Preliminary study of the integration of first year students at engineering courses

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Abstract — **The Council of Engineering Courses of the University of Minho, started with systematic course evaluation in the mid-nineties. Comprehensive course evaluations were made concerning students, staff, facilities, the curriculum and integration in the labour market. Parts of the evaluation are repeated every year, like the questionnaire about the integration of students at the university. With the results of this study, the university aims at anticipating on possible problems of students and to support students where necessary. Although the University cannot change the selection of students, it is possible to be well prepared for the students that arrive and support them where possible.**

Index Terms — **Integration of students, first year students, evaluation.**

I. INTRODUCTION

The first year of a student at university is the transition between a known life at secondary school and a new world with a new course, new colleagues, sometimes a new situation of living and many new experiences and challenges. A first year student is confronted with a vast amount of changes in his life during the first few months at university. He or she needs to adjust to the new situation and at the same time it is necessary to perform well on the first subjects. This can be quite stressful to a first year student [1]. The Council of Engineering Courses of the University of Minho in Portugal aims at supporting students where possible in the transition from secondary school to university. Therefore it is necessary to have accurate information about the situation of the first year students.

Aspects of transition

Three aspects of the transition period are regarded of major importance. The first one is the choice they made for their course. Is the course they are in their first choice and are they in the university of their first choice. A student can indicate up to six options of courses he or she would like to enroll in. The higher the exam marks of the student are, the more likely that he will be able to study the course of his first choice. Much wanted courses have very high minimum entrance requirements. Less wanted courses have lower minimum entrance requirements.

The options to be selected by students with high marks are chosen on several grounds. The status and job perspective of a course are a reason to choose a course as a first option. The reputation of a course and the university at which it is given are another motive to choose a certain course. The region of the university is also a reason to choose a course at a specific university. Universities in more remote regions tend to be less popular than universities in bigger towns. Because of this selection behaviour of students with high marks and the limited number of vacancies at each course, students with lower marks will adjust their selection of options. They will not have the most wanted courses as their options, because their marks are not high enough to enter these courses [2]. Although they may have a clear preference for a certain course or field of study, they will select other courses with lower entrance requirements that are less popular. This will increase their chances of being allocated. Besides these motives to choose a course, students may have other motives to select their course. What is the motivation of the first year students and what does the university need to do in order to provide students with a good motivation for their course where necessary.

The second aspect of the integration into the university is their preparation at secondary school. Have they had the right subjects as a preparation on an engineering course? Is their knowledge of physics and mathematics enough to start with an engineering course? In general, a serious percentage of students has an insufficient or hardly sufficient preparation in mathematics and physics [2]. It is useful for the Council of Engineering Courses to know how many students are likely to face serious problems in their first year due to a lack of mathematics and physics knowledge.

Apart from course related aspects of integration, there are aspects related to the personal life of students that either slow down or facilitate the integration of students [3]. The most obvious change that can take place is moving out of the house of their parents. In previous studies [4]-[5], students have indicated that it is important to them to stay near to their family and friends during their studies. So it is supposed that leaving home will have a negative effect on the integration of students in their first year. Is this really the case and what can the university do to facilitate the change to the new situation of living.

II. METHOD

In the last five years several evaluation projects have taken place [4]-[5]. Questionnaires were used to obtain information about the integration of students in the university. Based on

the results of these questionnaires, a new questionnaire was developed to acquire information with regard to the integration of 2000/2001 first year students. The questionnaire contain 26 closed questions aimed at the motives of the students to choose their course, whether the course was their first, second of other choice, the preparation they made with their secondary school education and their situation of living. Furthermore, questions were included about to what extent they are familiar with facilities present at the university and the help they have had in the integration process. The questionnaire was completed by 243 students of 8 engineering courses of the Council of Engineering courses.

