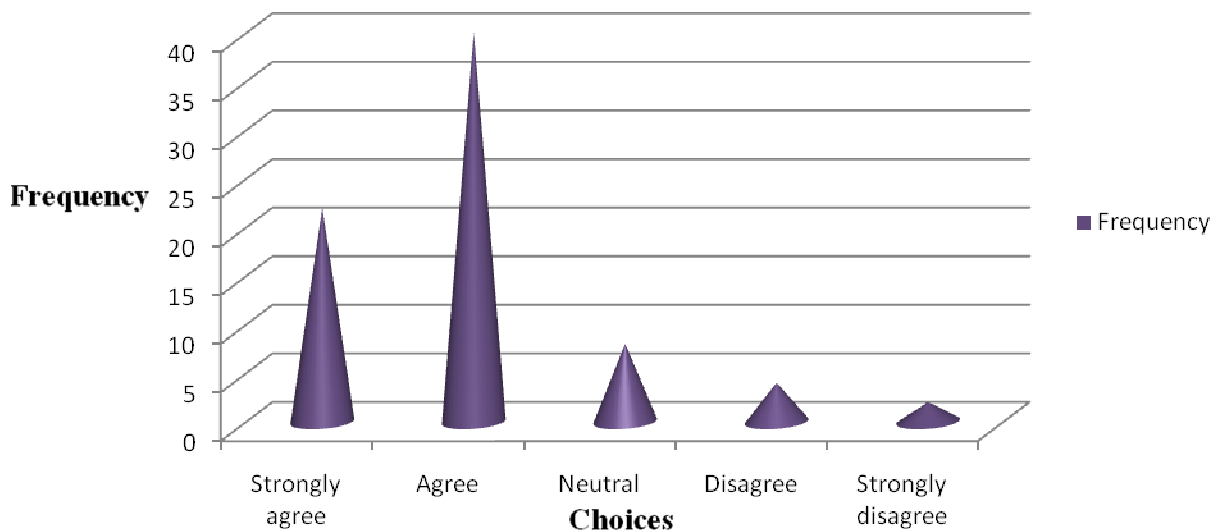


Figure 4. PBL promotes more students reflective/critical thinking and reasoning of anatomy when compared with TDL.

Although Stokes et al. (1997) and Lo (2004) has earlier reported that, time consumption and heavy workload were student's negative perception of PBL; they were not as serious as those reported in our study. A plausible explanation to this discrepancy could be that in our environment, sources of information such as internet services are largely rudimentary at this stage of our development.

Conclusion

In conclusion, the results of our study (observational and experimental) showed that, third year medical students demonstrated as well as believed that, PBL was effective

and more beneficial than a traditional teaching regimen as an anatomy teaching method. With this feedback provided by the students, we feel that, PBL could have a role in medical colleges even in our environment, especially as a method to explore the non-cognitive domains of learning. It is therefore suggested that, there should be an intelligent combination of using both the traditional and PBL approaches for teaching anatomy which may provide the most effective training for undergraduate medical student. Topics with a predominantly theoretical basis and not much clinical correlation could be taught using the conventional didactic lecture method. A PBL method could then be used for other topics with more clinical application. It is our contention that this novel pedagogy will help our students become better and

