# Evaluation of the Effectiveness of the Problem-Based Learning Method and the Role of the Tutor in this Process: Practical Recommendations

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**ABSTRACT**

This article contains an analysis of the efficiency and effectiveness of introducing Problem-Based Learning into the educational process of the Medical University of Astana (Nur-Sultan, Kazakhstan); the role of the teacher (tutor) in this process is described and some recommendations are given that will help him further improve his skills in interaction with the study group, increase his psychological and pedagogical competencies. We are confident that the recommendations prepared by the authors of the article will provide significant assistance to all participants in the educational process using the Problem-Based Learning methodology.

**Keywords:** Problem-Based Learning, PBL, Tutor, Coordinator, Medical education, Student-centered learning, Small groups

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## INTRODUCTION

Modern conditions associated with the globalization of society have significantly changed the technology of the educational process. In the current conditions, methodological approaches in medical education have significantly changed. It differs from that of the last century. First of all, it should be noted the global introduction of Internet technologies and other forms of digital education in the learning process in all branches of knowledge. The current generation of students is known as the socially digital generation (Hodges C, *et al.*, 2020; Liu Q, *et al.*, 2016; Stegmann K and Fischer F, 2016; Vaona A, *et al.*, 2018). All this naturally requires the development and implementation of new educational technologies and new approaches to the learning process, the adaptation of well-known innovative methods to modern conditions. To date, these processes are carried out in the following areas: modification and implementation of well-known training methods, such as Problem-Based Learning, team- based learning, virtual and standardized patient training, and training based on medical errors (Kyaw BM, *et al.*, 2019; Fontaine G, *et al.*, 2019) formation of new educational content, development and implementation of new pedagogical technologies, creation of new types of educational institutions

The coronavirus pandemic has also made some adjustments to the learning process. COVID-19 forced the participants of the educational process to start working on the creation of emergency forms of online communication. This led to the fact that the teaching staff of those disciplines in which training did not involve a remote format was forced to urgently analyze, search for and implement optimal interactive methods for exchanging information and knowledge that would make up for the shortcomings of Internet communications.

It becomes obvious that in this situation, various methods of mixed learning have come to the fore, which is one of the trends of the modern educational process and, according to many scientists, is likely to remain so in the near future. Mixed learning, or blended learning, involves the interpenetration of full-time and electronic forms of learning with the ability to independently choose the time, place, pace and trajectory of their learning (Salmon G, 2013; Chi MT and Wylie R, 2014; Silova I, 2016).

Blended learning, like any other innovative technology, requires time and additional efforts on the part of the teacher to form the student's learning culture. In contrast to classroom work, where the main time is spent on the formation of educational skills and the establishment of discipline, when using mixed learning, the main emphasis is on the formation of skills of independent work, group work, mutual assistance and communication competencies (Edström DW, *et al.*, 2020; Bergman J and Sams A, 2015).

One of the models of mixed learning, which has been successfully used by some educational organizations over the past years, is the method of training sessions based on solving a problem related to the patient's health, presented on paper, in electronic form (virtual patient) or in the form of live communication with a standardized patient (Isaza-Restrepo A, *et al.*, 2018; Kiesewetter J, *et al.*, 2020).

Problem-Based Learning (PBL) is a rather interesting, innovative learning technology that is based on real or fictional life situations (Dochy F, *et al.*, 2003; Duch BJ, *et al.*, 2001; Khamchiyev KM, 2016). It is aimed, first of all, at the formation of new qualities and skills in students - new competencies, and only then-at the development of knowledge (Khamchiyev KM, Derbissalina GA, 2015; Khamchiyev KM, *et al.*, 2014).

