

## Chapter 6

# Contribution of Project– Based Learning on Social Skills Development: An Industrial Engineer Perspective

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### ABSTRACT

*The scope of this chapter is to describe and share experiences of two industrial engineers that had practiced project-based learning (PBL) during their engineering degree. Currently, authors look backward with a different perspective related to PBL as they are working as industrial engineers in different areas for 10 years in a multinational environment. Such experiences provide to the students the opportunity of developing soft skills that would be difficult to obtain following a traditional expositive lecture, more focused on individual work. Several challenges and advantages of learning by doing with PBL prepare students and contribute for their professional life because this kind of learning is closer to the professional daily life. In this chapter, four main experiences faced by the authors as engineering students are reported. Furthermore, the importance of experience like that and its contribution for the professional life is explained from the authors' point of view.*

### INTRODUCTION

Bologna Process led some changes in the European University learning methodologies and it also brought transparency and standards creation to ensure mobility and comparability between European countries. The process implied changes such as curricula, structures, education paradigm and also the

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teaching culture, adopting different learning approaches student-centered (Alves et al., 2016; Reinalda & Kulesza, 2006). The university to which the authors belong also drove this transformational process, including PBL approaches in some courses. Authors experienced PBL in the first editions (2006-2007 academic year) in an Integrated Master degree in Industrial Engineering and Management (IEM) of the approach pioneer in the engineering degree (Lima et al., 2007). At that time, Project-Led Education (PLE) presented by Powell & Weenk (2003) was one of the approaches in engineering courses that promoted active learning by doing a opened project, presenting a team solution for it, being able to discuss the topic, fulfilling deadlines and reporting outcomes.

PBL is an active learning methodology that aims to develop technical and transversal skills in student-centered environment involving stakeholders cooperation and collaboration (Alves et al., 2018; Knoll M., 1997). That approach provides to the students useful tools and methods to deal with onsite challenges and situations, developing argumentation and social interaction skills in a professional environment, being prepared for conflicts management and also having a proactive approach (Alves et al., 2018; Frank et al., 2003; Guerra et al., 2017). Some authors (Dewey, 1996; Kilpatrick, 1918, 1921) also referred the contribution of PBL on the autonomous, independent, and responsible individuals' development as students are creating their own knowledge combining practice and theory in a project environment.

The main contribution of this chapter is to describe and present an overview of the PBL experiences of two Industrial Engineers and provide their perspective about this learning approach. Authors participated in four main PBL experiences for five years: in both semesters of the first year and in both semesters of the fourth year. Authors have faced some challenges during the implementation of this approach in their university once they were enrolled in the first Bologna curricula. The approach development led some experiences and adjustments from teachers and organizational committee during several years (Lima et al., 2017). Therefore, authors experienced two PBL projects in the first-degree year and the integration of different engineering courses and architecture in the same project, a framework that was not repeated until now. There are many studies (Alves et al., 2018; Lima et al., 2007; Mills & Treagust, 2003; Soares et al., 2013) performed by researchers and teachers regarding PBL approach and its impact on students' competences acquisition, however this chapter presents the personal opinion of two alumni with ten years into their engineering careers. Each experience had different levels of importance and it was felt in different way. These projects demanded a group of students working for the same project, building up ideas, discussing problems and managing conflicts between them. Additionally, skills such as communication, teamwork, time management and many others had to be developed. The ability of doing public presentations and defend an idea was a big advantage in this kind of learning that was not demanded before. Furthermore, teachers' role was not the same as authors were used to see. Its role was more focused on guiding students to find their own answers. Teachers were not anymore at the center of teaching process and this is also part of the teaching paradigm change in a PBL approach (Alves et al., 2016; Angelva et al., 2017; Powell & Weenk, 2003).

According to the Council of the European Union (2018) there are three elements that define competences in a learning process such as knowledge, skills, and attitudes. Knowledge is the combination of different existent concepts that allows to understand a given subject. Skills are the ability and capacity of achieving results applying acquired knowledge. Attitude is related to the mindset to deal with people, ideas, and situations. Key competences are determinant for a personal, professional, and social development, and they might be acquired throughout life. Critical spirit, teamwork, initiative, communication, intercultural relationship, creativity, analytics skills, problem solving, and negotiation are example of key competences that might be acquired in an education, training and learning process. That kind of compe-

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