

**PROBLEM-BASED LEARNING AS A LEARNER-CENTERED APPROACH:
GENERAL REVIEW**

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The article is devoted to the problem-based learning that creates a link between theoretical knowledge and practice in educational process. PBL main goals as: developing group learning environments; helping students to learn and understand curriculum contents; helping students to acquire problem solving skills, to be used in the future on the professional practice; improving communication and professional interaction are observed in the article.

Key words: *problem-based learning, principles of PBL, components of PBL, a tutor, self-study.*

Статья посвящена проблемно-ориентированному обучению (ПОО), которое служит для связи теоретических знаний и практики в обучающем процессе. В статье рассматриваются основные цели проблемно-ориентированного обучения, а именно: создание среды обучения группы, помощь студентам в обучении и понимании содержания учебной программы, помощь в приобретении навыков решения проблем, которые будут использоваться в будущем в профессиональной практике, улучшение коммуникации и профессионального взаимодействия.

Ключевые слова: *проблемно-ориентированное обучение, принципы ПОО, компоненты ПОО, тьютер, самообучение.*

Problem-based learning (PBL) helps to improve and innovate learning environments and provides students with necessary knowledge and skills for future work and society interactions. Today many curricula still divide knowledge in pieces but this scheme is not as effective as PBL. It seems that we could learn more from peer discussion about real problems compared to passive listening to lectures. Today we have a lot of information resources like the internet, libraries, etc. from which students can obtain relevant and contextual knowledge instead of bringing them all in our learning environments. PBL promotes autonomous searching of relevant information and adequate group discussion conditions. Additional PBL goals are to provide better skills for future jobs context.

PBL is a learning approach that seeks to create a link between theoretical knowledge and practice (Cockrell and Caplow, 2000). PBL is based on the concepts of Lev Vygotsky about Social Development Theory, which considers learning as a social construction of knowledge. Due to this origin, PBL recognizes nothing can be learned in totality and learning needs to be shared among transdisciplinary groups (Missimer and Connell, 2012). It is essential to have collaborative groups in learning contexts, to explore, analyze and solve the problems presented (Cockrell and Caplow, 2000). Its main objectives are:

1. Construct an extensive and flexible knowledge base.
2. Develop effective problem-solving skills.
3. Become effective collaborators.
4. Become intrinsically motivated to learn (Beringer, 2007, 446).

PBL focuses on empirical learning organized around searching and problem solving; where students are encouraged to solve real life badly structured problems. The curriculum is organized around those integral problems, helping students to learn in connected and relevant ways. PBL provides a learning environment where teachers train students thinking and guide them with help of their questions.

Five components can be considered as the minimum standards of PBL least characteristics that should be present in PBL:

1. Ill-structured problems are presented as unresolved so that students will generate not just multiple thoughts about the cause of the problem, but multiple thoughts on how to solve it (Barrows, 2002).

2. A student centered approach in which students determine what they need to learn. (To derive the key issues of the problems they face, define their knowledge gaps, and pursue and acquire the missing knowledge (Barrows, 2002; Hmelo-Silver & Barrows, 2006).

3. Teachers act as facilitators or tutors in the learning process.

4. Problem selection from professional or 'real world' practice (Barrows, 2002). The problems are inherently cross-disciplinary and require students to investigate multiple subjects (Barrows, 1996) in order to generate a workable solution.

5. PBL is typically undertaken in a small group setting (Barrows, 2002; Hmelo-Silver & Barrows, 2006). While groups of five to nine students were used in the original McMaster model for PBL (Barrows, 1996), these later definitions allow for the possibility of PBL without small group work.

Interest in learning has led to several new theories and related research about the underlying principles in the few past decades (Ormrod, 2006). It has been also shown that four main principles

are collaborative, contextual, constructive and self-directed learning (Dolmans, De Grave, Wolfhagen, & Van der Vleuten, 2005).

