Psicothema

Article

University Dropout in Engineering: Motives and Student Trajectories

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Abstract

Background: Dropout in higher education is a concern for students, families, educational institutions, and society. Tertiary education is an important mechanism for empowering people and STEM courses are vital to countries' development. **Method:** The study combined quantitative and qualitative data. Step 1 was an analysis of personal and contextual variables in a comprehensive examination of dropout in a sample of 1,016 engineering students. In step 2 a short interview by telephone were conducted with 82 students who dropped out, identifying their reasons and their academic/professional situation. In step 3 in-depth interviews were conducted with six students in order to understand the dynamic process of their decisions to leave. **Results:** The academic/professional situations of students who dropped out were quite varied, for example the same course or a different course at another institution, starting a job, not working or studying, or attending another level of professional training. There were three main reasons for dropping: vocational, learning process and achievement, and reconciling roles. **Conclusions:** Engineering student dropout is related to vocational and academic achievement. This should be considered in the implementation of programs to reduce the rate of dropout.

Keywords: Higher education; engineering students; academic dropout; first-year students; academic trajectories.

Resumen

Abandono Universitario en Ingeniería: Motivos y Trayectorias de los Estudiantes. **Antecedentes:** la deserción en la educación superior es una preocupación para los estudiantes, las familias, las instituciones educativas y la sociedad. La educación terciaria es un mecanismo importante para el empoderamiento de las personas, y los cursos STEM son vitales para el desarrollo de los países. **Método:** estudio que combina datos cuantitativos y cualitativos. En el paso 1 analizamos variables personales y contextuales y la deserción de 1.016 estudiantes de ingeniería. En el paso 2 se realizó una breve entrevista telefónica a 82 estudiantes que desertaron, identificando sus motivos y situación académica/profesional. En el paso 3 se realizaron entrevistas en profundidad a seis estudiantes para comprender el proceso dinámico de decisión de abandonar. **Resultados:** la situación académica/profesional de los estudiantes que desertaron es bastante diferente, por ejemplo cursar la misma o otra carrera en otra institución, empezar trabajando, no trabajar ni estudiar y cursar otro nivel de formación profesional. Los estudiantes informaron tres razones principales para la deserción: vocacional, proceso de aprendizaje y logro, y reconciliación de roles. **Conclusiones:** la deserción de los estudiantes de ingeniería está relacionada con el rendimiento académico y vocacional. Esto debe tenerse en cuenta en la implementación de programas para reducir la deserción.

Palabras clave: educación superior; estudiantes de ingeniería; deserción académica; estudiantes de primer año; trayectorias académicas.

In recent decades, more students have attended higher education (HE), and currently the students are more diverse in terms of their characteristics, academic and sociocultural backgrounds, motivations, and goals (Tight, 2019). This diversity enriches HE, contributing to its mission and democratization, but also brings with it some challenges (Adabaş & Kaygin, 2016). One is to improve students' permanence and persistence, preventing dropout.

Academic dropout is an international phenomenon which negatively impacts students, their families, and society. The literature suggests that the rate of dropout is highest in first-year students (Casanova et al., 2018; Tinto, 2010), which may be related to the difficulties students experience in transitioning and adapting to their new academic context (Naylor et al., 2017). For example, some students leave the family home to attend university and lose

parental support, making it important for them to develop new interpersonal relationships that support their social and emotional lives (Stinebrickner & Stinebrickner, 2014). In addition to personal stressors, like distress in previous years, students have to learn to manage their own curricular and extracurricular activities, and deal with the significant changes in the teaching and learning processes at university (Pérez-Fuentes et al., 2020; Rivera-Munoz et al., 2020).

The worldwide frequency of dropout may be related to the characteristics of HE systems in each country. Countries without selection mechanisms for entering HE have higher rates of academic dropout, whereas countries with more restrictive access systems – selecting students based on prior achievement for a limited number of places in each course – are frequently associated with the reproduction of socioeconomic inequalities. In Portugal, the *numerus clausus* system for access to public university and polytechnic institutions explains why 40% of first-year students report not being on their first choice of course, or not being at their first choice of institution, resulting in significant dissatisfaction (Fonseca et al., 2014; OECD, 2018).

