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# TEACHING AND LEARNING IN PROJECT-BASED EDUCATION: A case study in Engineering Education in Portugal.

**Sandra Fernandes**  
[sandrafernandes@ie.uminho.pt](mailto:sandrafernandes@ie.uminho.pt)

**Diana Mesquita**  
[diana@dps.uminho.pt](mailto:diana@dps.uminho.pt)

**Maria A. Flores**  
[aflores@iep.uminho.pt](mailto:aflores@iep.uminho.pt)

**Rui M. Lima**  
[rml@dps.uminho.pt](mailto:rml@dps.uminho.pt)



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# 1. Introduction

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- This paper aims to analyse and discuss teaching and learning in project-based education, focusing on students, teachers and tutors' perspectives.
- It reports on data from a broader piece of research aimed at evaluating the impact of Project-Led Education (PLE) on students' learning and its contribution for the improvement of teaching and learning in higher education (Fernandes, Flores & Lima, 2009).



## 2. Context of the Study

- ▶ Encouraged by the demands of the Bologna Process, a group of teachers took the initiative to implement, in 2004/2005, a **Project-Led Education (PLE)** experience with first year Industrial Management and Engineering (IME) students.

### What is Project-Led Education (PLE)?

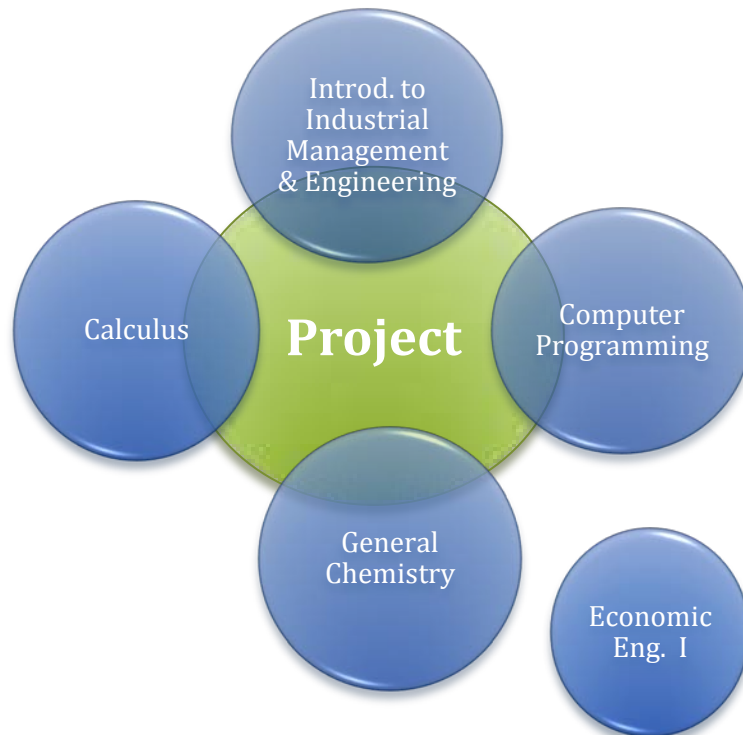
«...team-based student activity related to learning and to solving large-scale open-ended projects. (...) A team of students tackles the project, provides a solution, and delivers a 'team product', such as a prototype or a team report at an agreed delivery time (a deadline). Students show what they have learnt by discussing the 'team product' with each other and reflecting on how they have achieved it».

Powell & Weenk (2003:28)



