

## Problem-based Learning and Lecture-based Learning Comparison: A Literature Review

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Accepted 01 June 2016, Available online 11 June 2016, Vol.4 (May/June 2016 issue)

### Abstract

*Introduction: Medical education is important once that it will determine the quality of the future physicians. For this reason exists a lot of discussion regarding the best method to teach medicine to medical students. We conducted a literature review to didactically point out the pros and cons of problem-based learning and lecture-based learning.*

*Discussion: The two main methods of teaching medicine are problem-based learning and lecture-based learning. The first one consists of small groups of students that discuss cases with the orientation of a tutor. This method help students to work with real scenarios cases, improve work in group, stimulates idea generation and stimulates deep learning. The second consists of a professor teaching their students through lectures. This method has a great diversity of professors that are more accessible when compared to problem-based learning. Both methods have pros and cons and based in this study we think the union of both methods can improve medical education once that you stimulate skills development and also learning.*

**Keywords:** Problem-based learning, lecture-based learning, medical education

### Introduction

Medical education is an important topic once that medical students graduation will determine the quality of future physician and the quality of medical care. Medicine can be taught in different ways and the two most widespread are student centered method, also known as problem-based learning (PBL) and teacher centered method or lecture-based learning (LBL). The first is characterized by small group discussions with the guidance of a tutor. (A.I. AlHaqwi Al *et al*, 2015) The second is characterized by a professor passing their knowledge through a class. (S. M. Lucieer *et al*, 2015)

Due to the relevance of the theme educational institutions and faculty are always discussing the issue in an effort to always improve medical education. For this reason there are many publications on this topic. However no consensus is reached.

Therefore we conducted a literature review regarding these two teaching methods, defining both and pointing the main pros and cons of each one.

### Discussion

#### Problem-Based Learning

PBL is a method of small group collaborative learning that was first used in medical education at McMaster

University in the late 1960s. (B. Preeti *et al*, 2013) (Y. Oda *et al*, 2014) (H.S. Barrows *et al*, 1980)

This method is much more dependent on the learner, who needs to increase his knowledge principally in an autonomous way. According to Schmidt, the students need to work in a clinical scenario. And these clinical scenarios not only increase the intrinsic motivation of the student, but it also facilitates future knowledge retrieval. In PBL classes the tutor give less information than the Lecture Based method, however the quality of this information is much better, more solid and drives lifelong learning. (A. Naranjo *et al*, 2015) Students will need to increase the capacity to work in groups to learn about a subject in the context of a real problem. (E. Bate *et al*, 2014).

It is an active learn method so the student is the protagonist. (A. Naranjo *et al*, 2015) So the learner will not be only a passive recipient. It is their involvement in the process that will help them to learn from each other's experiences and consolidate what they know, and memorize the arguments that will serve them well in the clinical environment (D.C.Taylor *et al*, 2013).

Even with the student being the center of this learning method, the tutors also have his obligations, such as identify the difficulties that each student have and principally guide them to solve the problems and how to

think. Tutor stays on the class to make sure students find the way to learn and to answer questions that the student can't solve alone.

Students like more PBL due to knowledge retention, class attractiveness, motivation and practical usefulness of contents. (P. Khoshnevisasl et al, 2014) Medical school is a part of the life of the students where they find how the world works, how to work with other professionals and how to survive on the competitive field of medicine with no one to guide. Therefore it is very important that medical school develop physicians that are able to work and know how to solve problems. PBL method certainly guide the student to be a better professional in terms of how to handle with the problems because they are charged with more responsibility to learn on their own and how to use a simulation of real world to understand what need to be learnt. (B. Preeti et al, 2013)

Overall PBL is an interesting educational method that could complete some gaps not only in medical skill but principally in professional skills.

PBL pros and cons (Table1).

**Table 1** - PBL advantages and disadvantages

Pros	Cons
Student and professor are active	Students needs more responsibility and commitment
Feedback	Increase vulnerability to unfamiliar questions raised by students
Deep learning	Increased teacher work
Collaborative learning	Reduced control over content covered
Work with real scenarios	Reduced control over quality of material studied
Work in group	Difficult to ask the right questions on the subject
Stimulates idea generation	Human resources

*Problem-based learning pros*

- 1) Student and professor are active (A. Naranjo et al, 2015): Student must be active in seeking their own knowledge. They will not have a professor every day saying what they need to study and therefore they must be proactive. Tutor must know how to conduct the discussion and how identify students qualities and weakness.
- 2) Feedback: Students receive feedback periodically helping them to identify their weaknesses and can thus improve them. Also they identify their strengths and can maintain what they are doing well.
- 3) Deep learning (S.A. Azer et al, 2013) (Figure 1): The student must seek discuss and reflect on the issue. This active approach in pursuit of knowledge favors deep learning.
- 4) Collaborative learning (W.J. Pluta et al, 2013) Students come together and collaborate towards a common goal which is to acquire knowledge.