HE dropout is a complex, multidimensional phenomenon. Student dropout can be related to personal characteristics (abilities,

competences and motivations), family characteristics (first-generation students, sociocultural and socioeconomic situation), academic background (previous achievement and vocational choices), and contextual characteristics (curriculum organization, size and quality of institutions) (Casanova et al., 2018; Ikuma et al., 2019; Mujica et al., 2019). Dropout is a phenomenon that occurs in all scientific areas, including essential science, technology, engineering, and math (STEM) courses. Here, dropout become a relevant problem for society when fewer young people choose these courses because traditional perception of difficulties in math or physics, and if there is a lack of technicians or graduates in these areas to meet the needs of the labor market. Dropout from engineering courses in Portugal may be related to access conditions. In Portugal admission to public higher education is regulated by a *numerus clausus* system or a number of places fixed annually by higher education institutions for each of their courses. Based on application score (a weighted combination of grades from upper secondary education and the grades in national examinations for the core scientific areas), that varies between 10 and 20 points, students can apply up to six different combinations of institutions and courses, indicated in order of preference. The placement in each institution / course is made according to the ordered lists of candidates until the available places are exhausted. This ordering is done in decreasing order of the application grade for each institution /course pair. Students will fill the vacancies of others when their first option is not available, leading to "waves of (dis)satisfaction" (Ferrão & Almeida, 2018; Fonseca et al., 2014). Students who do not attend their desired degree course are forced to quickly choose another degree, without time to explore or consolidate their vocational options (Heublein, 2014).

Often, engineering students feel disappointed or disillusioned when confronted with the rigor of HE programs and feel unprepared for the academic demands of math and physics units, for example. In these situations, students could experience more feelings of not fitting in, ineffectiveness, and distress (Salas-Morera et al., 2019; Sharp & Theiler, 2018). Students with more fragile academic backgrounds are especially vulnerable and they need more support to overcome difficulties and develop suitable learning strategies (Bártolo-Ribeiro et al., 2020; Bernardo et al., 2019). Without institutional support, many students exhibit lower achievement, which is a strong predictor of dropout (Casanova et al., 2018; Eichler & Gradwohl, 2021; Ferrão & Almeida, 2018; Rodríguez-Muñiz et al., 2019). This lower academic achievement in engineering students tends to be related to dropping out in the first-year, to the tendency to change to non-STEM courses, or to need more time to successfully complete the course (Cámara-Zapata & Morales, 2019; McCavit & Zellner, 2016). Considering the engineering courses, national data highlights only 30% of students complete the degree in the expected 5 years, 50% drop out and 20% remain enrolled degree. High rate of dropout can also be explained by early entrance in job market. In the area of Informatics, for example, students are frequently invited to enter job market in last years of graduation (Engrácia & Baptista, 2018).

Contextual variables are also important in explaining dropout in engineering courses. Class sizes in basic units of the curriculum tend to be larger than in other scientific areas, with many students repeating these classes in order to pass. In these circumstances, levels of motivation and comprehension are reduced, and an impersonal and distant relationship with peers and teachers is established. At same time more expository classes are frequent and students develop a

perception of not being considered (Ikuma et al., 2019; Tight, 2019). The literature shows that, the quality of experiences at university, the educational climate, opportunities, and institutional support will have an impact on academic success, especially for minorities (Chang et al., 2011). The decision to persist with a course is more related to demographic characteristics, academic background, attitudes towards education, the curriculum, and quality of advice than to personal cognitive abilities (Seymour & Hewitt, 1997).

In this study, combining quantitative and qualitative combining quantitative and qualitative data, we characterize engineering students who remained at university and students who dropped out during their first year (did not enrol in the following academic year). With the students who abandoned their course we tried to know the motives and the process of their dropout.