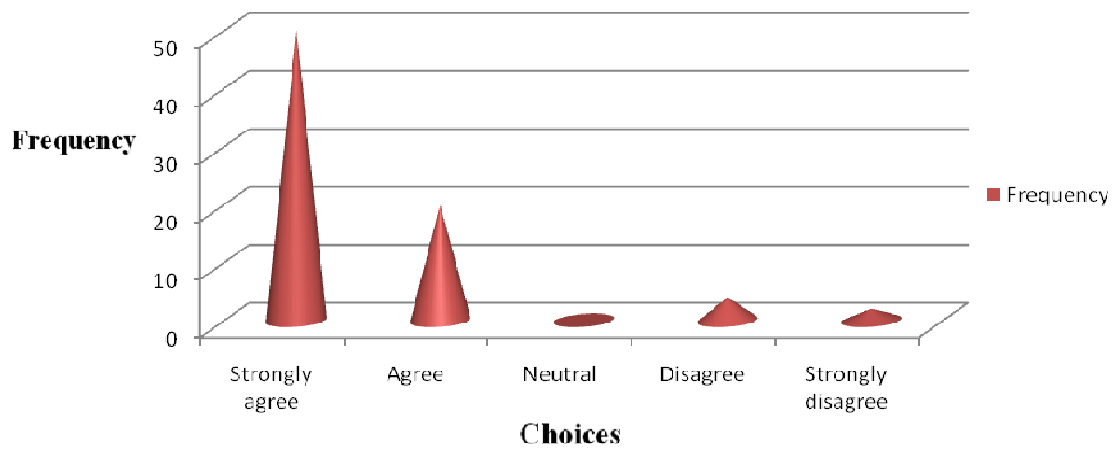


Figure 5. PBL is more interesting and provides more learning fun when compared with TDL.

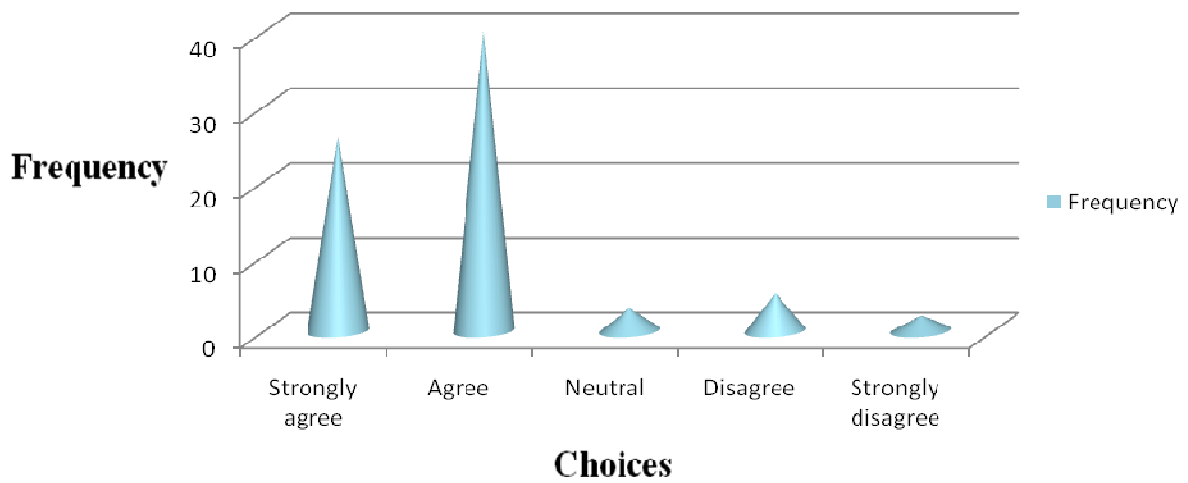


Figure 6. PBL promotes more students team work and interpersonal skills acquisition when compared with TDL.

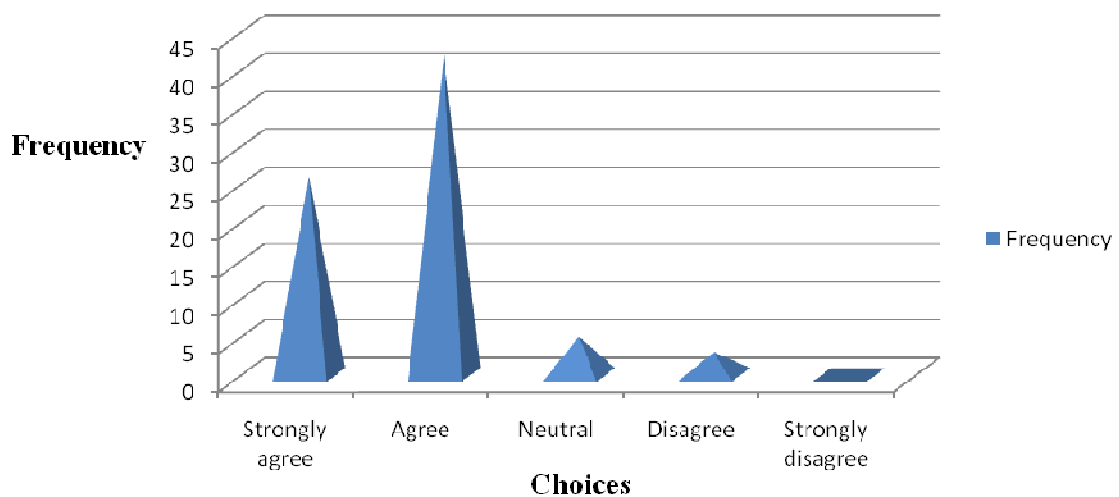


Figure 7. PBL is more effective in fulfilling learning objectives when compared to TDL.

