STUDENTS SUPPORT IN HIGHER EDUCATION: AN EXPERIENCE WITH MENTORS

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Abstract

One of the problems detected in students in the first year of university engineering degrees is the disparity in previous training in subjects such as mathematics or physics. One of the ways to support these students is the generation of propaedeutic courses. In this work we present the results of an experience related to the matter of Physics (the first academic year) of engineering studies at the University of Girona. A professor acts as tutor of the course. One of the important aspects is that as support to the sessions in the classroom there are one or two mentors. The mentors are expert students of higher courses who act in the classroom when the students have some doubt when trying to solve (usually in a group) one of the practical cases raised by the professor. The students who act as mentors have been trained in previous sessions with the support of the tutor. Their activity is recognized academically through a scholarship (or sometimes with internship credits). Regarding the students who receive the training, most have a very basic knowledge of mathematics and physics. The previous experience (of the years prior to the realization of these student support activities) is that many abandoned their studies or need between 2 and 3 more years to complete their studies than the average. Analysis of their academic results is being carried out during these last years and it is verified that the dropout rate has decreased significantly, and that the percentage of students who end up passing the subject that same academic year is around 50-70% higher than before. The study also reveals that it is imperative for academic and students to generate teams to work jointly in providing effective student support mechanisms.

Keywords: Innovation, Mentoring, Physics.

1 INTRODUCTION

Since the new educational system was introduced in Spanish universities more than 10 years ago, the access paths to university technological studies has increased by adding diversity in the previous Physics and Mathematics knowledge. This fact brings with it an added difficulty to the university professor: the attention to the academic diversity, especially, in the first academic year courses.

At the Polytechnic School (EPS) of the University of Girona (UdG), different actions are carried out to mitigate the effects of this academic diversity and reduce dropout rates in the first year in the degrees of this center. One of the actions is the development of a mentoring student training program led by the Department of Physics. From the 2016-2017 academic year, the Department of Physics of the University of Girona is carrying out a pilot training program as an experience in academic mentoring. This experience has as a main focus the figure of the mentor student in his areas of academic counselor and tutor. The idea of mentoring is rooted in the belief that is good for a young learner to have a close relationship with an expert [1]. In our case, the mentor student is a second or third year student who has shown a good ability to adapt to the university system and has successfully achieved the specific competences of the different subjects of the first academic year. It is also important that this student has the ability to help first-year students who face university learning for the first time. It is a peer mentoring. Previous studies remarks that mentoring promotes the student success [2,3], also the peer-mentoring [4].

The mentoring student's training is carried out by a tutor during a period of three months (two hours a week). In this period of time, the mentor student has been trained to acquire the skills in the use of ICT related to classroom management, teamwork (collaboration between mentors) and development of the different competencies required as a training future. After this period, the mentor is considered well prepared to carry out his work in the areas of counselor and trainer. The second period begins under the supervision of the tutor and, finally, the latter, becomes mentor student advisor until the latter finalizes the tasks (last year of his degree studies).
This paper collects the results obtained in the follow-up of the academic assessments of tutored students from the beginning of the mentoring tasks until the 2018-2019 course. Tutored students (mentees) are students who have not studied physics in their pre-university studies. They are students who face for the first time, with serious conceptual shortcomings, in the subjects of Fundamental of Physics in the field of engineering (mechanical, electrical, chemical, computer, agrofood). Many students struggle with the transition [5]. This work also includes the degree of satisfaction of these students, and also provides an analysis of the expectations and the results obtained.

2 METHODOLOGY

The Physics Department's professors detects that a large number of students began their studies in engineering degrees without having previously followed Physics courses (or with a low Physics level). The adopted solution was a short Preparatory Physics course (propaedeutics approach) that began in 2015. The objective of this course was to provide the basic concepts of Physics necessary with one main objective: that the student could successfully achieve the specific contents of the subjects of Fundamentals of Physics 1 and 2. Figure 1 shows the initial web page of this preparation Physics Course.

In 2015, 25 students with different learning needs of Physics were voluntarily engaged. Since 2015, the number of involved students has been increasing as a result of the good reception of these courses by the new students. During the 2018-2019 academic year, the number of students engaged was 79, more than 25%.

During the 2016-2017 academic year, in order to attend to students individually, the help of an academic mentor was introduced. This experience allowed to attend more specifically the students of the Degrees in those basic concepts (recommended by the professors responsible for the subject of Physics of the different degrees). In the course 2018-2019 the course has been split into two courses that are taught simultaneously, one with a more focused subject in Mechanics (49 students corresponding to chemistry, industrial technologies, mechanics, electric, electronic, agrofood and biomedical engineering degrees) and other one focused on Electromagnetism (25 students corresponding to the computer, architecture, building and videogames grades). The course is organized by semesters with 11 group face-to-face sessions (1.5 hours every week). In one of the courses, the person in charge is a tutor with the help of a mentoring student (in training) and in the other course, the mentor is the mentor student with the help of an expert mentored student.
3 ACTIVITIES AND RESULTS

3.1 Activities development

The program activities are:

a) Activities in the classroom: personal and/or cooperative work. It is a consolidation activity of the fundamental concepts of Physics, necessary for the correct follow-up of the subjects of Fundamentals of Physics of the engineering degrees of the EPS.

