HELP TO NEW STUDENTS OF ICT SYSTEMS ENGINEERING DEGREE AT EPSEM-UPC: MENTORING

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Abstract

Freshmen at the Manresa School of Engineering, Escola Politècnica Superior d'Enginyeria de Manresa (EPSEM), of the Universitat Politècnica de Catalunya (UPC) are voluntarily provided with the mentoring service during their initial period at University. Mentoring gives academic, teaching and self-organizational support. It improves academic results and reduces the percentage desertion of the studies. The mentor is usually an experimented student who is studying his last year's Degree.

The goal of the present work is to expose how mentoring is performanced in ICT (Information, Communication and Technology) Systems Engineering Degree at EPSEM. These studies have been recently created and they are unique in Spain (according to our knowledge). We present here a treatment and analysis of the performance and possible actions that have taking in account in order to continuous improvement. We have analyzed the methodology and the opinion of the Degree's students during two academic years (2010-2011 and 2011-2012) in which mentoring was possible thanks to a Grant from EnginyCat AGAUR (Agency for Administration of University and Research Grants of "Generalitat de Catalunya") and the UPC. Then, this Grant was unfortunately cancelled and mentoring could not go on. Thats's why mentoring has been just applied few academic years, what is not enough to develop an exhaustive statistical analysis. However, we think that results are very interesting and we aim to carry on with this activity as son as possible in order to develop more comprehensive results.

Keywords – Mentoring, Coaching, ICT, Engineering Education.

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1 INTRODUCTION

We present the model of mentoring in ICT (Information, Communication and Technology) Systems Engineering Degree at the Manresa School of Engineering (EPSEM) that belongs to Universitat Politècnica de Catalunya (UPC), as well as, its implementation and the corresponding comparative among other degrees at EPSEM.

The goal of mentoring is to help new students to satisfactorily develop new skills in order to improve their results in the first Degree's course (Álvarez Pérez & González Alfonso, 2005; Álvarez Pérez & González Alfonso, 2008). According to Álvarez Pérez & González Alfonso (2005), mentoring (and the tutoring) started in some studies of the Europe's North and United Stated. It has been applied since the 70's in Anglo-Saxon countries as a tool to facilitate the processes of adjustment and transition and also in personal and professional development (Risquez, 2008). In this paper we analyze mentoring applied to ICT Systems Engineering Degree.

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The ICT Systems Engineering Degree was implemented for the first time in the academic year 2010-2011 at EPSEM. It was created as a union of three different specialities in the Engineering: Electronics Engineering, Telecommunications Engineering and Computer Engineering. This Degree is unique in Spain (according to our knowledge) for its innovative and contents. It combines these three disciplines using new methodologies and the so-called teaching by problem based learning (PBL), emphasizing the teamwork and the mentoring (Branda, 2009). One of the aims of PBL is the development of self-directed learning (SDL) skills. By being invited into the learning process, students are also invited to take responsibility for their learning, which leads to an increase in self-directed learning skills (Loyens Sofie, Magda & Rikers, 2008). Other models apply PBL and focus on SDL led to motivation for students to maintain study pace, led to social and academic integration, encouraged development of cognitive skills, and fostered more study progress than students in a conventional learning setting (Severiens & Schmidt, 2008).

Mentor is a student who, having passed an adversity or a difficulty, assistances and guides new students to pass such adversity or difficulty. Also the mentor is like a friend freshman who generates a secure environment in both, personal and professional (Cano González, 2008).

Even though, nowadays there exist too many definitions of mentoring, all of them are related with peer coaching or peer tutoring. In general, mentoring is a modality's type of educational intervention with a past in universities and companies, which has been used over the years as a trained or influenced learning (Lobato, Arbizu & Castillo, 2005). In fact, definition of mentoring is related with its own development in its environment, so it implies different definitions, one for each type. Table 1 sketches some possible definitions for the concept of peer tutoring (Álvarez Pérez & González Alfonso, 2008). However, other authors (García, Asensio, Carballo, García & Guardia, 2005) consider mentoring in another point of view like we do for ICT Systems Engineering Degree.