Method

Participants

The study was carried out in a public university in the north of Portugal, with all students who enrolled for the first time engineering courses (n = 1016). For the study, we considered students in a situation of dropout as those who cancelled their enrolment during the 1st year of attendance, as well as those who did not enrol in the following academic year at the same institution (n = 82). The student characteristics are presented in Table 1. Based on the students' main reasons for dropping out in the telephone interviews, students were invited to participate in the in-person and in-depth interviews (n = 6).

Instruments

For the quantitative analysis, we used a sociodemographic questionnaire to collect data at enrolment, including sex, age, parents educational attainment, academic background (repeating school years, HE access grades), vocational options (course and university preferences, participation on vocational guidance in High School). Information about student permanence or dropout was obtained from Academic Services at the beginning of the second academic year.

The engineering students that had dropped out were invited to participate in a qualitative study about the dropout process and their decisions. Based on literature review, were elaborated two interview guides: a structured guide to telephone interviews and a semi-structured guide for in-person interviews. The short telephone interview with each of the dropout students focusing on two questions: the trajectory they followed after dropping out, and their main reasons for dropping out. Based on the main reasons for dropping out, we selected six ex-students, inviting them to participate in an in-person semi-structured interview focused on: 1) their sociodemographic and family characteristics; 2) their previous academic background; 3) their transition and adaptation to course and university; 4) the dropout process and decision; and 5) how satisfied they were with their decision to drop out, and return conditions if that was an option.

Procedure

This project was approved by the Ethics Committee of the university where the participants first enrolled (Process:

BI042754054). The study was conducted in 3 steps. Step 1 – First year students were invited to participate in the study at enrolment in university. They were informed of the study objectives and gave their free, informed, written consent to match the data collected when they started their course (sociodemographic questionnaire) and the data about academic achievement and dropout from Academic Services. Step 2 – At the beginning of the second academic year, dropout information was collected at Academic Services and matched with the sociodemographic questionnaire from step 1. All dropout students were contacted by telephone to answer specific questions about their reasons for dropping out. Step 3 – Considering the three main reasons for dropping out in Step 2, six students were invited for an in-depth interview about their academic experience and the dropout process. The interviews were audio-recorded, transcribed and the answers were analyzed according thematic analysis approach (Braun & Clarke, 2006) by two of coauthors to identify and describe patterns in function of main reasons to dropout. In all steps students were assured of the confidentiality of the data, and that they were not obliged to participate.

Data analysis

Data were analyzed using the IBM-SPSS Statistics v.26. Description of students' situations after dropping out, and of students' reasons for dropping out are presented through frequency and rates. Qualitative data from the interviews was analyzed according thematic analysis approach (Braun & Clarke, 2006). Codes was developed according relevant literature. The codification process was analyzed and discussed among study co-authors to improve the accommodation of data from each interview.

Results

Table 1 provides a description of the participants in terms of various sociodemographic variables. These data concern the students on engineering courses, who are described according to whether they dropped out or not (permanence) at the end of first year.

Internationally, engineering courses tend to be taken by more men than women. In the case of students who dropped out in the first year, the proportion of male students was a little higher (79.7%), but this difference isn´t statistically significant. Dropout students were also older and age difference is significant ($t = 7.797$, $df = 1014$, $p < .001$). Considering mothers and fathers' levels of education, no differences comparing students who remain and burnout are statistically significant. Students are expected to have completed 30 European Credits Transfer System (ECTS) credits during their first semester, but most of the dropped out students made about 23.31 credits, being this difference significant ($t = -9.019$, $df = 903$, $p < .001$). It also relevant analysing the rates of students that did not make any credit and students who carried out the totality of ECTS credits at 1st semester. Considering the students that dropped out at university, 24.4% has not done any ECTS and 11% has done all ECTS expected. Also considering the students who remained, 5.7% have not done any ECTS and only 48.4% has done all ECTS expected.

