



## PASCAL SPECIAL INTEREST GROUP

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## Problem-Based Learning (PBL)

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### Introduction

Problem-Based Learning (PBL) is an instructional and curricular learner-centered approach. It empowers learners to acquire and apply knowledge and skills required to solve a problem on hands. PBL is a constructivist teaching methodology, which values an active learning process. The development of educational and Higher Education Institution (HEI) strategies has given growing importance to PBL. For example, the Obama Administration began to improve active learning strategies to engage students in thinking, questioning, and problem-solving, all of which lead to deep knowledge retention (Handelsman & Brown, 2016). OECD has promoted PBL as a means for higher education to strengthen the teaching of skills for innovation (Hoidn & Kärkkäinen, 2014). The European Commission and the Modernisation Agenda of Higher Education stated that higher education had not changed much and is fundamentally still a process of imparting knowledge using lectures to those who want to acquire it. Higher Education thus needs to adapt to the challenges and development of the 21st Century. According to the Modernisation Agenda of Higher Education there is a real need in a changing world the kind of education that enables students to engage as active and thinking global citizens and members of the societies. In order to achieve that the students need to be faced with important problems and they need to engage with new questions which have relevance to their lives (McAleese et al. 2013). According to the Agenda higher education should deliver coherent learning which among other things develops learning behaviours such as problem solving, interaction, critical reflection and self-correction, competence improvement, meaning making and experiential learning (ibid., 35).

### Brief history of PBL

PBL has several precursors – like the work of John Dewey, who established an experimental school at the University of Chicago. His assumption was that learner is more engaged when s/he is actively involved in own learning. PBL as a method was created by Howard Barrows and his colleagues at the McMaster University, Hamilton, Ontario, Canada. It was pioneered in 1969 in medical school for twenty students, who were engaged in a learning process that was called problem-based learning. Students received a limited number of lectures but were asked to learn through self-directed study.

They were given specific problems designed by their teachers. Students were also guided to collaborate, and self-regulate (Schmidt, 2012). Today, for example, the majority of the medical schools in the USA and Australia are using PBL in medical education around clinical problems. Quite recently in healthcare education, virtual patients have been taken the use of PBL. A virtual patient is an interactive computer simulation of real-life clinical scenarios for medical education (Ellaway, 2013). The adoption of PBL has expanded to various disciplines and schools. For example, Samford University in Alabama uses PBL in different programs in Business education, and schools of Education, Nursing, Pharmacy, Arts and Science (Savery, 2006). In other universities also schools of architecture, law, engineering, forestry and social work have picked up PBL (Hoidn & Kärkkäinen, 2014).

### **PBL as a learning process**

PBL advocates learning, which is problem-based, student-centered and learning were a collaborative process with and from the others. Learning is a reflective process in which the teachers are facilitators. And keeping up with new information asks forth also the skills of life-long learning. PBL is typically characterised as an approach encompassing interdisciplinary learning. Critical to the success of PBL is the selection of problems and a supervisor, facilitator to guide the learning process (Mair & Halkier, 2013; Savery, 2006).

PBL values among other things following objectives:

- students take responsibility for the learning process
- students need to identify the root problems and actions needed for a solution
- knowledge is integrated
- acquisition and use content knowledge and intellectual skills to become continual learners
- ability to think critically
- students collaborate and utilize team-based problem-solving methods and acquire collaborative and team-learning skills
- to use effective communication skills
- problem-solving is aiming to develop real-life problem-solving skills
- students acquire skills necessary to organize the work process
- students need to learn to self-reflect
- learning must be applied back to the (root) problem with reanalysis and resolution
- students assess themselves and their peers (Mair & Halkier, 2013; Savery, 2006).

McMaster's PBL model had three phases. Phase One: revealing the problem scenarios; Phase Two: finding information; and Phase Three: discussion and new knowledge application to the problems (Zabit, & Zachariah, & Karagiannidou, 2016).

The problems used in PBL are typically designed to challenge students to acquire theoretical concepts needed while they exercise skills related to aforementioned

objectives. For example, FHWien, one of the leading universities of applied sciences in Austria, has organized PBL on Seven Steps-program. Those steps are:

1. Clarify text and terms (group work)
2. Define the problem(s) (Group work – Metaplan)
3. Problem analysis (Group work – Brainstorming)
4. Inventory of problems (Group work – Discussion)
5. Formulate self-study objectives (Group work)
6. Self-study (Individual)
7. Conclusion, Synthesis (In group) (Mair & Halkier, 2013).

Aalborg University in Denmark uses PBL in all its university programmes. The students work in groups applying problem oriented methods in preparing projects of a high academic standard. The PBL principles at the Aalborg University are: the problem is a point of departure, projects are organized in groups, the projects are supported by courses, collaboration, exemplarity and student responsibility for learning (Aalborg University).

The problem is the starting point of the PBL learning process. The problem is typically a real-life problem, but as at the Aalborg University, it can also be theoretical. The problem is adapted for education, is complex and ill-structured and is attractive to the learners, (for example, Mari & Halkier, 2013; Savery, 2006).

Aalborg University aims to work with authentic issues and maintain close contact with external organisations. It conducts research within PBL learning to eg. relate educational practice to theory. That research is supported through *close cooperation between the environments engaged in subject matter didactics and the educational environments* (Aalborg University).

## Future opportunities

Digital technologies create new and smart opportunities but will also demand to change the traditional working concepts and enable new types to work and collaborate. As Klaus Schwab has stated, in the old world decision makers had enough time to analyze and study the issues to respond, but that is no longer possible in more digital world (Schwab, 2017, 69). According to Schwab governments will have to *engage citizens more effectively and conduct policy experiments that allow for learning and adaptation* (ibid., 71). In that kind of a world PBL may provide a meaningful tool in the face of uncertainties. PBL is commonly defined as learning that results from the process of collaborating to understand and solve a problem.

The same problems which may drive students' learning, can enhance triple helix interaction (Lykke & Nyang, 2013). PBL can thus be an effective approach to develop needed skills (Hoidn & Kärkkäinen, 2014). PBL is an approach that may facilitate double-sided learning. Then the external partners will get ideas, better understanding of theoretical frameworks and students learn to apply theories for real-life problem solving.

Thus PBL may enhance more proactive role in knowledge acquisition, structuring, problem-solving and learning both for students and external partners. PBL methodologically values multiple perspectives, collaboration, and analysis.

From Pascal's perspective, there are many direct and indirect links and interfaces to PBL. Those are among other things the following:

- One of the PBL's major goals is to promote skills in lifelong learning
- PBL enhances and promotes triple-helix approach to problem solving and innovation
- PBL may offer and generate effective responses to external partners' important, pressing problems and challenges
- problem solving (including knowledge acquisition, analysis, critical thinking and collaborative interpretation) will be one of the most important employee skills in the future
- in the information age cities are key sites for the production and Research, Development and Innovation (RDI); and cities that are moving forward are those which are open, diverse and learning; cities around the world are crowdsourcing ideas, best practices and pursuing solutions to a variety of problems (for example. Schwab, 2017, 74-80) – all of what are core issues and activities of Pascal
- therefore Pascal would integrate PBL to those aforementioned activities and policies, develop PBL concept further and pilot that PBL 2.0 with some external city-partner

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