Boronat, Castaño and Ruíz (2005)	Helpness among students in the same degree.
Del Rincón Igea (2000)	Student who coaches with their colleagues.
García Asensio, Carballo, García and Guardia (2004)	Coaching system between a senior student, who personally knows the University environment, and other new students without previous experience, who have recently started at University or are studying in the first courses.
Lobato (2003)	Process where a student, with training and under the guidance of a teacher, helps students to learn a specific skill.

Table 1. Some definitions of "peer tutoring" (Álvarez Pérez & González Alfonso, 2008)

In the University context, mentoring, which is related with tutoring, consists in assistance and training to overcoming difficulties in students' academic environment. It let students to develop basic skills to progress in their studies: academic planning, strategies to pass exams, development of learning strategies, socio-professional development, improving their self-development, etc.

Mentoring at EPSEM was first started in the academic year 2009-2010 thanks to the scholarship program EnginyCat AGAUR and a generic grant of UPC, and it finished in the academic year 2011-2012 when such grants were cancelled. In order to study and optimize the accomplishments, teachers asked for a complementary grant (Teaching Improvement Project) at UPC from 2010 to 2012. The goal of this project, called "Mentoring at EPSEM" or "Mentoring Project", is to provide a quality service and support to new students. The research team is formed by people who have different tasks with the same aim: to improve the welcome and the academic results of new students at EPSEM from the beginning. Even though the goal of the project is the 'mentor' (also called coaching), there also are other people that allows to carry the project out: all beginning students, all teachers in general, Assistant Director of Academic Policy, the coordinator of the "Mentoring Project", and advisors. Thanks to this "Mentoring Project" we have been able to study the mentoring applied to ICT Systems Engineering Degree during two academic years (2010-11 and 2011-12) which are not enough to develop an exhaustive statistical analysis.

1.1 Design, methodology and approach

Mentors are students in their last academic year with experience as senior students. They provide help, motivation and perseverance to the new students. Some of its functions are:

- To focus on learning methodologies (understanding and applying methods to solve problems and conflict situations).
- To give support to understanding, reasoning and answering questions and problems.

To achieve these goals, mentors have available materials provided from teachers, advisors and the Assistant Director of Academic Policy, that can help mentors in their functions, such as methodologies, exercises and problems, previous exams, notes, etc. All these materials are supervised and facilitated by the coordinator of each subject. For more details about that, the interested reader can see (Gorchs, Molinero & Garriga, 2012) where it sets out the assigned functions to each previously mentioned agent involved in mentoring: all beginning students, all teachers in general, Assistant Director of Academic Policy, the coordinator of the "Mentoring Project", and advisors.

Mentoring applied to ICT Systems Engineering Degree was based in the so-called "open mentoring" (Gorchs, Molinero & Garriga, 2013) in the sense that mentor adapts the available methodology depending on their mentored students. It makes the mentoring project more comfortable and as a result they are more confident themselves. "Open mentoring" means that new students use mentors at their convenience in time and in subject. The role of the mentor in this model is to help according to the neediness of the new students. There is a possible handicap: The mentor needs to have a general knowledge of all subjects. However, mentors are selected among the most brilliant students in each degree, so they are able to assume this task.

ICT Systems Engineering Degree uses a traditional mentoring where, in general, students go to mentoring whether they want. However, the corresponding coordinator also encourages all new students to assist mentoring sessions (8 hours per week spread over three different days) in open classrooms provided by the EPSEM. Mentoring requires a learning room to develop seft-learning with the mentor support. Even though students do initially not use the mentoring service a lot, when time pass they attempt more and more to take advantage of this service (especially during the second period of the academic year). Students have their personal reasons for rejecting it: some of them think that they can overcome studies on their own, other ones, seem to be ashamed and do not want that their colleagues know they use mentoring, other ones see that like a waste of time, etc. In this sense, organizers, tutors and mentors convince and motivate students to use mentoring because it improves both teamwork and individual work. Note that this Degree has around thirty five students per subject which makes a friendlier relationship.

Next we present our mentoring results applied to ICT Systems Engineering Degree, and some actions to improve possible disagreements. Take into account that mentoring was just applied to students of the first academic year, that is, about thirty five students.