Constructive learning

Constructive Learning refers to learning which occurs by constructing an understanding and knowledge by experiencing things and giving meaning to it (Ertmer & Newby, 2008). The design of instruction should be able to successfully trigger 'internal cognitive processing' in the mind of the learner, especially in the complex learning environment of health sciences and medicine (Stewart, 2009). It is important to include strategies and teaching formats that enable knowledge construction, storage and retrieval ways in which new knowledge can be linked to prior knowledge and transferred from short term memory to long term memory (Ormrod, 2009). This includes strategies to direct attention, give meaning to learning, construct, organize, elaborate and clarify information. Information retrieval is enhanced by allowing retrieval time, variety of questions, increasing flexibility in teaching and creating challenge.

Contextual learning

Contextual learning is characterized by the use of cases/problems or examples that closely match or are real world situations for which the learners are being trained. Learning in the context of a problem or situation helps learners to understand its content application more easily. It is also more motivating and interesting. Coupled with practice, and exposure to multiple related environments, it allows for 'deeper learning' and better learning transfer (Regehr & Norman, 1996). Instructional design should therefore include real problems with multiple perspectives, to challenge and motivate students as well as enhance transfer. The cognitivist and constructivist theories of learning emphasize the need of contextual embedding of the new information to more effective learning (Ertmer & Newby, 2008).

Contextual theorists show that the storing process of new knowledge is more effective when connections are made to the prior knowledge. The contextual approach helps the students to make these connections and to give the new information sense in their own prior existing frames of thinking (Ormrod, 2006).

Collaborative learning

Collaborative learning is a concept in which the members of a group work together to achieve a common goal (Van Boxtel, Van der Linden, & Kanselaar, 2000). They have to interact, share and learn from other students. During the process of discussion, the students need to present and defend their own ideas. This has a positive cognitive as well as social influence on the learning process (Rudland, 2009). Then it could be recognized that their communication and social interaction skills will improve day after day (Johnson, Johnson, & Smith, 2006). The collaborative learning environment has been shown to be very effective on problem solving (Qin, Johnson, & Johnson,

1995). Educational processes must therefore provide opportunities for collaboration. Considering those benefits makes us believe that collaborative learning is one of the most important learning principles and should be applied in any programme.

Self-directed learning

Self-directed learning means that the learners 'direct' their own learning process. This requires awareness of metacognitive skills to decide on the goal, on the methods to approach the task and to ensure the goals will be met. It also means that the learner anticipates the difficulties and the enabling factors for learning. The learner not only plans and accomplishes the goals, but also evaluates the process through reflection. Self-regulation requires prior knowledge and motivation, and leads to more effective learning and higher achievement levels (Dolmans & Schmidt, 2006). Relying on this research we think it is very important to pay attention to designing a unit which promotes self-directed learning.

All the above strategies create an active and meaningful learning environment. Together they foster the cognitive, motivational and social goals related to learning. Looking at this theoretical background, we see that PBL is a student-centred learning strategy that optimises the mentioned principles of collaborative, contextual, constructive and self-directed learning. (Dolmans et al., 2005). Literature reveals that students in PBL curricula are more interested and motivated about their learning (Dolmans & Schmidt, 2006), have better interpersonal skills, better competencies in problem solving, self-directed learning (Schmidt, Vermeulen, & Van der Molen, 2006) and are more satisfied with the learning situation (Albanese & Mitchell, 1993).

The PBL approach is characterized by working in small groups on a presented scenario (e.g. problem or case), a teacher which facilitates the process by guiding the students and time for self-directed learning (Hmelo-Silver, 2004). In theory this approach enables the students to become more effective collaborators, develop self-directed learning and problem solving skills, construct an extensive flexible knowledge which goes beyond the learning of facts and raises the intrinsic motivation.

The theories and literature cited above make us believe that the PBL-approach creates a meaningful learning environment in which the students are educated most effectively and lastingly.

When applying PBL the educational process involves five steps:

1. Observation or information gathering: The problem scenario is presented and it is expected that the learners will identify the facts around the given problem.

2. Questions, ideas and hypothesis formulation: When having a better understanding of the problem, the learners use their previous knowledge and can identify the assumptions and the questions they might have. They formulate their questions, ideas and hypotheses related to the solution of the problem.

3. Learning issues/inquiry strategy: The learners identify their knowledge deficiencies and define their learning issues to be explored by them in a self-directed learning process. At this point, they can collaborate with others, within and outside the learning situation to fill in the understanding gaps.

4. Action Plan: They integrate the new knowledge on the results of the second phase and then proceed to the development of a solution.