III. RESULTS

As described above, a student in the Portuguese system does not automatically enrol at the course of his first choice, but is allocated to a course, depending on his exam results and the entrance requirements of the courses he is interested in. The higher the exam results, the more likely it is that the student enters his first option. Looking at the option lists of the engineering students, more than half of them are in the course of their first choice, 53,8%. There are, however, considerable differences between the courses as is shown in Fig. 1.
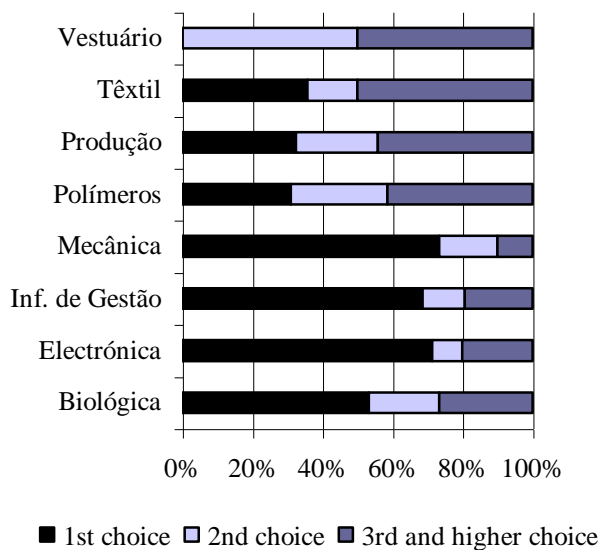

Fig. 1. *Choices of students for their course.*

In Biological Engineering, 53,3% of the students have chosen this course as their first choice. In Industrial Electronics, 71,4%, Business Informatics, 68,7% and Mechanical Engineering, there is also a majority of students with a first choice. In Polymer Engineering, 31,0%, Production Engineering, 32,6%, and Apparel Engineering, 35,7%, most of the students have not chosen the course as their first option. In fact, for most students the course was their third or less wanted option.

Although many students are not in the course they prefer most, they have similar reasons to choose their course. The motives to choose their course are shown in Fig. 2. In general, a good job perspective is the most important reason to choose a course. About 80% of the students indicate that the future perspectives on the labour market, is one of the most important reasons to choose a course. Apart from that, their personal preferences and the status or standing of the course are motives to select a certain course. Student who are not in the course of their first choice, tend to have other motives as well. When they have low exam scores and the course of their first choice requires much higher scores, they change their preferences to courses that require different exam results. Others enter a course with the goal of changing to another course as soon as possible. Especially the students of Production Engineering, 32% and Polymer Engineering, 24%, selected their course, because they intend to change to another course. The main motive of these students to choose the course was the relatively easy access. They are not interested in the job opportunities afterwards.
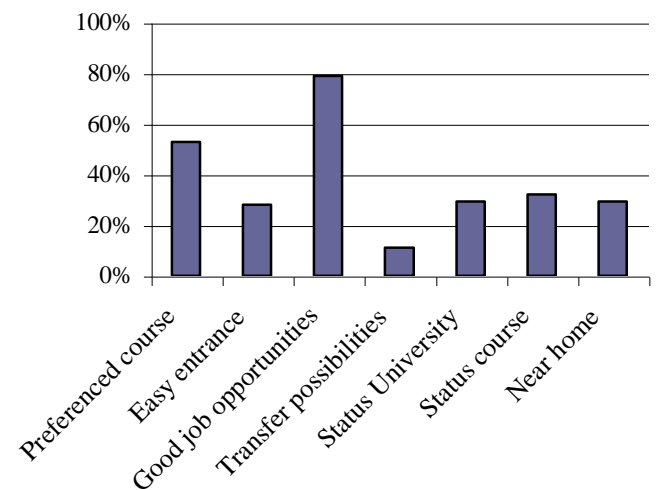

