Original Article

Comparative study on the measurement of learning outcomes after powerpoint presentation and problem based learning with discussion in family medicine amongst fifth year medical students

Sujata Khobragade[1], Adinegara Lutfi Abas[1], Yadneshwar Sudam Khobragade[1]

[1]Department of Community Medicine, Melaka-Manipal Medical College, Melaka, Malaysia

Abstract

Background: Learning outcomes after traditional teaching methods were compared with problem-based learning (PBL) among fifth year medical students. Six students participated each in traditional teaching and PBL methods, respectively. Traditional teaching method involved PowerPoint (PPT) presentation and PBL included study on case scenario and discussion. Both methods were effective in improving performance of students. Postteaching, we did not find significant differences in learning outcomes between these two teaching methods. **Aims:** (1) Study was conducted with an intention to find out which method of learning is more effective; traditional or PBL. (2) To assess the level of knowledge and understanding in anemia/zoonotic diseases as against diabetes/hypertension. **Settings and Design:** All the students posted from February 3, 2014, to March 14, 2014, participated in this study. Six students were asked to prepare and present a lecture (PPT) and subsequent week other six students were asked to present PBL. Both groups presented different topics. Since it was a pre- and post-test, same students were taken as control. To maintain uniformity and to avoid bias due cultural diversity, language etc., same questions were administered. **Materials and Methods:** After taking verbal consent, all 34 students were given pretest on anemia and zoonotic diseases. Then lecture (PPT) by six students on the same topic was given it followed by posttest questionnaire. Subsequent week pretest was conducted on hypertension and diabetes. Then case scenario presentation and discussion (PBL) was done by different six students followed by posttest. Both the methods were compared. **Statistical Analysis:** Analysis was done manually and standard error of means and students *t*-test was used to find out statistical significance. **Results:** We found statistically significant improvement in performance of students after PPT presentation as well as PBL. Both methods are equally effective. However, Pretest results of students in anemia and zoonotic diseases (Group A) were poor compared to pretest results of students in hypertension and diabetes (Group B). The students who participated in presentation did not influence their performance as they were covering a small part of the topic and there were no differences in their marks compared to other students. **Conclusions:** We did not find significant differences in outcome after teaching between PBL and traditional methods. Performances of students were poor in anemia and zoonotic diseases which need remedial teaching. Assessment may influence retention ability and performance.

Keywords: Active learning, conventional teaching, PowerPoint presentation, problem-based learning

Introduction

Teaching and learning goes together. Understanding and reproducing learned material is important in a clinical setting. Remembering names of drugs, doses, duration and adverse

Address for correspondence: Dr. Sujata Khobragade, Department of Community Medicine, Melaka-Manipal Medical College, Melaka, Malaysia.
E-mail: sujuyk@yahoo.com

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effects of drugs is an important component in training of medical students. Studies have shown that in conventional lecture-based learning, students construct new knowledge by adding on to previous knowledge base. The learning is poor if lecture is nonrelevent, lecturer is poor communicator and students get bored if lecture is too lengthy.[1] Over the years, new modalities of teaching-learning have been added to improve learning outcomes. Active learning such as problem-based learning (PBL), task-based learning (TBL), cooperative learning, collaborative learning, project-based learning, portfolio writing have been found to improve understanding, motivation, skill and knowledge of student.[2] Traditional teaching has been modified by blending it with question-answer, interactive learning and various other methods by which students actively participate in teaching learning. At Melaka-Manipal Medical College, Melaka, Malaysia, students are posted in family medicine, in their final year. They attend clinics in the morning and in the afternoon they have active teaching-learning sessions such as presentation in tutorials on Tuesdays and Thursdays, and presentation in the common program on Wednesdays. Other days, they have self-directed learning (SDL) and lectures. To promote active learning among students we have included PBL, TBL and role play in tutorials apart from conventional teaching.