5. Reflection: The learners should reflect on the abstract knowledge gained. This phase also appears during other phases of the process. In the end, it is important for them to reflect also in the skills gained and in the collaborative aspect of the process (Cockrell and Caplow, 2000; Beringer, 2007; Hmelo-Silver, 2004).

Each student participates actively in PBL and has a particular role in the team. The roles change every week. The roles are:

1. Team leader directs the team work.
2. Secretary, he/she takes notes of the discussion.
3. Process manager. He/she listens, delegates, facilitates and focuses on the main question.
4. Investigator, he/she should have research skills, use various types of sources, and has the ability to determine relevant information.
5. Timer, he/she manages the time.
6. Presenter, he/she presents team's work.
7. Final decision maker, he/she identifies the best choices.
8. Creative consultant, who is responsible for presenting team work through art and technology.
9. Legal consultant, who checks for sources' accuracy.

PBL does not follow the academic logic of subjects, but the logic of problem solving within shared and individual learning processes. It does not make sense to apply PBL within single subjects. Starting PBL within separate subjects rapidly leads to a situation in which problems are not challenging enough because they are designed simply within the framework of one subject. The problem-based curriculum is organized on the basis of problems and problem themes creating core competence (for example, academic or general professional competence). Lectures, seminars and other types of teaching are carried out as before, but their timing and content is designed according to the needs of problem solving. PBL usually leads to diminishing time of face-to-face teaching because students themselves acquire a remarkable deal of information that was earlier delivered in the form of lectures. However, students need more guidance with independent studying, especially at the beginning of their studies. One of the most important tasks of the tutorial is to direct what

students need to do together and independently in order to achieve learning results. Learning is initiated by presenting a problem rather than teaching the content.

Problem-based curriculum demands a high standard regarding the problems used as starting points for learning. The purpose of problems is not only to integrate disciplines or subjects, but also to achieve the pedagogical core process of producing learning and competence. The critical point to a successful approachment is the selection of well-structured problems (often interdisciplinary) and a tutor who guides the learning process and conducts at the conclusion a thorough debriefing of the learning experience.

The tutor effectiveness is related with five facilitation skills: (1) helping the group be aware of how group processing works, (2) encouraging feedback within the group, (3) guiding the group to set appropriate learning issues, (4) assisting the group to integrate learning issues, and (5) supporting students' professional development. The unit construction is finalized by planning and scheduling the other educational activities (e.g. an overview lecture, a skills training session) and writing the unit book and the tutor version ('tutor guide') of the unit book. The tutor guide describes the type of problem, the learning objectives, summaries of the issues that should be discussed, students' prior knowledge and expected misconceptions, expected difficulties in problem discussion, and suggestions for tutor reactions and summaries of the relevant literature. A detailed tutor guide is important both for theoretical reasons (Papinczak T, Tunny T & Young L., 2009) and for practical reasons.

PBL becomes more effective if:

1. The scenario of the problem is consistent with the faculty learning objectives.
2. Problems are appropriate to the stage of curriculum and the level of students' understanding.
3. Problems are relevant to students' future practice.
4. Problems are sufficiently open to allow discussion to continue and not to stop too early.
5. Basic sciences are presented as an educational scenario to be encouraging.

PBL is an effective learning method through which the students are called to undertake responsibilities and initiatives. PBL has the potential to prepare the students more effectively for future learning, based on four insights into learning. It's a constructive, self-directed, collaborative and contextual process. It also promotes students' confidence in their problem solving skills and strives to make them self-directed learners. Firstly, we assume that this process is constructive, since meanwhile PBL the students have to participate actively (planning, monitoring, evaluating the learning process), give their personal interpretations based on their previous experience and knowledge and after their self-study and mutual interaction within the group, they are able to construct and reconstruct their knowledge networks (schemas). The tutor has to share guidance in

which students and tutors together guide the learning process and also learn ways to evaluate the functioning of their group. On the other hand, teachers who provide a good learning community in the classroom, with positive teacher-student and student-student relationships, give students a sense of ownership over their learning, develop relevant and meaningful problems and learning methods, and empower students with valuable skills that will enhance students' motivation to learn and ability to achieve.

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