The main purpose of the method is the desire to instill in students the abilities aimed at identifying the main problem and finding ways and ways to solve it, as well as the skills of independent work with new information. The emphasis is on the generation of knowledge in the process of co-creation of the tutor and the student, the student and the student, and not on obtaining ready-made knowledge from an expert teacher. Complex real-world problems in teaching using this method are used as a means of facilitating students ' memorization, understanding, and consolidation of concepts and principles, as opposed to directly presenting facts and concepts. In addition to acquiring theoretical knowledge of the content of integrated disciplines, PBL promotes the

development of critical thinking skills, the ability to independently solve complex problems, as well as communication skills. Of course, the main role in all these processes is played by the tutor-coordinator, facilitator, assistant and guide of all the hypotheses of students, put forward by them and ways to solve the problems set before them (Khamchiyev KM, *et al.*, 2016; Khamchiyev KM, *et al.*, 2020).

## MATERIALS AND METHODS

To analyze the work and evaluate the role of the tutor, the problem-oriented training methodology proposed by Barrows HS, *et al.* (Burroughs HS, 1993; Barrows HS, Tamblyn RM, 1980).

The work used cases of the University of St. George (SGUL). St George's University of London has a Problem Learning Curriculum (PBL) for an undergraduate course using traditional paper cases for patients. These cases were prepared by Dr. Ella Sincerely and Professor Terry Polton (Poulton T, *et al.*, 2014) and adapted by a team of tutors under the guidance of PBL-coach K Khamchiyev (Khamchiyev KM, *et al.*, 2020). Cases have been changed and supplemented, taking into account the normative and legal acts of the Republic of Kazakhstan, the peculiarities of the diagnosis of diseases and the provision of medical care, the nomenclature of medicines, ethnic and other traditions of the country. Classes with students were held on the basis of two Universities in specialized rooms equipped with all the necessary technical means.

13 clinical cases were studied. As tutors, 6 university teachers worked, under the guidance of a PBL coach. The PBL methodology was tested in 12 small groups (87 students) of 1-3 courses of the General Medicine faculty. After classes conducted according to the PBL methodology, students completed anonymous questionnaires with answers to questions in which they reflected their attitude to the PBL methodology and the work of the tutor. The results were calculated according to the point system, where 5-completely agree, 4-agree, 3-I find it difficult to answer, 2-disagree, 1-completely disagree.

## RESULTS AND DISCUSSION

Analysis of questionnaires showed that according to the majority of students (93.5%), PBL is a useful technique for more effective assimilation of the subject, 3.4% of students answered "fully agree" and only 3.1 found it difficult to make a decision on this issue *(Figure 1)*.
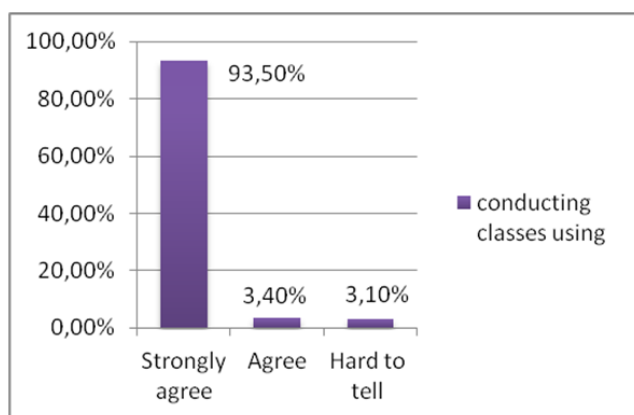


**Figure 1: I like performing classes using PBL**

The bulk of students (94.2%) fully agreed that the problem-oriented learning methodology is an effective technology that allows you to more deeply master the discipline studied, while 5.8% of students filled the "agree" column *(Figure 2)*.
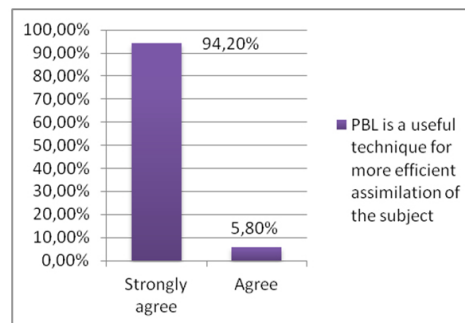