Fig. 2. *Motives to choose a course.*

The preparation of students on secondary school in this study refers to their background in Mathematics and Physics. Each student in the engineering courses has had Mathematics till the end their secondary school education. Apart from Biological Engineering, their average grades vary from (going from 0 to 20).11,25 to 13,77. The mean score on Mathematics on secondary school for Biology Engineering students is 14,30. All Production Engineering student and more than 90% of Mechanical Engineering and Industrial Electronics students did Physics in the last year of their secondary school. Only small percentages of students in the other courses did Physics, respectively 7% in Biological Engineering, 27% in Business Informatics, 28% in Polymer Engineering and 14% of the Textile Engineering students. As Mathematics and Physics are about 53% of the credit units of every first year engineering course at the University of Minho, an insufficient background in these subjects can make the first year very hard for a student. The high percentage of

students with low grades for mathematics and little or no preparation in physics, do not support the easy integration of students in their first year.

A majority of the student still live with their parents, 64%. The students who do not live with their parents, live either in the student residences in Braga or Guimarães, 11%, or in a room or a house together with friends, 25%. Moving out of the house is a big step in the lives of many students For 30%% of the students, the choice of their course is greatly influenced by the distance of the university to their hometown. Being close to family and friends remains important, although they have started a new life at university. Of the students who have indicated that closeness to family and friend is an important motive to choose a course, nearly 40% still lives with their parents. About 50% of the students is prepared to travel to go to university. Although students indicate that in many cases they prefer to stay with their parents, of course also for financial reasons, students who have moved to university residences and student rooms in Braga or Guimarães, are in general happy with their situation of living. In fact, from the students living with their parents, a higher percentage indicates to be unhappy with their situation, 15% against 12% of the students living away from home. The students who still live with their parents say that their main problem is how to manage their time. More than 70% of the students that are unhappy with their situation indicates that problems with time management are a reason. For students who have left the house this is also an issue: 58% has difficulties with time management. Looking at the students who have left home, they do not describe serious problems, although 40% misses their family and 29% feels lonely from time to time.

IV. Discussion

The integration of a first year engineering student at the University of Minho in all aspects of his or her course is of main importance to the Council of Engineering Courses. The results of this study open a discussion about the best way to support students in their first year. In an ideal situation, students start their studies with the right motivation. They are interested in the subject and have chosen their course for positive reasons. In the case of some of the engineering courses, a majority of the students have chosen their course for negative reasons and are not very much interested in their course. In fact, many plan to change to another -engineering-course if possible. The university should try to motivate these students. Motivation depends on how much individuals value a particular outcome and their expectation of achieving this outcome [6]. In this study, it appears that students do not value the outcome of successfully finishing certain engineering courses, like Production Engineering and Polymer Engineering. The university has to make students aware of the possibilities they have in the future after finishing the course. More practical insight in their future job opportunities and a realistic view on the content of the course are important in the first year, especially because the first year of an engineering course mainly consists of mathematics and physics and does not give a representative impression of the course as a whole.

The emphasis on mathematics and physics in the first year is a foundation for any engineering course. Therefore, a solid preparation in mathematics and physics is essential. The engineering students of the Council of Engineering Courses do meet the entrance requirements of having mathematics and, where necessary, physics as a final subject at secondary school, but their grades are not high enough to be successful in the subjects in the first year of their course. As this already had become clear after previous evaluations, projects have started to overcome the difficulties of students, especially in their first year. The assessment frequency has become higher, and tutorial classes have changed drastically. Tutorials are more intensive with smaller groups and a shorter period of time per lesson. The results of the students have improved significantly [7].

The situation of living, with their parents or away from home, is less important for the integration of student than expected. It was supposed that leaving the house would have a negative impact on students. Students living at the university residences are happy with their situation. Time management is more of a problem for students who live at home than to students who live in student housing. It may be supposed that travelling from and to university together with the large number of contact hours is a reason for these problems. It is recommended for a next study to have a more detailed look at time management of first year students and the influence of travelling.

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