

# The tutor in project-led education: evaluation of tutor performance

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## Abstract

At the University of Minho, project-based learning is becoming part of most first year engineering curricula. Although projects are different, a common element is the changing role of the teachers, as some are supposed to function as tutors instead of lecturers. The precise role of a tutor in project-led education is rather ambiguous to both tutors as well as to students. In order to define this role and inform the tutors about their performance and help them to improve, the Council of Engineering Courses developed a questionnaire with both open and closed items that aims to evaluate the performance of individual tutors in a project semester. After a pilot version at two courses, a revised version was applied at the end of the first semester of 2007/2008. The answers to the open questions provided information about strengths and weaknesses of each tutor. The answers on the closed items helped to gain insight in the performance of a tutor with regard to the functioning of the group, individual learning processes, the progress of the project, the attitudes of the tutor with regard to project-led education and his/her role in the development of critical thinking and problem solving skills for students.

*Keywords:* project-led education, tutor roles, questionnaire

## 1. INTRODUCTION

Project-led engineering education (PLE) [1] was implemented at the Industrial Management and Engineering course of the University of Minho for the first time in the second semester of the academic year 2004/2005. The initiative of a group of teachers of this course led to the implementation of an approach to learning that was no longer merely subject based, but aimed to replace separate and sometimes not clearly related contents of subjects by one project, that would serve as a starting point for all subjects. The main goals that the teaching staff hoped to reach with the implementation of PLE were the improved integration of contents, the emphasis on student-centred learning, the early contact of students with real-life problems and the development of transversal competencies like communication skills, management skills, leadership and conflict management, because students work on the open ended problems in teams. In this teaching and learning approach, the teacher is no longer a lecturer, but is regarded as facilitator of learning. Instead of serving as an intermediate between specific course content and the individual student, a teacher becomes a tutor and is supposed to support the learning process of a group of students that try to develop competencies in areas that the tutor may or may not be familiar with. This role is a new one to most of the teaching staff. Teachers are used to roles that are directly related to their expertise and are less used to roles that emphasise the support of students working in teams.

Powell and Weenk [1] identify a number of tutor roles that can be distinguished in project work, starting with the tutor as setter of the exercise. Deciding on form and content of the project would in this case be a role of the tutor. Another role of a tutor can be the stimulator of the students by showing interest, asking about the why and how of the project, encouraging them to go into more depths and helping them to get through difficult periods, likely to occur in long lasting projects. A tutor can also be a monitor of the learning process, a role in which learning as a group effort is emphasised and the tutor supports the development of the cooperative effort to perform a number of task necessary to successfully conclude the project. The authors finally suggest that a tutor could serve as a technical expert and as an evaluator. They do not prescribe specific tutor roles, but suggest possibilities for a tutor to perform one or more of the roles as described above.

### 3. INSTRUMENT

A questionnaire was developed, based on the tutor roles as identified by Powell and Weenk [1] and complemented with information from PLE experiences at other Engineering courses of the University of Minho. Studies on the roles of a tutor usually refer to problem-based learning instead of project based experiences [6, 7, 8], mostly taking place within medicine courses and instruments described in such studies are usually more aimed at the group process and less at the project goals that have to be achieved. The first version of the instrument was tested at the Production Engineering and Management course and the Fashion Design and marketing course and led to the removal of a scale on assessment, as both teachers and students agreed that a tutor should not take part in the assessment of his own team. As the reliability of this scale was only ,55, the entire scale was removed. Other items were reformulated, especially those that referred to the tutor as a content expert, as those were too confusing for many students. Both the first and the second version of the instrument include the role of the tutor in reaching the project goals, which distinguished a tutor in problem-based learning from a tutor in project-based learning. The second version consists of six scales and the first scale refers to knowledge on PLE. The second scale is on the attitudes of a tutor in the tutoring process. It contains 11 items that aim to reflect the attitudes of a tutor with regard to PLE, the tutorials and the communication between students and the tutor. The third scale is related to the progress of the student team in the project. It contains 10 items that intend to analyse how students think about the way the tutor monitors the progress of the project. The next scale contains four items on the development of critical thinking and problem solving. The penultimate scale contains seven items of group functioning of the student team, including, among others, items on the discussion of peer and self assessment results. The last scale dedicates three items to the learning process of the individual student. Apart from the 38 closed items, two open items were included to enable specific comment on tutor performance. A last general closed item was also added to make a general quantitative evaluation of the tutor on a 10 point scale.