Currently, in the tutorial classes, their training includes preparation and presentation on assigned topics using Microsoft PowerPoint and PBL. To see the effectiveness of these tools on learning, we decided to conduct a comparative study on conventional vis-à-vis PBL with following.

Aims

- To find out differences in the marks after traditional teaching method and PBL
- To find out effectiveness of students participation in learning
- To find out the weakness in certain topics if any so that it can be rectified.

Hypothesis

PBL leads to better learning outcomes than the conventional method of teaching.

Materials and Methods

All 34 students posted in family medicine from February 3, 2014, to March 14, 2014, were taken for study. A verbal consent was taken from them. All of them agreed to participate in this study. Six students were given the task of presenting on anemia and zoonotic diseases prevalent in Malaysia. All the students were informed that there will be 10 MCQs carrying 10 marks for 10 min, before and after the presentation. In the afternoon session on Tuesday at 2.30, a pretest was given to students. This was followed by traditional teaching with PowerPoint (PPT) slide projection. Most of the students read out slides whatever they have written; few students initiated their talk by throwing questions at the audience. We gave a break of 5 min for question–answer but no student asked any question or clarification. Teacher present in the class was a facilitator, observer, and moderator but he intervened and clarified doubts wherever required. After the session, same MCQs were used for assessment. The purpose of giving same questions was to maintain uniformity, standard, and avoid bias because we have students from various cultural backgrounds, language, and medium of instructions during their schooling days and nationality. We wanted to assess their knowledge, understanding and recall ability. We want them to remember factual information related to diagnostic criteria, names of drugs, doses, and other relevant material related to concerned topics. We do not feel that the students who presented in tutorial will do far better than others and influence result because each of them was covering very small portion of the topic and audience was informed in advance about topic hence everybody may have prepared at home or may not have. Hence, everyone had an equal chance of doing well before and after the presentation.

For the next week, another six students were asked to present on hypertension and diabetes. Here, the students were not given prior intimation about proposed topic to be discussed. Of total number of 34 students, one student was absent due to sickness. Before starting teaching session, students were given 10 MCQs on hypertension and diabetes, carrying 10 marks for 10 min. Teacher gave the outline on the methodology of teaching-learning in PBL in hypertension and diabetes. Three students were selected randomly for presentation on hypertension and three students for diabetes mellitus. They were given case scenario and asked to prepare in 30–40 min. For preparation, they could read books or relevant topic on internet. To avoid bias in performance we gave case scenario to all students and all of them were asked to read or search on internet and study so that they could have a meaningful discussion. For the purpose of presentation, students divided the main topic into sub-topics and presented. The presentation and discussion continued for 40 min. It was a group presentation involving collaboration with each other with a common goal of solving problem. The chances of influencing results by presenters were minimized by asking all the students to prepare and discuss, thus giving opportunity to all students for preparation and discussion. The presentation was related to topic and not to the questions asked in assessment. We hope it minimized the bias. After presentations, they were evaluated using the same questionnaire, and marks were awarded on the scale of ten. The purpose of selecting different topic was to see their level of knowledge and understanding in various areas of medicine. Often students answer well in cardiovascular diseases than other topics such as anemia and zoonotic diseases as prevalence of latter is less compared to former in Malaysia.

Statistical analysis used

This study was on assessment of the performance of students after teaching by different methods hence experimental and control group were same. Data were analyzed and standard error of difference between two means and paired Student's *t*-test were applied to find out the test of significance.

Results and Analysis

From Table 1, we can notice that the mean marks before presentations are very poor which improved significantly after presentation. Each student in presenter group projected and read out a fraction of topic hence we do not feel that it will influence the results. In the normal course, it is our observation that students in audience do not pay much attention to PPT presentation and presenting students also do not take pain in presentation and discussion. They only read out what they have prepared. When questions are asked on slides projected they invariably fail to answer. However, in this case, they have done well. We feel that examination appears to be a strong motivating factor in learning, retaining, and reproducing learned material even though there was no active discussion after presentation.