## 2. Context of the Study

### Project Supporting Courses of PLE



#### ▶ **Students:**

- 6 teams of 6/7 students
- 1 tutor for each team

#### ▶ **Staff coordination team:**

- Course Lecturers
- Tutors
- Researchers

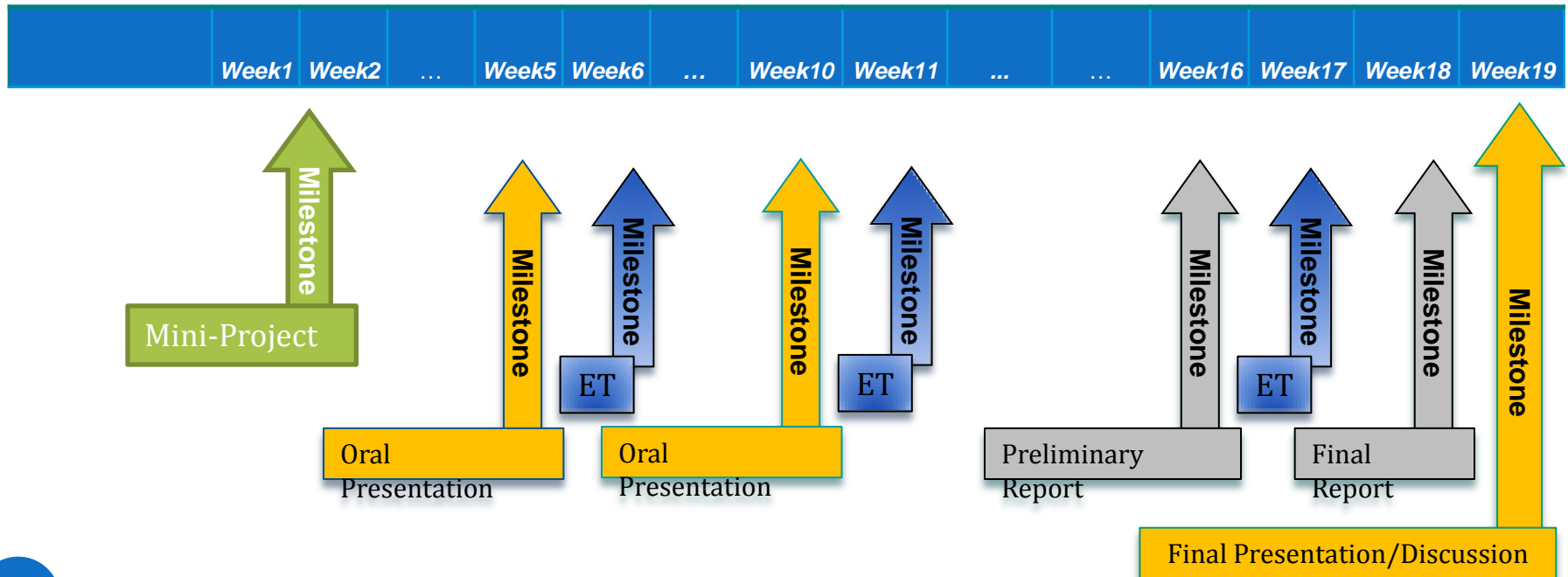
#### ▶ **Tutors:**

- Course Lecturers
- Faculty Staff
- Researchers



## 2. Context of the Study

### Project Milestones





## 3. Methodology

Data were collected through a combination of qualitative and quantitative research methods applied from the academic years of 2005/2006 to 2007/2008, to students, teachers and tutors.

### **Methods of Data Collection:**

- ▶ **Questionnaires** (students)
- ▶ **Semi- Structured Interviews** (tutors and faculty staff)
- ▶ **Focus Groups** (students)
- ▶ **Participant observation** (coordination team meetings)
- ▶ **Narratives** (students)



## 4. Findings

### Emerging categories from data analysis:

- Impact on student learning
- Students' and teachers' role

*Based on students, tutors and faculty staff's voices...*





## 4. Findings

### *Impact on Student Learning*

- **Student engagement** and **academic success** (deeper understanding of the concepts taught in each course);
- Students develop a set of **transversal skills** such as teamwork, problem solving, time management, oral and written communication skills;
- **Teamwork** is a key issue which increases student **motivation** and commitment to effective learning.





## 4. Findings

### *Impact on Student Learning*

“I have learned a great deal of concepts. I didn’t just hear about them, I actually saw their **application in real cases**. We learn much more with PLE and this is also visible in the grades we achieve.”

“With this methodology, students’ **effort is continuous** and there is a need to follow lessons in order to succeed in the project. The contact with the industrial world is also provided in an early stage of the engineering degree.”