**Figure 2: PBL is a useful technique for more efficient assimilation of the subject**

100% of students spoke positively about the method and style of work of the tutor: 59.6% fully agreed with this statement, 8.3% supported them; the remaining 32.1% could not unequivocally answer this question *(Figure 3)*.
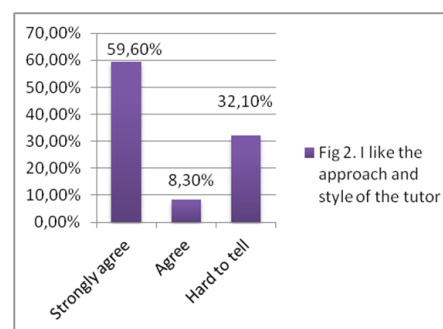


**Figure 3: I preferred the approach and style of tutors' work**

All students noted that a distinctive feature of the presented methodology is the ability to independently formulate questions for study. This allows students to develop their own trajectory of study, making up questions for study. To the approval of the questionnaire "Do I like to self-formulate questions for study?" 94.7% of respondents answered "completely agree" and only 5.3% wrote "agree"*(Figure 4)*.
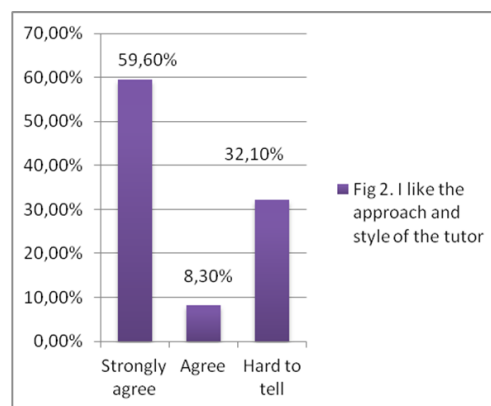


**Figure 4: I preferred the approach and style of tutors' work**

93.8% of students agreed that tutors encouraged discussion of questions by all members of the group and guided students along the correct discussion path, 6.25 respondents had difficulty answering this question *(Figure 5)*.
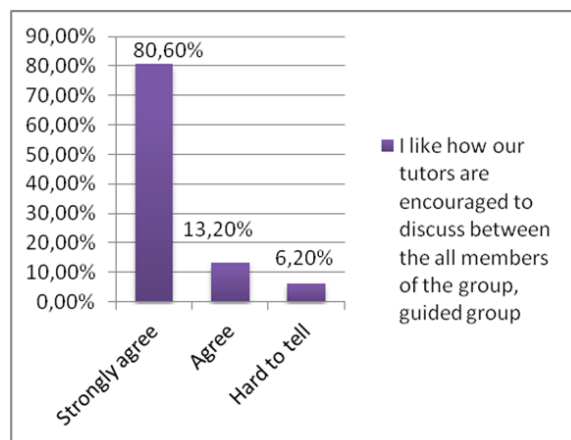
**Figure 5: I agree with the way our tutors encouraged discussion between the all members of the group, guided group**

Both students and faculty were pleasantly surprised by the extensive information about the structure and functioning of the body, methods of diagnosis and treatment, patient rights that can be obtained when studying a simple clinical case. And this is especially important, to make training activities more exciting. "It's very interesting for us. Very motivating to individual study of the material. We feel like doctors and we carefully understand that the life and health of the patient depends on the level of our knowledge and decisions, "-the opinion of students during the reflection, which are carried out by tutors after each class. And this is evidence of the effectiveness of the PBL method, stimulates the functioning of the Center for Medical Education, the Center for the Transfer of New Educational Technologies, the TEMPUS working group and tutors to improve it.

PBL methodology can be used in the study of any discipline. The main thing is the preparation of a case, a clinical case, with the setting of a particular problem, which will be solved by students collectively. This problem should motivate students to seek a deeper understanding of concepts, based on basic knowledge. The problem should require students to make informed decisions and defend them.