A total of 57 students participated in the tutor evaluation, of which 36 students are first year Production Engineering and Management students and 21 are fourth year students. The latter group consists of an equal distribution of Polymer Engineering students, Industrial Electronics students and Production Engineering and Management students. The student teams for both the first as well as the fourth year included 6 students. The questionnaire was applied at the end of the semester in the last project week. The tutors of the first year - tutor A till F - were all experienced tutor who had served as a tutor in two or more PLE experiences. Two of the tutors of the fourth year also served as a tutor in the first year, both teaching staff of the Production Engineering department. The two other tutors - tutor G and H - were new tutors and are teachers at, respectively, the Industrial Electronics and the Polymer department department.

### 4. RESULTS

The internal consistency of the seven scales of the Tutor Evaluation Questionnaire was estimated by the Cronbach alpha coefficient and generally considered satisfactory, as presented in table 1, although the reliability on the critical thinking and problem-solving scale is rather low, which may be caused by the more abstract and extensive items of this scale.

Scale	Item number	Mean	SD	Cronbach alpha
PLE Knowledge	3	12,75	3,30	,82
Attitudes	11	45,51	5,59	,84
Project progress	10	40,38	5,09	,91
Critical thinking-problem solving	4	16,86	1,96	,65
Team functioning	7	28,33	4,27	,83
Individual learning	3	11,30	2,17	,75

TABLE 1. Reliability analysis of the questionnaire

Looking at the results of the questionnaire of the first year students, as shown in Table 1 and 2, the scores on each scale show strengths and weaknesses of each tutor. Although there are many differences between individual tutors, some general remarks can be made. The PLE knowledge scale has the highest score in four groups. The attitudes of

PLE Knowledge				
Tutor A	10	15	11,17	2,04
Tutor B	11	14	12,6	1,14
Tutor G	13	15	14,40	,89
Tutor H	9	15	11,60	2,30
Attitudes				
Tutor A	35	46	39,00	4,05
Tutor B	41	52	45,80	4,49
Tutor G	50	55	53,00	2,00
Tutor H	37	50	42,20	5,07
Project progress				
Tutor A	33	48	39,83	5,71
Tutor B	35	49	41,20	5,12
Tutor G	42	50	47,00	3,46
Tutor H	31	41	36,6	3,78
Critical thinking-problem solving				
Tutor A	12	19	16,50	2,43
Tutor B	15	18	16,00	1,22
Tutor G	19	20	19,60	,55
Tutor H	13	18	16,00	1,87
Team functioning				
Tutor A	21	30	26,00	3,52
Tutor B	24	33	28,40	3,36
Tutor G	34	35	34,60	,55
Tutor H	17	30	25,20	4,97
Individual learning				
Tutor A	9	12	10,83	1,17
Tutor B	10	13	11,20	1,30
Tutor G	12	15	13,60	1,34
Tutor H	6	12	9,60	2,61

TABLE 3. Mixed 4<sup>th</sup> year students

Tutor B has the second highest scores on each scale and Tutor H and A are third or fourth on each scale. It could be remarked that more experience as a tutor does not automatically lead to a better perception of student performance of a tutor, as tutor G and H were inexperienced in tutoring PLE projects, whereas A and B have several years of experiences. It must be said though, that the results of Tutor A and B are show differences between the evaluation of their first year and their fourth year student group.

With regard to the open items of the questionnaire, it can be remarked that the fourth year students left either one or both questions blank. Those who answered only one of the questions always chose the first one, on the positive aspects of the tutor. The first year students showed similar behaviour, as 19 left one of both questions blank, and in case of one unanswered question, it was always the one on expectations that were not yet met. When analysing the answers to the open questions of the fourth year students, it appears that they would like the tutor be more present at meetings. This comment was made by three students. One student also finds that a tutor should have more attention for who is working more and who is working less within the team. Motivating the team, being available, answering questions, proving contacts of companies and believing in the team were considered important contributions of the tutor to the performance of the student teams, according to the fourth year students. The first year students show a more diverse pattern of answers to the open questions. With regard to the important contributions the tutor made to their team, they comment that their tutor tried to keep them on track when they felt lost, that the tutor gave valuable information on how to format the reports and the presentations, that they received important feedback on the reports, that a critical analysis was provided when necessary and that the team spirit was encouraged by the tutor. The first year students hardly made any clear comment on expectation that had not yet been met. Only being more present at meetings, being slight more active and being more severe could be identified as serious comments.