# Project-based learning: the complexity and challenges in higher education institutions

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**Abstract**

Within the context of the 21st century education paradigm competence and new skill require new authentic learning methods. The growing popularity of the project-based learning (hereinafter PBL) paradigm, as an active, student-centric methodology, is related to extended opportunities in terms of knowledge attainment, facilitating the acquisition of several transversal competences such as team work, search and selection of information and synthesis and analysis abilities. Therefore in this paper authors would present main features of PBL identifying aspects that give both students and teachers a kind of drive for the involvement of all parties in the learning process; also discussion on the innovativeness within PBL paradigm is presented and finally some obstacles/challenges are dealt on the basis of leaving an open space for further considerations and possible explorations on the effectiveness using this approach in learning and teaching.

## 1 Introduction

The project-based learning is defined as "a teaching method in which students gains knowledge and skills by working for an extended period of time to investigate and respond to a complex question, problem or challenge" (see at Bie.org, 2014). To many scholars PBL is seen as a model, a philosophy of teaching and learning rather than as another educational strategy (Thomas, 2000; Markham, 2012; Bell, 2014; Mapes, 2009 et al.). Putting it in other words, a project-based learning is the model that organizes learning around projects. According to the definitions found in PBL handbooks for teachers, projects are complex tasks, based on challenging questions or problems, that involve students in design, problem-solving, decision making, or investigative activities; give students the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations (Thomas, 2000 et al.). While other defining features found in the literature include authentic content, authentic assessment, teacher facilitation but not direction, explicit educational goals, (Moursund, 1999), cooperative learning, reflection, and incorporation of adult skills (Diehl, Grobe, Lopez, & Cabral, 1999, see in Thomas, 2000). Thus, according to Thomas (2000), we may identify some of main driving factors that enable all parties of education process to be extremely engaged within explorative activities in various fields of studies: i) PBL projects are focused on questions or problems that "drive" students to encounter (and struggle with) the central concepts and principles of a discipline; ii) projects involve students in a constructive investigation; iii) projects are student-driven to some significant degree; iv)

projects are realistic, not school-like.

Implementation of PBL concept addresses the European Higher Education Area (EHEA) call that urges students to be engaged in more autonomous work. Self regulated educational process is seen as an effective pathway to involve digital-age learners, engage them in real-time problem solving through creative thinking. The PBL learning is approached as a managed process through projects that comprise a set of complex tasks, based on challenging questions or problems, investigative activities, decision making resulting in creation of realistic and meaningful outputs and their presentations (Thomas, 2000; Arce et al., 2013; Mapes, 2009).

Therefore, the main goal of this paper is to describe theoretically the project-based learning process, define its content, main objectives and functions, and discuss some of the challenges for both learners and teachers in HEI.

Paper design and methods mainly go from the theoretical analysis and researches made by Thomas (2000) and Lidón, Rebollar & Møller (2011) on PBL models and content. Authors have chosen the analysis, interpretation and summary of educational findings on PBL's advantages and difficulties arising from implementation this method in various learning contexts, environments and the issue of the readiness of both students and teachers.

## 2 The model of Project-Based Learning process

Viewing learning from a holistic approach, the PBL enables creating an integrated multilayer context composed of element from pure educational content and activities, practical experience of learners, as well knowledge led cooperation arising from networking of research and

educational organisations and business companies (see Figure 1 below). This way the organised and managed learning-teaching continues process produces a qualitatively new learning environment, which ultimately not only enhances overall educational capacities, address the 21st century demands of business world and education but also puts in practice a culture of the learning organisation (Lidón, Rebollar & Møller, 2011).
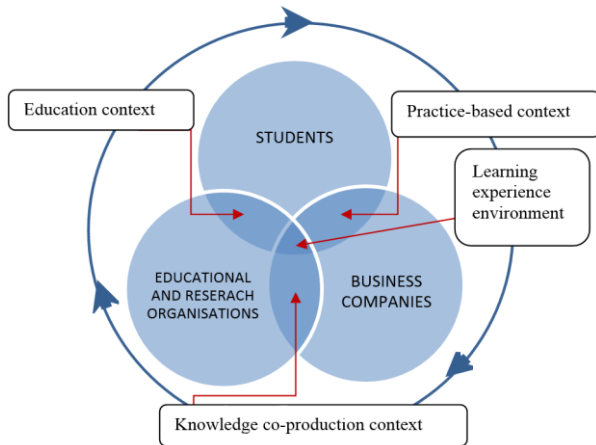


FIGURE 1 The PBL training model (Lidón, Rebollar & Møller, 2011)