The problem should include finding new knowledge in a way that links it to previous courses/knowledge. When used for a group project, the problem requires a certain level of complexity to ensure that students must work together to solve it. When used for a multi-stage project, the initial steps of the task must be open and attractive in order to attract students to the problem.

Problems can come from a variety of sources: newspapers, magazines, magazines, books, textbooks and television/films. Some of them are in such a form that they can be used with little editing; however, others must be completely rewritten and adapted to the conditions of a particular country, taking into account normative legal acts, the peculiarities of national traditions, moral, ethical and spiritual and moral aspects.

It is necessary to choose the central idea, concept or principle that is always taught in this course, and then think about the typical task, task or homework that students are usually given to help them learn this concept, to list the learning goals that students must fulfill when they work on the problem.

At the first stage, the tutor and students need to resolve the group relationship, determine the rules of behavior and stages of the lesson. The following are some questions that can help guide this process:

• What will the first page (or stage) look like?

• What open questions can I ask? What training issues will be identified?

• How will this issue be structured?

• How long will this problem continue? How long will it take to conduct classes?

• Will students receive information on subsequent pages (or stages) when they are working on a problem?

• What resources will students need?

• What is the ultimate goal of the student class?

The final stage is the identification of key resources for students. Students need to learn how to identify and use learning resources themselves, but this can be helpful if the instructor points out some good sources for them to start working. Many students prefer to limit themselves to the Internet to search for information, so the task of the tutor is to motivate students to work with library material.

The main role of the tutor in the PBL class process is to carefully listen and identify the abilities of students and their psychological features: "omniscience," "silence," "leader," "quiet," etc., and not just transfer knowledge. Adapting to such a regime is difficult for both the tutor and the student. However, it should not be assumed that this approach implies, in a way, non-interference. This is rather a division of responsibility for training. Tutor should be student-oriented, that is, help them to manifest themselves, accept them as they are, and not what they "should" become.

One of the most important tasks of the tutor is to establish "basic rules" in the group. Creating clear rules will allow students to concentrate on learning. However, the more basic rules are introduced, the higher the likelihood that the educational process will flow into the game. This should also be monitored.

Often, during the discussion, students behave with restraint and, at best, make only a formal contribution to the dialogue. Rather talkative students outside the audience, in the presence of a tutor, refuse to take an active part in the discussion. If the tutor acts as a coordinator, this may cause discontent, and the tutor cannot, in response to this discontent, accept the traditional role of leader. To motivate students, the tutor can resort to simple methods listed below:

**Eye contact with the group:** Tutor should keep the whole group under review, even when he listens or speaks to only one student. If during communication with one student, the tutor will look not only at him, but also periodically at the entire group, this will motivate the rest to follow the process, and thereby attract attention to the speaker. This will avoid turning the discussion into a series of one-on-one dialogues.

**Signals:** While one student speaks, the tutor will receive signals from the rest of the audience. Periodically examining everyone else, he will notice if anyone is puzzled whether questions arise. Thus, when the speaker is finished, it will be easier for the tutor to get the least talkative students into the discussion. Most often, the signals are nothing more than suppressed sighs, annoying hibernation; scabbard not a chair or just a stunned look. To notice all this, and also to make it clear that you have noticed it, means to better assess the "climate" in the group and, therefore, positively affect it.

**Nonverbal communication:** Sometimes it is rather difficult to interrupt the discussion and at the same time not seem critical or rude. In such cases, the best assistant to the tutor will be nonverbal communication. To intercept the student's gaze and smile encouragingly or to invite him to speak by raising his eyebrows - all these gestures are frequent companions of verbal communication, but their use is as unobtrusive as it is effective.