2 RESULTS: ATTENDANCE, SATISFACTION AND ASSESSMENT

In this section we present the results obtained from the Mentoring Project during the academic years 2010-2011 and 2011-2012 for ICT Systems Engineering Degree. We focus our analysis in some inquiries about the students' attendance at mentoring sessions, the students' satisfaction with the mentoring sessions, and the general assessment that students consider for this Mentoring Project.

2.1 Attendance

Table 2 shows the assistance of ICT students at mentoring service. Ha it can be seen participation was very satisfactory. Results reflects how assistance increases from the first quarter (Q1) to the second one (Q2) during both academic years 2010-11 and 2011-12. Maximum participation in the project was accomplished in the second quarter of the academic year 2011-2012: 100% of participation. On the opposite, the minimum participation was found in the first quarter of the year academic 2011-2012: 62 % of participation, but we consider that it is also a satisfactory result. Here it is necessary to take into account that the project started two months later in this period because of the grant was delayed. We conclude that mentoring increases when the course progresses. In general, the implication between courses increases from 71% (academic year 2010-2011) to 81 % (academic year 2011-2012).

	Academic year 2010-2011		Academic year 2011-2012	
	1st Quarter	2nd Quarter	1st Quarter	2nd Quarter
Implication per quarter	67%	75%	62%	100%
Implication per academic year	71%		81%	

Table 2. Assistance Percentage of the Mentoring Project applied to ICT Systems Engineering Degree (EPSEM-UPC)

2.2 Satisfaction

Table 3 presents the general satisfaction of the students with this project. The answers are divided into three categories: 'yes', 'medium' and 'no'. In general results are very good: 0% of students answered 'no'; and the highest satisfaction appears during the second year of the mentoring program. Note that during the first year of the Mentoring Project (academic year 2010-2011), mentors were not students of the same Degree (remain that ICT Systems Engineering Degree was in its initial development) and it maybe makes the relation between mentors and students less friendly. However results are satisfactory enough: 40 % answered 'yes' during 2010-2011, while 73.90% said 'yes' in 2011-2012).

	Academic Year 2010-2011			Academic Year 2011-2012		
	Yes	Half and half	No	Yes	Half and half	No
Satisfaction	40%	60%	0%	73,91%	26,09%	0%

Table 3. Satisfaction of the Mentoring Project applied to ICT Systems Engineering Degree (EPSEM-UPC)

2.3 Assessment

Students evaluated the project with three options to discriminate their feeling: from 0 to 4 to consider undervaluation, from 5 to 7 to design just enough assessment, and from 8 to 10 to really show a good assessment (Table 4). It can be seen that the assessment of the project is slightly better during the academic year 2010-2011. Note that during the academic year 2010-2011 all students were happy with the project and during the academic year 2011-2012 less than 5% of all students were unhappy. This last small percentage scored between 0 and 4 during the academic year 2011-2012 (4.3%) can be attributed to the exceptional delay in the project start because of economic and administrative reasons. However, in general most of the students always are really assessed (from 8 to 10): 75% in 2010-2011 and 74% in 2011-2012.

	Academic Year 2010-2011			Academic Year 2011-2012		
	From 0 to 4	From 5 to 7	From 8 to 10	From 0 to 4	From 5 to 7	From 8 to 10
Assessment	0%	25%	75%	4,3%	21,7%	74%

Table 4. Assessment of the Mentoring Project applied to ICT Systems Engineering Degree (EPSEM-UPC)

2.4 Results and comparison

Table 5 shows percentages of students who follow the "normal" academic evolution, that is, students who pass all registered credits at the first time in ICT Systems Engineering Degree. The table also shows percentages of students who have leave the degree or resigned to take the exams from the beginning to the end of the academic year (leave degree or have not been presented at exams). The empty boxes refer to quarters that still have not been implemented.