Considering academic background, the HE access scores were similar in both students who dropped out and those who remained. Unlike students that remained at university, the majority of students who dropped out were not enrolled on either their first-choice course ($\chi^2 = .299$, $df = 1$, $p < .584$) or at their university of preference ($\chi^2 = 2.870$, $df = 1$, $p < .090$). They also had higher rates of repetition in previous academic years ($\chi^2 = 7.720$, $df = 1$, $p < .001$) and lower rates of participation in vocational guidance processes during High School, but in this case it is not statistically significant. The number of students that had left home to attend university were similar in engineering students who dropped out and those who remained.

After identifying students who had dropped out (82 students), we carried out telephone interviews. The students' academic/professional situation (Table 2) and reasons to drop out (Table 3) are presented.

The majority of students who had dropped out (32.9%) were doing other courses at other HE institutions, 23.2% had started working, 6.1% were not working or studying, 4.9% were doing the

Table 1
Sociodemographic variables for engineering students that dropped out and that remains

	Engineering students		
	Total M(SD)	Permanence M(SD)	Dropout M(SD)
Age	19.52 (3.93)	19.24 (3.47)	22.67 (6.63)
GAP to access HE	15.98 (1.51)	15.99 (1.50)	15.88 (1.71)
ECTS (credits) passed in the 1st semester	23.31 (9.33)	23.97 (8.71)	12.45 (12.20)
Sex (Male)	63.5%	62.8%	70.7%
Mother's educational level			
Basic	33.5%	33.6%	30.8%
Secondary	28.6%	28.6%	28.8%
Tertiary	37.9%	37.8%	40.4%
Father's educational level			
Basic	42.2%	42.5%	37.3%
Secondary	29.5%	29.4%	31.4%
Tertiary	28.3%	28.2%	31.4%
1st option course (Yes)	58.5%	60.4%	36.6%
1st option university (Yes)	76.8%	79.6%	45.1%
Repeated a school year (Yes)	5.1%	4.6%	13.2%
Vocational guidance (Yes)	31.4%	34.0%	31.3%
Leaving home (Yes)	37.2%	35.8%	37.3%
N Total	1016	934	82

Table 2
Description of students' situations after dropping out

	n	%
Attend the same course at another institution	4	4.9%
Attend another course at another institution	27	32.9%
Attend another level of training	2	2.4%
Started working	19	23.2%
Prescription situations	4	4.9%
Not working or studying	5	6.1%
Inactive Contacts	7	8.5%
Did not answer the calls	14	17.1%
Total	82	100%

same course at another institution, 4.9% in prescription situation and only 2.4% were attending another level of training. In this sample, only 8.5% of the contacts were inactive after one year, but we have to add to this the 17.1% who did not answer the three contact attempts. Table 3 presents the frequency of the main reasons the students gave for their decisions to drop out.

The majority of students (31.6%) pointed to vocational reasons for dropping out because they were not on the course that they wanted to do (e.g., "It was not the course that I wanted to attend.", "I did not like the content and I decided to leave.", "I was waiting to get information about entering another institution, so I left when I found out that I achieved my goal of entering military academy.", "I left to go to an institution that had special enrollment on my preferred course", "I am studying to do the national exams and try again". In addition, 26.2% of students identified learning and achievement reasons for dropping out, especially related to the difficulty of course content (e.g., "I found it difficult to follow the discipline's content.", "I understand that I have lack of basic knowledge.", "There was a lot of content to learn in a short period of time."). Students with academic, professional and family responsibilities (9.8%), identified difficulties in reconciling time and goals (e.g., "I left university to change to another institution that had my course at night so I can do my professional football training.", "I have to be more present due the birth of my