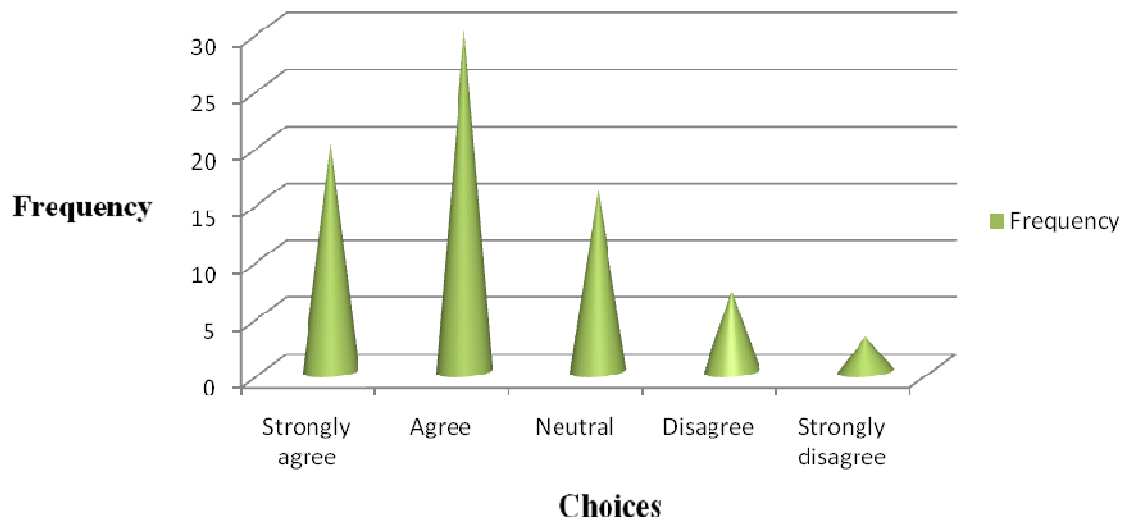


Figure 8. More PBL sessions should be organized.

scientific physicians rather than just pass examinations.

REFERENCES

- Abu-Hijleh MF, Chakravarty M, Al-Shboul Q, Kassab S, Hamdy H (2005). Integrating applied anatomy in surgical clerkship in a problem-based learning curriculum. *Surg. Radiol. Anat.* 2: 152-157.
- Dewey J (1938). *Logic: The theory of inquiry*. New York: Holt p. 350.
- Dolmans D, Schmidt HG (1996). The advantages of problem-based curricula. *Postgrad. Med. J.* 72: 535-538.
- Donner RS, Bickley J (1990). "Problem-based learning: An assessment of its feasibility and cost," *Pathol. Educ.* 21: 881-885.
- Dowie R, Charlton B (1994). *The making of a doctor*. Oxford: Oxford University Press; 1994.
- Fisher RC (1994). "The potential for problem-based learning in pharmacy education: A clinical therapeutics course in diabetes," *Am. J. Pharm. Educ.* 58: 183-189.
- Ganske I, Su T, Loukas M, Shaffer K (2006). Teaching methods in anatomy courses in North American medical schools: The role of radiology. *Acad. Radiol.* 13: 1038-1046.
- Hinduja K, Samuel R, Mitchell S (2005). Problem-based learning: Is anatomy a casualty? *The Surgeon* 3: 84-87.
- Ho MT, Tani M (2007). What medical students value from their teachers. *Aust. Health Rev.* 31: 358-361.
- Kasselbaum DE (1989). Change in medical education: The courage and will to be different. *Acad. Med.* 64: 446-447.
- Kaufman DM, Mann KV (1996). Comparing students' attitudes in problem-based and conventional curricula. *Acad. Med.* 71: 1096-1099.
- LASUCOM curriculum (2007). Regulations governing M.B.B.S. degrees and department courses pp. 77-78.
- Likert G (1932). A technique for the measurement of attitudes. *Archives of Psychology* 22(140).
- Lloyd-Jones G, Margetson D, Bligh JG (1998). Problem-based learning: A coat of many colours. *Med. Educ.* 32(5): 492-494.
- Lo A (2004). Development quality students for the hospitality and tourism industries through problem-based learning. Conference proceedings of hospitality, Tourism and Foodservice Industry in Asia: Development, marketing and sustainability. May 27-29, Phuket.
- Musal B, Gursel Y, Taskiran HC, Ozan S, Tuna A (2004). Perceptions of first and third year medical students on self-study and reporting processes of problem-based learning. *BMC Med. Educ.* 4: 16.
- Nandi PL, Chan JN, Chan CP, Chan P, Chan LP (2000). Undergraduate medical education: Comparison of problem-based learning and conventional teaching. *Hong Kong Med. J.* 6: 301-306.
- Osler W (1913). An introductory address on examinations, examiners, and examinees. *Lancet* 1913; ii: 1047-1050.
- Patel VL, Groen G, Norman GR (1991). Effects of conventional and problem-based medical curricula on problem solving. *Acad. Med.* 66: 380-389.
- Stokes FS, Mackinnon MM, Whitehill TL (1997). Students' experiences of PBL: *J. Questionnaire Anal. ZSfHD* pp. 161-180, 220.
- Verhoeven BH, Verwijnen GM, Scherpbier AJJA, Holdrinet RSG, Oeseburg B, Bulte JA (1998). Undergraduate medical education: Comparison of problem-based learning and conventional teaching. *Hong Kong Med. J.* 6: 301-306.
- Walsh K (2008). Learning Styles: Do they really exist? *Med. Educ.* 41: 618-620.
- Walton HJ, Matthews MB (1989). "Essentials of problem-based learning," *Med. Teacher* 10: 57-67.
- Weatherall DJ (1994). The inhumanity of medicine. *BM. J.* 308: 1671-1672.