Analysis of Table 2 shows that marks secured by the students are significantly improved after problem-based exercise presentation. Here we find pretest marks in hypertension and diabetes are relatively more than anemia and zoonotic diseases and improved further after PBL suggesting that after teaching performance improves. The significant improvement in marks cannot be attributed to presenting students because only a small portion of the topic was presented by each student. The improved group performance is because of their active participation, discussion, and understanding the subject matter. We could not see much variation between presenter and audience.

In Table 3, we observe that marks gained by students before teaching session were significantly less in the field of anemia and zoonotic diseases compared to hypertension and diabetes mellitus. We feel that this poor performance in pretest in anemia and zoonotic diseases is to lesser exposure to these illnesses in clinics and hospital. As the incidence of these illnesses is less so also teaching and discussion in clinics and hospital is less in these topics. Another contributory factor may be that students find questions on anemia and zoonotic diseases tougher hence lesser marks compared to diabetes and hypertension. After teaching significant improvement has been seen thus suggesting that conventional teaching methods using PPT is an effective method of learning. From this observation, we feel that pretest poor performance in anemia and zoonotic diseases could be due to reason cited above that is lesser exposure and discussion, thus giving an indication that there is a need to focus more on teaching in anemia and zoonotic diseases.

We wanted to find out, which method is more effective for learning?

From Table 4, it is seen that posttest marks in PBL are more than traditional teaching, but the difference is not statistically significant. The higher score can be due to the fact that the students find it easy to understand diabetes and hypertension, as they see these patients on daily basis and when discussed it is easy to understand and reproduce. Hence, it may be a matter of chance to secure more marks in these topics. Hence, we cannot conclude that PBL method is better than traditional lecture method.

Postteaching both methods have shown statistically improved performance. We conclude that both methods of teaching; PBL as well as traditional are equally effective as a tool of teaching learning. What is important is motivation on the part of students, their willingness to learn and desire to understand and recall.

In this study, we feel assessment as strong motivating factor in learning outcomes; we suggest periodic assessment or surprise tests during teaching courses.

Discussion

Students learn by attending lectures, group discussion, PBL, project-based, inquiry-based, case-based, research-based, situation-based, action-based, PBL and SDL. Active learning means when students are participating in learning program and it occurs

Table 1: Mean marks of students before and after traditional form of teaching in anemia and zoonotic diseases (Group A)

	Number of students	Mean marks	SD
Pretest	34	1.69	0.55
Posttest	34	4.00	1.70

Difference between two mean: 2.31; SE of difference between two mean: 0.417; *t*: 5.5395. At df - 60, *t* (0.05)=2. 00, *t* (0.001)=3.460; at df - 70, *t* (0.05)=1.994, *t* (0.001)=3.435; statistically highly significant. SD: Standard deviation; SE: Standard error

Table 2: Mean marks of students before and after problem-based learning in hypertension and diabetes (Group B)

	Number of students	Mean marks	SD
Pretest	33	5.35	2.64
Posttest	33	7.30	2.12

The difference between the mean: 1.95; SE of difference between two means: 0.5894, *t*: 3.30. At df - 60, *t* (0.05)=2. 00; statistically significant. SD: Standard deviation; SE: Standard error

Table 3: Comparison of mean marks of students between traditional teaching (Group A) and problem-based learning (Group B) before presentation

	Number of students	Mean marks	SD
Anemia and zoonotic diseases (Group A)	34	1.69	0.545
Hypertension and diabetes mellitus (Group B)	33	5.35	2.62

Difference between two mean: 3.66; SE of difference between two mean: 0.479, *t*: 7.64, df - 60, *t* (0.05): 2.00, *t* (0.001): 3.460; df - 70, *t* (0.05)=1.994, *t* (0.001)=3.435; statistically significant. SD: Standard deviation; SE: Standard error

Table 4: Comparison between mean marks after traditional teaching and problem-based learning