b) Individualized academic advice. Resolution of doubts individually, and sometimes also in groups, during group tutoring sessions. The tutor mentor’s task is defined as a guide in the student’s learning process, helping them to identify their individual learning needs and to favor learning improvement (with particular emphasis on students who present major difficulties).

c) Follow-up activities. Weekly assignment of activities through the ACME ICT platform: This enables individualized monitoring of the consolidation of the student's learning. The activities are verified weekly by the tutor-mentor. This tracking allows us to detect unconsolidated concepts and skills. In this action, the feedback between mentor and student is important. Sometimes the basic concepts are not achieved with the activities proposed in the ICT platform. For this specific case, complementary academic material has been developed.

d) The different activities developed by the students are also collected by the student in a learning notebook. This notebook is delivered at the end of the course (in order to obtain additional information of the realization of the proposed activities and the achievement of the basic concepts). The development of this notebook is an activity that can be evaluated.

e) Attention to diversity in the attention to diversity. Due to the different learning student rhythm/evolution, complementary individual tutoring sessions are carried out (for those students who needed more support). The objective is to guide them better in their self-learning, respecting the individual rhythm.

f) The tutor-mentor realizes at the end of the course a personalized report for all the mentees. The report is addressed to the professor acting as responsible for the subject of Physics of the specific degree of each mentee. The objective is to follow up on their learning process and to draw conclusions about the mentoring process consequences on the students Physics level.

We should remark that the professors of the Department of Physics have positively appraised the work done by the mentors. In some degrees the activities carried out in the mentoring tutorial system have been considered in the final evaluations of the subject of Fundamentals of Physics.

The mentoring program has also been used for: a) the generation and adaptation of teaching materials (including virtual learning), always under the supervision of a team of professors and b) giving support with regular sessions (outside the classroom) to the first-year students assigned to them. In this second case, they also help them in matters related to their integration in the university system (by supporting the development of a culture of participation in training actions and complementary activities organized by the University). The mentor has been trained to carry out the aforementioned tasks, as well as in the elaboration of activities via MOODLE and ACME ICT platforms. Figures 2 and 3 shows two images of some material produced (always with the validation of professors). The mentoring student's learning process takes place over a semester. During this period, the future mentor performs activities with the professor and the expert mentor. Once this period has finished, it is the student who acquires the role of mentor with full autonomy but under the supervision of the teacher.

Once the process has been completed, the mentor student has acquired tools for assessment in the processes of learning achievement, tools to support the development of critical thinking and thoughtful tutoring students and activities development techniques (consolidation, monitoring, evaluation ...) to promote learning, as well as the management of courses via platforms.
3.2 Academic results and student perception

The engineering students usually agreed the Preparatory Physics courses methodology. The number of engaged students should be regarded as a mark of a generalized good perception of this program. It has grown since its beginning in 2015. In 2017-18, the number of students has increased a factor 3. This fact shows the students interest in this training courses. There are academic activities that take into account the needs of learners and allow them to confront the content in core subjects more safely (with a high critical and reflective level).

The percentage of mentees that finish the academic reinforcement oscillates between the 74 and the 90% (2015 to 2019 data). Likewise, the percentage of students that have successfully pass the
Fundamentals of Physics subject varies between 47 and 70%. This rate of success can be considered as satisfactory if it is considered that these tutored students have a high lack level of Physics knowledge and learning shortcomings. Another important factor is that none of the students engaged in the course abandoned their undergraduate studies.

The degree of satisfaction of the students attending the program is reflected in the results of the surveys carried out (as shown in Table 1). The table shows an average of the annual evaluations (in percentage).

<table>
<thead>
<tr>
<th>Table 1. Students perception.</th>
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<tbody>
<tr>
<td>Agree</td>
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<td>------------------</td>
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<tr>
<td>Good subject organization</td>
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<tr>
<td>Improvement in following Physics courses</td>
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<td>Recommendation to further students</td>
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Figure 4. Initial webpage of the Physics + course (Física +).

It is important to focus that one of the keys to the success of this Preparatory Physics course is the figure of the mentor and the possibility of individualized tracking progress.

This method needs at least two new mentors every year. However, one of the important problems is to find undergraduate students who have the abilities and abilities to develop the tutoring-mentoring tasks, with the high degree of dedication needed. A complementary program has been performed to select the best students. A course, Physics +, has been created for students with high capacities. In the next figure we show the initial webpage of this course. Some of these students are acting now as mentors. Likewise, there are future engineers and the mentoring literature that there are similarities between academic mentoring and the socialization of new hires in work organizations [6].

4 CONCLUSIONS

Students registered in the university system for the first time come from very diverse educational environments. It is a well-known phenomenon that the pre-university educational system provokes a high academic diversity. University professors cannot remain alien to this problem and avoid our individual responsibilities by appealing to the economic situation or the lack of motivation of students.

In 2015, a Preparatory Physics course was introduced based on the mentoring system. The data shows that this approach alleviate the effects of academic diversity and reduce dropout rates in the
first year in the engineering degrees at the Polytechnic School. Since 2015, the number of students engaged has increased a factor three (25% of the registered students).

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REFERENCES