- 5) Work with real scenarios: Cases are used to simulate the reality thereby increasing the student's ability to ratiocinate and act in accordance to a real situation.
- 6) Work in group: Students learn to deal with the qualities and defects of colleagues thus improving interaction and strengthening the group resulting in a higher learning.
- 7) Stimulates idea generation: Students study cases that do not come with solutions and therefore should be able to discuss with the group and propose ideas on how to reach a solution of the problem. It creates an environment propitious to idea generation.



**Figure 1** Deep learning scheme

*PBL cons*

- 1) Student needs more responsibility and commitment: Students need to be responsible to dedicate themselves and study, once that they will not receive key points from the tutor. They also must be committed and create the habit to study by themselves, once they will not be in class during the whole day and every day.
- 2) Increase vulnerability to unfamiliar questions raised by students (L.R.C. Ribeiro et al, 2011): Students search in different sources of knowledge. So they can have ideas or questions that the tutor are unable to answer. It also increase the work of the tutor in a good way because they will need to study more to became able to answer the questions.
- 3) Increased teacher work: Professors will stay a small period with their students, so they need to interact with all in order to check out if they are learning and to identify their personal skills and their difficulties.
- 4) Reduced control over content covered: Tutor will have more difficulty to know if the students learn all the necessary basic concepts. Once they can study using different materials. Therefore, is more difficult for the professor know if all students are in a similar level
- 5) Reduced control over quality of material studied: Students can search in poor quality sources if they are not minimally conducted to good sources.
- 6) Difficult to ask right questions on the subject: In the beginning of the course students may face difficulty in how to ask good questions. Because they don't know what is more relevant.
- 7) Human resources: In PBL more staff is required to follow the student and help them.

*Lecture-based learning*

Teacher centered model consists of student's passive learning. During lecture students are exposed to a lot of new information and they should retain great amount of the knowledge presented. (P. Khoshnevisasl et al, 2014). This methodology largely depends on the speaker

knowledge, didacticism and capacity to keep students motivated during the lecture. This teaching method present pros and cons (table 2).

**Table 2** - LBL advantages and disadvantages

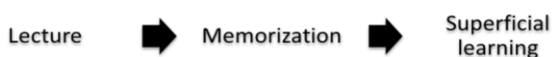
Pros	Cons
Highlight key points of each topic	Student is passive
Transfer great amount of information	Superficial learning
Lecture of experts in some field	Priorize memorization
More accessible teachers	Spend a lot of time in class

*LBL pros*

- 1) Highlight key point of each topic: During lecture professor highlight the main topics that students need to learn. Serving as a guide to what students should focus on their studies. Facilitating the study for exams.
- 2) Transfer a great amount of information: During a lecture the professor can transmit large amount of knowledge.
- 3) Learn with experts: LBL allows diversity of professors. Each lecture can be given by an expert of the subject. Benefiting students which may have a broader view because of the diversity of teachers and also a narrower view since each teacher deepens in your area of knowledge.
- 4) More accessible teachers: Professors are present every day during class, facilitating the interaction with students.

*LBL cons*

- 1) Student is passive (A. Naranjo et al, 2015): In LBL students are passive in the learning process. They keep listening to the teacher and taking notes.
- 2) Spend a lot of time in class: Students stays a lot inside class left almost no time to extracurricular activities such as research projects, study, sport practice, social life.
- 3) Emphasizes memorization: By staying a long time in the classroom, there is little time for study. With little time, students tend to focus on decorating the key concepts of each subject, rather than reflect on it.
- 4) Superficial learning (S.A. Azer et al, 2013) (Figure 2): By decorating key concepts students do not have the opportunity to reflect, hypothesize on the issues. Without this interaction with the knowledge that has been presented, it is stored in a superficial way.



**Figure 2** Superficial learning scheme

In this literature review we observe that both methods Problem-based learning and Lecture-Based Learning have advantages and disadvantages.

Medical school is an important period to students for the construction of the personality and to increase their skills. Therefore medical school needs to be able to offer the best tolls for the students became a better physician in the future.

There isn't a better way of learning. However, we believe that the union of the pros of both methodologies can improve medical learning once that you mix the theory of LBL with the practice of PBL.

Other study showed that after a six months crossover trial with 40 students that compares the grades of the student in the same theme but learned in different methods shows that in both methods students were capable to receive the highest score. PBL students stayed with a more constant mean, while the LBL group mean fluctuates more. Despite that the mean of the both groups are not statistically different. (P. Khoshnevisasl et al, 2014).

This support the idea that both methods are equal capable to form good physicians and with the advantages of both, medical school could increase the skills and knowledge of the students.

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