ICT Systems Engineering Degree	1st quarter	2nd quarter	3rd quarter	4th quarter	5th quarter	6th quarter	7th quarter	Leave degree or have not been presented at exams
2010/2011	100%	85,7%	60%	60%	45,7%	40%	40%	37,1%
2011/2012	97,3%	83,8%	70,3%	62,2%	56,8%			37,8%
2012/2013	95,5%	91%	68,2%					20%

Table 5. Students who pass all registered credits at the first time in ICT Systems Engineering Degree

Next we show Table 6 to compare ICT Systems Engineering Degree (Table 5) against the other degrees at the same School (EPSEM), i.e., Bachelor's degree in Electrical Engineering, Bachelor's degree in Industrial Electronics and Automatic Control Engineering, Bachelor's degree in Mechanical Engineering, Bachelor's degree in Chemical Engineering and Bachelor's degree in Mineral Resources Engineering (see http://www.epsem.upc.edu/studies/degree/degree).

Other Degrees of ICT Systems Engineering Degree	1st quarter	2nd quarter	3rd quarter	4th quarter	5th quarter	6th quarter	7th quarter	Leave degree or have not been presented at exams
2010/2011	95%	57,5%	37,6%	37,6%	37,2%	33,2%	31,4%	38%
2011/2012	90%	55,8%	41,3%	56,9%	29,8%			41%
2012/2013	86,6%	55,15%	41,8%					20,8%

Table 6. Students who pass all registered credits at the first time in all degree at School (EPSEM) less ICT Systems Engineering Degree

Note that the percentage of students who leave their degree or have not been presented at exams is less in ICT Systems Engineering Degree from the 1st quarter (5% at minimum). Differences are quite relevant between 2nd quarter and 5th quarter, and in particular differences are at minimum, 28%. In the 2nd quarter. We think that it happens (between other facts) because most of students of ICT Systems Engineering Degree follow mentoring from the beginning, while most students in the other degrees did not follow mentoring ever. Moreover, methodologies of teaching and skills of students are specific for ICT Systems Engineering Degree, and the number of students per class in such degree is lower than in the others degrees. However, note that results of the last two quarters in all Degrees (see Tables 5 and 6) are similar, in such quarters subjects are specifics (no generalistic) and maybe more interesting for students. Moreover then the used methodologies become similar in all Degrees (activities and practices increase).

Note that as it can be seen in Table 4, quite students of ICT Systems Engineering Degree leave the studies in the 5th quarter (3rd course). We really think that this tendency could be avoided if mentoring and/or tutoring had been applied throughout all the degree (not just during the first two quarters).

3 CONCLUSIONS

In conclusion we can ensure that the development of the Mentoring Project applied in students of ICT Systems Engineering Degree at EPSEM has been successful. This project has achieved the desired expectations and has helped to improve the academic performance, especially in the 2nd quarter.

Mentoring project has left a good feeling between the working-team because, once the first course has finished, students were able to carry on success fully in the second course without mentoring but they still go on working together and helping each other, i.e., making the so-called team-work. In this sense students' academic progress increases in the 3rd and 4th quarters, when mentoring has finished (remind that mentoring is applied just in the first academic year, 1st and 2nd quarter).

Moreover, when we make a comparison between the Mentoring Project applied to ICT and to other Degrees at EPSEM (see Gorchs, Molinero & Garriga, 2012), it can be concluded that the present Mentoring Project has been more satisfactory. The reasons for this difference can be attributed to a higher proximity among tutor-student-coordinator-mentor-methodology. However, there aren't relevant differences between new students of other Degrees and new students of ICT Systems Engineering Degree.

Moreover, students of ICT Systems Engineering Degree follow the mentoring methodologies in the next courses working together and helping each other.

It should be convenient to apply mentoring and tutoring throughout all quarters for each Degree in order to minimize the desertion.

It could also be interesting to apply these methodologies joint with other degrees and universities.

Nowadays one of the main is to carry on with the Mentoring Project because grants from EnginyCat AGAUR and UPC have been cancelled. It should be necessary to start again with mentoring to develop a more exhaustive study which gives us more solid conclusions. Two academic years are not enough to get an exhaustive statistical analysis. However, one possible way to overcome this difficulty would be to do a subject for each Degree entitled "The mentoring" as it happens in other Universities, but EPSEM is still analyzing how to manage this possible new subject.

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