“Sometimes we had to choose between studying for tests or keeping up with the projects’ milestones. We had to manage work related to the **assessment** of PSC and also tasks related to the project’s development. Most of the times, we chose to work on the project instead of studying for tests.”

“I think one of the things that could be improved is teachers’ **feedback**. We had to take in account all of teachers requests, which sometimes were not very similar. (...) I think there should be more dialogue amongst teachers in order to clarify goals and intentions.”

“I prefer traditional teaching instead of PLE because it is easier for me to achieve higher grades, besides the fact that I think **assessment** is fairer.”



## 4. Findings

### *Impact on Student Learning*

“Finally, students [Industrial Management and Engineering] found out what Chemistry is all about!”

“(…) Students are more involved in the courses, not only because of the continuous assessment but also because of the practical component of the project. Students learn how to apply the concepts in real life situations.”

This is one of the advantages of learning with projects: since the projects are open ended it is always possible for students to deepen even more their understanding about the subjects. It is not like an exam or an activity, where students are usually just concerned with what is necessary to study for examinations. And with projects, the difference is that the study is never enough!

“(…) Students are more involved in the courses, not only because of the continuous assessment but also because of the practical side of the project. Students learn how to apply the concepts in real life situations.”



## 4. Findings

### *Student's and Teacher's Role*

- Student's play an active role in the learning process.
- From transmitters of knowledge, teachers shift to the role of **facilitators**.
- Teamwork is not only for students. **Faculty staff are also expected to work collaboratively**.
- **"New" skills and attitudes** are required by teachers to monitor and support student's learning process – **tutor plays important role**.
- The tutor's role is focused on the **group process** (most tutors lack professional background in this field).



## 4. Findings

### *Students' and Teachers' Role*

“In PLE, the role of the tutor is not to direct but to guide. He should make the team believe that they can do even better. The tutor also plays an important role in keeping teams motivated and identifying strategies to overcome the difficulties. “

“Being a tutor is like supervising – there are different ways of doing it. In some cases, it is more effective to be more directive, in other cases it results better to stimulate student reflection, ask them questions. There is no standard way. In summary, it means meeting with the students and supporting them in whatever they need”.

"My main difficulty as a tutor was the lack of experience on what to do. As a tutor, if there had been a meeting at the start of the semester discussing tutorial issues, I think it would have been very useful.”

**Tutors' voices**



## 4. Findings

### *Students' and Teachers' Role*

“The main difference between PLE and traditional learning is the way that we work. PLE is more demanding and it forces students to work harder, both individually and in group. I think it is more effective like this and by learning independently”.

“Learning is student centred, which I think is great. This fosters greater student involvement and, consequently, deeper learning”.

“In PLE, students need to learn more by themselves and also learning by doing”.

“Due to our participation in PLE, we became used to working hard (...) If we had just been focused on contents taught in classes, we wouldn't be able to complete even half of the project report that we delivered. Great part of the research was done by ourselves”.

“One thing that I noticed in the last semester (PLE) was that I worked every single day for the project. Even on the weeks where there was no project deadline, we spent all the afternoons on the project rooms working on the project”.

**Students' voices**



## 5. Challenges and Implications

- In general, PLE was considered a positive approach to enhance student learning and increase motivation.
- Teachers' and students' role are more demanding
  - tasks that foster student autonomy and independent learning;
  - being a tutor or facilitator requires new competencies for faculty staff.
- Staff development and training should promote discussion and exchange of experiences and practices amongst colleagues.
  - need for training on tutoring in Higher Education
- Institutional support for faculty involved in this kind of teaching methodology is needed
  - organizational policies and procedures which encourage and reward teaching.
- Academic culture – collaboration and curriculum articulation.



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# Questions...

**Thank you for your attention!**

Sandra Fernandes  
[sandra@dps.uminho.pt](mailto:sandra@dps.uminho.pt)

Diana Mesquita  
[diana@dps.uminho.pt](mailto:diana@dps.uminho.pt)