	Sample size	Mean marks	SD
Traditional teaching	34	4	1.939
Problem-based learning	33	7.14	6.62

Difference between two mean=3.12; SE of difference between two mean=1.07, df=34+33=67−2=65, paired Students *t*-test=1.939; df - 60, *t* (0.05)=2.00, df - 70, *t* (0.05)=1.994; statistically not significant. SD: Standard deviation; SE: Standard error

in traditional or conventional lectures provided students are taking down notes and interacting with lecturer.[3] In a large classroom, this may not be very effective method as only few students are able to actively participate, and majority of students listen to talk hence are passive learners. Traditional methods are teacher centric where teacher has to complete his lecture in stipulated time and may not bring about desirable learning in students. To have better learning and improve student's performance, newer methods have been developed in which students participate extensively in teaching–learning process. Active learning can be collaborative, co-operative, PBL, or TBL.[4] Understanding, remembering, and reproduction are better in active learning process. This is because of high level of motivation, interest, and desire to learn. Retention of learned material is better in active learning compared to passive learning, and when students are given task they are more concerned, focused on their own preparation, they co-operate and collaborate with each other and present well. Performance-wise they do better.[5] However, in our study, we found significantly improved performance after traditional way of teaching. Hence, we cannot say that PBL is better than traditional way of learning. Nevertheless, learning is better if students are actively involved in learning process. In this study, we asked one group of students (Group A) to prepare and present a lecture on anemia and zoonotic diseases. In conventional lecture it is a common practice to prepare notes and present; often blackboard and books are used in teaching. Though teachers of old generation may not be comfortable with PowerPoint but younger generations find it more convenient and its usage is being encouraged in higher education. Students feel that learning is better with PPT than conventional methods.[6] In our study students prepare PPT and present it as a group. We feel it is a combination of traditional teaching-learning with TBL. Traditional because it is lecture preparation and nowadays it is a common practice to use PPT for lecture presentation. Task-based means completion of work of preparation of lecture and its presentation. Active learning component is also included here because lecture preparation and presentation is shared by group of students. There is a division of task, co-operation and healthy competition among students which promotes active learning. However, this active learning involved 6 participating students. These six students (Group A) prepared and presented lecture using PPT. Almost all of them read out what they have written in PPT slides. There was no discussion or question answers after presentation. When assessed, we found the significant outcome in terms of marks after their PPT presentation compared to pretest. In didactic lectures, students are passive learner; show little interest, listen only if topic is interesting[7] but we found enhanced outcome after PPT presentation which could be due to (a) assessment factor which acted as motivating factor to perform better in examination (b) active participation by students as they were given the task to deliver lecture and (c) small size of class where everybody was being observed. In PBL, studies have shown that students are focused, understand better, and their performance get enhanced when properly discussed.[8] In our study, we found similar results. There was significant increase in marks after PBL and discussion. Comparing traditional teaching with PBL, we cannot say that PBL is superior to lecture-based learning because posttest we did not find significant difference in marks between the two [Table 4].

In traditional teaching method students silently listen to presenter and read projected PPT slides. We observed less interaction of audience with presenter and very few questions were asked to presenter or teacher; however, it is worth noting that their posttest performance was good and statistically significant. This could be due to motivating factors stated above. We conclude that traditional method of teaching is equally effective.

As the performance of students was significantly poor in anemia and zoonotic diseases compared to hypertension and diabetes, we suggest adequate coverage and teaching in these topics in classroom lectures, tutorials, and discussion at bedside in hospital and polyclinics.

Conclusion

Traditional teaching method using PPT is as effective as PBL. Small group or small size of class, students' engagement in teaching-learning activities enhances learning outcome. The thought of assessment makes an impact; it may create feeling of competitiveness and may improve learning. Hence, there should be periodic assessment or surprise test. Similarly, a topic in which performance of students is poor needs remedial teaching.

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Conflicts of interest

There are no conflicts of interest.

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