APPENDIX**Serial number****Third year medical students' perception of and satisfaction from problem-based learning in anatomy****Study questionnaire**

This questionnaire is to aid the above study subject, being conducted by Drs. L.C. Saalu, A.A. Osinubi and W.O. Aina as part of a pilot study on the introduction of problem based learning (PBL) into the traditional didactic medical curriculum in Nigeria.

All information collected will be strictly confidential. The information will be used only for the research and no other purpose. Individuals will not be identified, as names will not be collected.

A. Demographic (mark or state as appropriate)

- 1) Sex: M F
 2) Age: _____ years
 3) Marital status: Single Married
 Divorced Widowed
 4) Religion: Christianity Islam Traditional belief Others

Please specify _____

- 5) State of origin: _____
 6) Ethnic origin: _____
 7) Which entry batch of the class do you belong to:
 First batch Second batch Third batch Direct Entry Repeat
 8) Primary school attended: Public Private
 9) Secondary school attended: Public Private

B. Students' perception of PBL as compared to Didactic learning (mark or state as appropriate)**i) PBL is more effective in fulfilling learning objectives**

- 1- Strongly agree
 2- Agree
 3- No opinion/confused
 4- Disagree
 5- Strongly disagree

ii) PBL gives better factual knowledge of Anatomy

- 1- Strongly agree

- 2- Agree
 3- No opinion/confused
 4- Disagree
 5- Strongly disagree

ii) PBL promotes better student participation in the learning process

- 1- Strongly agree
 2- Agree
 3- No opinion/confused
 4- Disagree
 5- Strongly disagree

iii) PBL promotes students' reflective/critical thinking and reasoning of Anatomy

- 1- Strongly agree
 2- Agree
 3- No opinion/confused
 4- Disagree
 5- Strongly disagree

iv) PBL is more interesting and provides more learning fun

- 1- Strongly agree
 2- Agree
 3- No opinion/confused
 4- Disagree
 5- Strongly disagree

v) PBL promotes students team work and interpersonal skills acquisition

- 1- Strongly agree
 2- Agree
 3- No opinion/confused
 4- Disagree
 5- Strongly disagree

vi) More PBL sessions should be organized

- 1- Strongly agree
 2- Agree
 3- No opinion/confused
 4- Disagree
 5- Strongly disagree

vii) What in your opinion is the main disadvantage (if any) of PBL?

viii) Please suggest ways by which you think the organization (that is preparation and conduct) of PBL can be improved