daughter.", "With work and university I was only just able to rest properly, it was a lot.", "I have short time to dedicate to university, so I decided that supporting my children was more important.". There were also 6.6% of students who were unable to enroll due to administrative procedures of prescription ("I was shocked when I found out that I cannot enroll this year, now I have to wait one year, I really want to do the course."). Academic Adjustment reasons were also mentioned by students (4.9%) related to being away from home to go to university and older students confronted with younger students (e.g., "I went back to live with my parents, and I will try enter a university close to my family.", "My peers are younger than me and I found it difficult to connect with them."). Students also reported financial reasons for dropping out (4.9%) (e.g., "My family does not have money to help me pay fees", "I thought I would have some kind of scholarship", "It was the tuition fees and other things, like eating, transport, etc…". For 4.9% of the students, the main reason to drop out was the opportunity to start work. In addition, at the time of the phone interviews, 3.3% of the students were studying abroad, had chosen a foreign university in health areas such as medicine or biomedical engineering; or they enrolled in Portuguese HE just to ensure their place in Portugal in case they did not get on the foreign course they intended to. At least 1.6% of students identified personal health problems as reasons for leaving and 1.6% gave answers that it was not possible to categorize.

Table 4 describes the six students that dropped out who agreed to participate on in-depth interview. Even in the interview students' presented several reasons, which have been classified according to the main motive.

Dropout was frequently directly or indirectly associated with vocational motives.

It was always due to the study and grades. I had the idea that we all have during high school: going to university. I thought it was going to be okay, but … I never thought I wouldn't like the course. I even did that vocational guidance, at school, with that psychologist, but I did things very quickly. My research was on the DGE website [government site] *and I spent hours looking at the courses there. Then I saw in newspaper that that course it was the course with the lowest unemployment rate. So, at the time the disciplines even seemed accessible to*

Motives	n	%
Vocational	22	36.1%
Learning and achievement	16	26.2%
Conciliation of roles	6	9.8%
Administrative procedures of prescription	4	6.6%
Academic adjustment	3	4.9%
Financial	3	4.9%
Enter job market	3	4.9%
Enter foreign university	2	3.3%
Personal health problems	1	1.6%
Other	1	1.6%
Total	61	100%

Table 3
Description of students' reasons for dropping out

Table 4
Description of participants' in-depth interview

Student	Sex	Age	Course	Trajectories	Main motive
1	Female	18	Engineering and Management of Information System	National HE access system, started first-choice course, leaving home, disillusion with subjects and the course functioning after attending some classes	Vocational
2	Male	23	Informatics Engineering	National HE access system, decided to leave and enroll on a non-degree course	Vocational
3	Female	18	Industrial Management and Engineering	National HE access system, leaving home, decided to change to a public polytechnic, looking for more practical activities in training	Learning and achievement
4	Male	27	Informatics Engineering	Mature student access process (over 23 years old), employed, disciplines very difficult	Learning and achievement
5	Female	38	Physics Engineering	Special access for foreign students, difficulties reconciling academic and family life	Reconciling roles
6	Male	32	Engineering and Management of Information System	Mature student access process (over 23 years old), employed, difficulties in reconciling academic and professional life	Reconciling roles

me. It was based on that that I chose the course. When I got there, it was a disappointment. I realized that I had not chosen the area well. The course was not for me because I thought I could handle the math, but I soon saw that it was not for me (Student 1).

I did the first semester, I was seeing more or less what it was like, but I didn't like it. From the second, third week I was already thinking about leaving. I didn't like the content, the way it was being taught ... I found the study of materials and applied physics relatively interesting, but otherwise, I didn't like it very much. I could choose another course at the university, but I could hardly find a course that went in the direction of what I wanted; and I didn't want to go back to the situation "I don't like a course". So, I decided to take a technical drawing course. I spent some months visualizing what I like to do, what I wanted to do and decided on a CAD / CAM Technician course, which is a professional course. It is more applied and more in line with my visualization skills (Student 2).

Several students used evaluations and exams to understand their competences, evaluating whether their efforts were leading to a successful experience in HE.

I did secondary education in a professional course and managed to get into university. Not everyone can. But when I started classes, it was a big change. The course was very difficult, there were many subjects and it seemed like a lot to study. I studied a lot and didn't get good grades. I started to think that it was more about studying in books than moving things… It was not what I had thought. So the solution was to go to a more practical course, with less theory and which was shorter. To learn things that I could use outside, while I don't finish the course (Student 3).

