Identifying Precursors of University Drop-Out in Physics and STEM Undergraduate Courses

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Abstract. The university drop-out is a complex phenomenon that has different implications both at an individual and at a structural level. In this poster, we present a study to explore the relationships between engagement, psychological distress, academic motivation, the intention to leave the university, the actual drop-out and academic performance. The study will involve about 1000 students enrolled in the first year of Physics and Science-Technology-Engineering-Mathematics university courses. The preliminary results will be presented at the conference. The study may help to develop guidance interventions aimed at addressing the "leaky pipeline" in physics and STEM undergraduate courses.

Introduction and theoretical background

The university drop-out is a complex phenomenon that has different implications both at an individual and at a structural level. In Europe, for example, in 2016, about 3 million students decided to abandon their university career [1]. The phenomenon of drop-out is a particularly relevant issue for Science-Technology-Engineering-Mathematics (STEM) courses (SCs) where the drop-out rates are among the highest in the first year of enrolment [2]. Among the variables that may affect drop-out, literature has recently put increasing attention on *engagement* [3]. Engagement captures the quality of commitment and identification of students with the institution, and it is in close connection with success and academic performance. A second variable that may affect drop-out at university is *psychological distress* [4], which refers to a set of manifestations of an anxious, depressive or, in general terms, stressful nature, which may occur as a result of specific critical events or developmental crises related to the developmental tasks of individuals. A third variable that literature has thoroughly shown to be negatively related to drop-out is *academic motivation* [5]. Specifically, the identification in the desired professional role and the development of congruent skills are recognized to be very closely linked to student academic motivation [6].

Research Aims

The main objective of the study is to explore a structural model that describes the relationship between the psychological variables described above (engagement, psychological distress and motivation) and the academic variables related to performance, intention to drop-out and actual drop-out in the STEM area. The hypothesized model is reported in Figure 1. The specific research question is: *What are the relationships – predictive, of mediation, of outcome – between engagement, psychological distress, academic motivation, the intention to leave the university, the actual drop-out and academic performance in STEM undergraduate courses?*

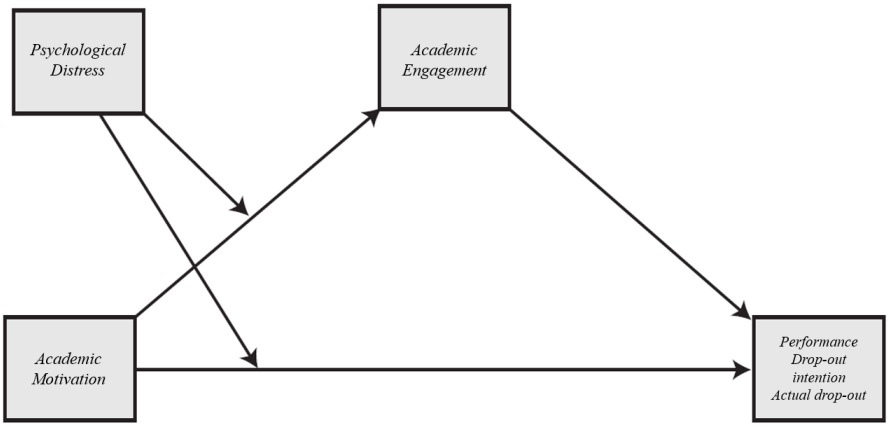

Fig. 1. Hypothesized model of relations among the variables.

Methods

The study has just started, and we plan to include about 1000 students enrolled in the first year of STEM disciplines at our local university. The following instruments will be used: 1) SInAPSi Academic Engagement Scale (SAES), a 29-item survey to measure engagement, which we developed and validated in a previous study; 2) Depression Anxiety Stress Scale (DASS-21), a 21-item self-report questionnaire to assess anxiety, depression or stress-related symptoms; 3) Academic Motivation Scale (AMS), a 20-item self-report questionnaire which self-determination regulations. Data analysis will be carried out as follows: first, the measurement model will be validated through confirmatory factor analyses of the SAES, DASS-21 and AMS questionnaires. Then, the model in Figure 1 will be tested through a structural equation modelling. To assess gender and between-groups differences, a multi-group structural analysis will be carried out.

Expected results and conclusions

We expect to finalize the data collection by the end of May 2024. Analyses will be carried out between June and July 2024, so to present the first results at the conference. The results of the study will contribute to design institutional interventions for the prevention of drop-out at national and EU level.

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