These characteristics, as Thomas (2000) would stress out, can include the topic, the tasks, the roles that students play, the context within which the work of the project is carried out, the collaborators who work with students on the project, the products that are produced, the audience for the project's products, or the criteria by which the products or performances are judged. Shortly PBL incorporates real-life challenges where the focus is on authentic (not simulated) problems or questions and where solutions have the potential to be implemented. Putting in addition to the figure, shown above, along with Thomas (2000) we may state that PBL incorporates three possible paradigms based on the following aspects, such as: i) outward bound wilderness expeditions; ii) postsecondary models of "problem-based" learning, and finally iii) university-based research in cognition and cognitive science applications. Therefore figure 1 takes in it education, practice, and knowledge; all these components are mainly achieved and assessed by participating in real-life settings and in some cases – in simulative contexts. Through this model PBL incorporates and bridges up educational institutions with business corporations, and integrates students into the paradigm that goes from "theory-to-practice" and the way around.

## 3 The main objectives of Project-Based Learning processes

The main objectives of the method include increased student's motivation; training of valuable skills as planning and organization of the research-based learning process that will build a strong foundation for their future in a global economy; encouraging creative thinking and social skill.

According to Bell (2014), a student-driven and teacher-facilitated approach to the learning rests on such core pillars as:
- Questions-driven learning for building knowledge;
- Student choice based research under the teacher's supervision;

- Collaborative work and communication;
- Authentic projects focused on real-world problems to find solutions.

Projects as enablers to combine all mentioned aspects are seen as the curriculum. Learners through projects encounter and get familiar with central concepts of the discipline. Students are encouraged to think out of the box investigating problem related environment through open-ended questions. They must craft diverse activities in teams and individually. Projects support inter-disciplinary approach. They allow building connections between various themes and topics embracing two or more disciplines. Also, projects enable Millennial to exercise extensively their technological skills.

The uniqueness of the project based learning offers not only a greater flexibility to students, but also transforms teachers' role. In case of PBL, teachers undertake a role of facilitators, who can overcome the boundaries and limitations of the traditional classes. The method empowers academicians apply various tools combining them in a way to boost an interest and motivation of students. On the other hand, it fosters collaborative culture between teachers calling them to share knowledge and pool recourses overcoming professional "silos", but also geographical boundaries and time zones. Admittedly that teachers, who are less familiar with technology-rich environment, 21st century project based teaching can be a challenge.

As Boss and Krauss (2007) admit, implementation of PBL turns teachers in lifelong learners. They are forced to conduct more research or seek out advice from business representatives. Designing projects requires long hours of planning. Also, PBL asks teachers to rethink and redesign students' assessment methods in order to reflect multiply grades and achievements doing projects.

## 4 The benefits of Project-Based Learning

Benefits arising from the PBL were acknowledged long before the 21st century. For instance, Dewey has already emphasized that "learning by doing has great benefit in shaping students' learning. High-quality experiences, as well as continuity of experiences, are paramount" (Dewey, 1938). Therefore for many years the PBL methodology has been exercised in fields of technical and engineering education. Nowadays it is becoming a preferred method worldwide across diverse discipline fields.

Also various research studies indicate that implementation of PBL bring tangible changes in learning-teaching experiences and learning environment. To Thomas (2000), project based learning transforms students work habits and effectiveness. As Boss and Krauss point out students acquire "new patterns of thinking, they learn how to capitalize on the wisdom of the group, and, most importantly, they continually learn how to learn together" (Boss and Krauss, 2007, p. 30). As a rule, students demonstrate a greater interest, engagement and mastery approaching various disciplines. Thus the project based learning contributes in growth of community of practice.

Professional learning of teachers differs from a peer-to-peer collaboration of students. The PBL brings together like-minded people forming teachers' learning communities. It enables increase of a critical mass of educators who share the same goal. Innovative thinking teachers together can

lobby seeking to decrease teachers' isolation through more extensive networking in- and out the educational sector; increase shared responsibility, improve time and recourse management, better cope with technological challenges, gain more power promoting time needed changes in a systematic way.

From the perspective of business, PBL method is also a source of a set of benefits. Projects require real-life problems, and thus open door for business organisations to better articulate and share business needs, test new business ideas just at a symbolic cost. Being participants of learning environment, companies can shape teaching-learning process specifying existing gaps in education field, share special training modules, launch internships in order to grow talents for their own needs. The PBL enables business organisations to avoid additional investment and risks that are related with retraining of post- graduates and prevent misuse of managers' time involved in the development of specialists.