I can't forget that 10 years have passed since I stopped studying. There is a lack of methods that are lost in these years. If there are some days or weeks without going there, the subject gets bigger and is not taught in the same way as in secondary. It is much more intense. (…) I had a lot of difficulty. And I only had 3 or 4 hours a day free to revise everything. So, it was very difficult (…) I tried to study, I went to exams, but the results were not good. It was terrible. You feel discouraged; the grades were not the result of my effort (Student 4).

Older students had to juggle personal, academic, professional and familiar responsibilities.

It was a tremendous effort. I worked, went to university and then when I got home I still had to study. It was very complicated to manage the family effort. At work, there are even facilities for studying, financial support, they have incentives. But in my case, in my role, there are no shifts, that is, to go to class I really have to leave my job undone, which can stop or delay the work of another 20 people. This means that when there was a crisis at work and I couldn't go to class, I would not go to university for a few weeks… it was very difficult to recover the topics) (Student 4).

In the year that I entered college, my oldest son entered a new school. In the first weeks, he needed me a lot, because he had

a difficult adaptation. And… I was very absent ... I couldn't take him to school, I couldn't monitor the homework... I had my husband's support, but it wasn't easy ... There were many different concerns and different schedules to organize. We were almost never all together. Maybe I didn't choose the right time to go back to school. My daughter is only 4 now, but next year she is going to school as well. So, I decided to dedicate myself to my children. Maybe I'll try again later (Student 5).

In addition to the reasons categorized in Table 4, some students reported feelings of inadequacy, isolation, depression and anxiety in their interviews about their academic experience. These negative feelings and experiences can appear close to the final decision to abandon the course.

I felt that everyone around me was doing what they were supposed to and I had decided to leave. "Everyone is here having a university life and I… what?! Doing what you would do in my city?!" (Student 1).

There was no one there. I felt very alone. When I came home for the weekend and had to return it was difficult. I was really depressed, dejected. I didn't want to talk about it to anyone, I thought I was the only person like that (Student 3).

I had the feeling that my class was very impersonal. There were a lot of people in our course, I think there were 160 people, that doesn't help much. People seemed so far away that I never spoke to anyone about thinking about giving up (Student 2).

Discussion

The expanding access to HE over recent years has resulted in increased diversity of students characteristics, leading to various challenges that increase dropout, especially in the first-year (Casanova et al., 2018; Tinto, 2010). This prevalence highlights the importance of several difficulties in adapting to the challenges of HE which require greater levels of maturity and autonomy (Naylor et al., 2017; Rivera-Munoz et al., 2020). In the particular case of STEM students, difficulties in adaptation are usually related to their poor level of preparation in the fields of mathematics and physics (Salas-Morera et al., 2019; Sharp & Theiler, 2018).

Comparing engineering students who dropped out at the end of the first year and who remained, dropout was more frequent in men and older students. In the first semester, students who subsequently dropped out had passed fewer ECTS credits (mean 12.5 from 30 possible credits). However, there was a wide range of values, meaning some students failing to adapt who passed very few credits and other students interested in changing course or institution at the end of the academic year trying to accumulate a large number of credits. Dropout tended to increase in first-year students with a small number of credits (Casanova et al., 2018; Ferrão & Almeida, 2018). In this sample, students that dropped out have a higher rate of failed ECTS credits at 1st semester. Considering the students that dropped out university, 24.4% have not passed any ECTS and 11% has passed all ECTS expected. In its turn, considering the students who remained, 5.7% have not passed any ECTS and only 48.4% passed all ECTS expected. This data highlight the impact of achievement in dropout decisions, but the rate of less than 50% of the students that achieve all the ECTS expected at 1st semester, reveal difficulties in academic paths and delay the conclusion

of graduation. This data is aligned with national report that only 33% of students spend 3 or 4 years to obtain a diploma of 3-years (Engrácia & Baptista, 2018).