**Verbal communication:** Sometimes you can't do without verbal stimulus. For example, when a student smiles quietly, looks puzzled or rolls his eyes, the tutor can say: "What are you thinking, Elena?," Or "Did you smile, Andrei?" It may sometimes be necessary to interrupt a student who constantly speaks and interrupts others. It is necessary to do this in an open and friendly manner: "Wait, Dmitry, let's listen to what others will say" or "For a second, Leo, listen to the rest" - the student will not feel "thrown out" of the discussion.

**Questions:** The tutor should keep the number of questions he asks to a minimum, except when the group is not functioning correctly (for example, when the student does not stop talking, and the only way to stop him is to ask another student a question), or gets off the approved discussion plan. Be careful to assess the answers: sometimes praise is needed to involve inactive students, but disapproval will have the opposite effect. Encourage hard work.

When asking questions, you should remember a few simple rules:

• Avoid complex, deeply scientific, or suggestive questions (questions that are often found in written exams)-they can mislead students, cause silence, or translate a topic into an unwanted one.

• If you still puzzled the students, do not aggravate the situation by repeating the same question-first wait for the answer, even if it takes longer than usual (a pause of 20 seconds will make students realize that they should speak out).

• Clarify whether your question is understandable to students if there is a need for it: "Do you want me to repeat the question?" or "Is the question too complex/incomprehensible?"

• Do not come up with "good" questions in advance. Follow students, and ask questions based on how well they understand the material.

• Ask questions that require a detailed answer, not a simple yes/no.

• Be careful to assess the answers: sometimes praise is needed to involve inactive students, but disapproval will have the opposite effect. Encourage hard work.

If the tutor asked a difficult question, he/she is no longer the coordinator. To remain in the same role, the tutor should ask the following questions:

Explanatory questions-

• "Can you paraphrase?"

• "What did you mean by saying...?"

• "Can you give an example?"

• Specific issues:

• "Tell us more."

• "Tell us more about it"

• "Yeah, what else?"

• "What do you think about this?"

• "Repeat" question:

(Repeat the phrase of the student with neutral intonation, thereby starting the discussion).

None of these questions poses a tutor as a superior. They are aimed at energizing students to speak out for the whole group, and not just for the tutor.

Following these rules, the tutor will be able to intensify the work of students, invest in the schedule of classes, as well as clearly follow the discussion plan. They should be applied in such a way as to share responsibility for the educational process between the computer and students. In other words, their task is to make it clear that the tutor is the coordinator of the discussion, and not the leader and visionary, who gives answers to all questions. Of course, these roles can be transferred to students, which will be a good practice for them.

## CONCLUSION

Thus, PBL develops student skills such as teamwork, leadership enhancement, listening and active participation in discussion, collaboration and creation, respect for colleagues' views, ability to analyze and critically evaluate literature, purposefully study and use resources. It is difficult to overestimate the role of the tutor as a coordinator and facilitator in the process of problem-oriented training. However, in order to become a really good and productive tutor, the teacher needs to completely change the style of his work, understand and adopt the principles of the PBL rule.

Following these rules, the tutor will be able to motivate students, intensify their work, fully follow the plan and content of classes, the course of discussion, while encouraging students to work independently, compile questions for study and formulate their own learning trajectory. These rules should be applied in such a way as to share responsibility for the educational process between the computer and students. In other words, their task is to make it clear that the tutor is the coordinator of the discussion, and not the leader and expert who gives answers to all questions.

## CONTRIBUTION DETAILS

Khamchiyev KM-concept, design, definition of intellectual content, manuscript preparation, manuscript editing and manuscript review.; Suleimenova FM, Askarova NB-literature search, preparation of questionnaire questions; Gabdullina GS-experimental studies, data acquisition; Muhtar NE, Sabit AE-data analysis, statistical analysis. All the authors made a significant contribution to the research and preparation of the article, read and approved the final version before publication.

Khamchiyev KM is responsible for the integrity of the work as a whole from inception to published article and should be designated as 'guarantor'.

## DECLARATION

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## CONFLICT OF INTEREST

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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