## 5 Challenges for teachers and learners using Project-Based Learning approach

As Thomas (2000) and other scientists (e.g. Edelson et al., 1999; Lidón, Rebollar & Møller, 2011; Bell, 2014; Mapes, 2009) would point out about the existing problems/difficulties while implementing PBL method with students, there could be such aspects of challenges indicated: i) research on PBL implementation is largely limited to research on project-based science administered by teachers with limited prior experience with PBL. From this research, there is evidence that PBL is relatively challenging to plan and enact. Keeping the limitations of this research in mind, it is probably fair to say that most teachers will find aspects of PBL planning, management, or assessment fairly challenging and will benefit from a supportive context for PBL administration; ii) there is some evidence that students have difficulties benefiting from self-directed situations, especially in complex projects. Chief among these difficulties are those associated with initiating inquiry, directing investigations, managing time, and using technology productively. The effectiveness of PBL as an instructional method may depend, to a greater extent than we recognize, on the incorporation of a range of supports to help students learn how to learn (see in Thomas, 2000).

For instance, Edelson et al. (1999) in their researches would mainly focus on inquiry-based learning approach, however, this is tightly linked to what we have just descrybed as project-based learning and some of the issues arising within inquiry-based learning might appear almost the same in using PBL method as well. These major issues, as authors would identify, are as follows:

1) *Students' motivation, their willingness*: for students to engage in a way that can contribute to meaningful learning they must be sufficiently motivated. PBL as well as the inquiry-based learning require a higher level of motivation on the part of learners than is demanded by most traditional educational activities. To foster learning, that motivation must be the result of interest in the investigation, its results, and their implications. When students are not sufficiently motivated, they simply either fail to participate or they participate in a disengaged manner that does not

support learning.

2) *Knowing the ways of how to explore and investigate the cases*. For students to engage in both PBL and in inquiry, they must know how to perform the tasks that their investigation requires, they must understand the goals of these practices, and they must be able to interpret their results. Scientific investigation techniques such as data collection and analysis can be complicated and typically require a level of precision and care that are not required of students in their everyday experiences. If students are not able to master these techniques, then they cannot conduct investigations that yield meaningful results.

3) *Knowledge that students have from previous experience*. The formulation of research questions, the development of a plan, and the data collection, analysis, and interpretation of that data – all require both scientific and practical experience/knowledge. In designing an appropriate PBL process, the challenge might appear in providing opportunities for learners to both develop and apply that scientific understanding. If students lack this knowledge and the opportunity to develop it, then they will be unable to complete meaningful explorations.

4) *Managerial skills*. To achieve the ultimate goal, students must be able to organize and manage complex, extended activities. An investigation requires planning and coordination of activity and the management of resources and work products. Students are not typically asked to manage extended complex processes as part of traditional educational activities. If they are unable to organize their work and manage an extended process, students cannot engage in PBL.

5) *Limits of the learning contexts*. The technologies and activities of PBL must fit within the practical constraints of the learning environment. Meeting the constraints of the environment is a critical consideration in design that must be considered alongside learning needs in the design of curriculum and technology (see in Edelson et al., 1999).

On the other hand Mapes (2009) would talk about many similar issues that occur while implementing PBL method in educational practice, i.e. both students and teachers face a much more complex set of challenges in PBL experiences not associated with the application of more prescriptive lessons. Particularly students mainly face with:

1) generation of meaningful questions;
2) management of complexity and time;
3) transformation of data;
4) development of logical rational to support decisions.

While teachers would encounter the following difficulties:

1) time: PBL investigative projects as such require more planning time and classroom time than typical lessons on both long term and daily bases;
2) classroom management as teachers must balance student autonomy with order;
3) subject depth: teachers need to focus on a driving question and link concepts and diverse activities,

helping the students to construct their own knowledge rather than didactically teach single subjects;

4) assessment: PBL requires alternative forms of evaluating the student's knowledge.

In order to effectively overcome these complexities, teachers must make profound changes in the way they teach.

Therefore, as Mapes (2009) states, that a primary criticism of project work is that it often leads to doing for the sake of doing. Project work is popular with both students and teachers and given that typical classroom initiatives are grass roots efforts unguided by research or theory this is a likely result. Unless challenged to do so by the conditions of the project it is unlikely that students will learn new skills or processes (Mapes, 2009; Bell, 2014 et al.).

## 6 Conclusions

The project based learning is a student-centric methodology that extends opportunities of all participating parties of educational environment. Projects themselves are seen as curriculums that involve a wide range of tools and aspects necessary for a successful professional training.

The PBL concept is based on a close networking of student groups, research and educational institutions and business organisations. Also the PBL learning is approached as a managed process through projects that comprise a set of complex tasks and activities, oriented towards real-time problems solving.
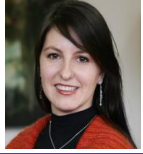
Through PBL, students, teachers and business companies can gain different benefits, which all together create favourable conditions to address the challenges of a changing society in this day and age.

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