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Key aspects for an effective implementation of Project Based Learning: experience in engineering studies

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Keywords: Project Based Learning; Engineering; Higher Education; Case Studies

1 Introduction

Project Based Learning (PBL) is a teaching method in which learning activities are organized around a project that the student has to develop. According to the definitions in the literature (Lehmann, 2008) projects are complex tasks, based on questions, challenges to be met or real problems, which involve students in the design and completion of an initial assignment. As a result, students develop a deep knowledge of the content while working on acquiring transversal skills such as critical thinking, creativity, oral and written communication or teamwork.

The PBL methodology has its origin in the work of Kilpatrick (1918) and since then, it has been applied in many teaching areas and its implementation has evolved not only in basic and secondary education but also at the university. Although there is a growing interest in applying this methodology at the university level and there are numerous papers presenting experiences of design and implementation of an PBL in the field of engineering studies (Alves et al, 2018; Espinosa et al, 2005; Moliner et al, 2018; Mellado et al, 2016) they do not highlight those previous conditioning factors or aspects that the teacher should take into account and consider before starting the design of this type of project, with the aim to ensure its successful implementation.

2 Objectives

This work identifies the key aspects that the teacher should consider before designing a PBL project in order to carry out a correct planning and effective implementation of this methodology.

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3 Methods

This paper uses the case study methodology (Yin, 1994) to identify the key aspects to be considered in the design of a PBL project. For this purpose, the eight PBL projects carried out within the framework of the subjects of Business Organization and Management (second year of the Degrees: Mechanical Engineering, Industrial Electronics and Automation, Electrical Engineering and Chemical Engineering) and Integrated Management Systems (second year of the Master in Industrial Engineering) in two consecutive years (16-17, 17-18) by members of the teaching innovation network (XID-APP) of the University of Girona are analyzed.

4 Results

Once the PBL projects part of the study were analyzed, six key factors could be identified on which the teacher must respond for an effective implementation of this teaching methodology:

- Motivation of the teacher to carry out a PBL project
- Adoption by the teacher of a certain role
- Target audience analysis. Level of preparation of the students
- Level of the teacher's knowledge of the teaching methodology
- Formation of the working groups for the development of the project
- Space where the activity will take place

In addition, various scenarios have been planned based on the cases analyzed.

5 Conclusion

This paper sets out the preconditions in the form of key aspects or issues that teachers should consider before starting the design of a PBL project. The teacher should be aware that often the first experiences in the use of this teaching methodology may not be completely successful and will not be developed as planned a priori but the teacher's reflection on these key aspects will help to minimize the weaknesses of the proposed PBL project.

References

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