Also, there was a higher rate of dropout in students who were not enrolled in their first-choice course or at their preferred university (Fonseca et al., 2014), as well as in students with higher rates of failure in basic or secondary education and lower rates of participation in previous vocational guidance processes in secondary education school or with lower HE entrance scores.

With regard to students' main reasons for dropping out, a large number (36%) reported vocational reasons due to not being on the course they had wanted. HE enrollment systems often leave behind students who do not achieve the grades necessary to enroll on a course or at their preferred institution (Engrácia & Baptista, 2018; Fonseca et al., 2014). This could lead to low levels of student engagement with academic activities, confidence or perception of efficacy. In addition, some students may have less explored their vocational and life projects and when beginning a course they want to do, are confronted with subjects that are not interesting or simply fail to align with their initial academic expectations. Some points in the interviews illustrated the importance of vocational motives, usually related to a lack of motivation in the course.

A second group of students (26%) reported difficulties in the learning process and academic achievement, which means they were insufficiently prepared by high school or they had specific difficulties with course content. Often reported in literature, academic achievement in the first year is strongly related to the decision to drop out (Oriol et al., 2017). When students get low grades or fail their early evaluations, they tend to experience more dissatisfaction and often disengage and avoid this context of confronting difficulties in performance and achievement (Kinser & Deitchman, 2007). When students feel that they are not academically capable or lack basic knowledge in scientific areas essential for learning and academic success, dropout becomes more likely.

A third group of students (10%) justified their decisions to drop out with difficulties in reconciling family or work responsibilities, which was more evident in older students. When students have to juggle personal, academic, professional and family responsibilities, it can become very difficult or even impossible to reconcile goals and tasks. Male students often reported the support of the family, but the main difficulties consisted in reconciling academic activities and professional responsibilities. For female students, the difficulties were related to the reconciling academic activities and family responsibilities.

Finally, in the interviews, students who dropped out mentioned feelings and experiences of isolation and depression. Early experience of feeling stress and anxiety at university are important predictors of intentions to dropout (Cvetkovski et al., 2018; Holdsworth et al., 2018; Sharp & Theiler, 2018).

To conclude, our results suggest that dropout is a multidimensional phenomenon, where personal and contextual variables interact. Engineering students present in their interviews, three main reasons behind their decision to drop out. Firstly, students reported vocational motives, they were on courses that were not first choice. This occurs with students who do not achieve the grades needed to get into their preferred course, which is why these vocational motives can also be related to a poorer academic background. Secondly, several students related their dropout decision to difficulties with the learning process and low academic achievement, leading to passing few ECTS credits and the decision to drop out. Thirdly, the decision to drop out may be related to difficulties in reconciling academic activities and family or work responsibilities. This situation was more common in older students and students with a job or family responsibilities.

These three main reasons suggest different, complementary interventions to reduce dropout rates in first-year engineering students. If the course failed to meet students' initial academic expectations, a more robust system of tutoring could be a support that would help students to make more informed efforts, choices and decisions. If first-year courses are too advanced for their basic knowledge, the problem could be reduced if students had the option to attend introductory and complementary courses to fill in the gaps in their knowledge, develop learning skills, or other study methods. Another alternative is to increase interaction between secondary and HE in order to promote transition in terms of curricular competencies acquired and required.

Work autonomously is important to deal with the demands of the learning process and in many cases students do not have strategies for self-regulation of learning, which could lead to academic failure. If students have professional or family responsibilities to combine with academic activities, the institution should be aware of class timetables, the amount of information to be learned, and the daily workload. Engineering courses demand dedication from students, they have to attend obligatory classes and do many hours of autonomous and group work or problem solving exercises, which makes it difficult to reconcile professional and family responsibilities with university life. After accepting this student' subgroup into the institution, HE could define greater conditions to encourage them to remain on the course and to graduate. To reduce dropout during first year, some institutional policies of monitoring academic trajectories, particularly classes and exams attendance, must be implemented. Mentoring projects directed for the last years of the degree could be also important to prevent dropout by early entry into the labor market.

Acknowledgements

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