A Method to Predict At-risk Students in Introductory Computing Courses Based on Motivation

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Abstract: This short paper summarizes a work (Schoeffel et al., 2020) that presents and evaluates a method to identify features that allow predicting at-risk students in introductory computing courses, based on four main components: pre-university factors, initial motivation, motivation through the course, and professor perception. For each component was created questionnaires, which have been validated for their reliability and validity using statistical methods such as Cronbach's alpha coefficient, omega coefficient, intercorrelation, and factor analysis. The questionnaires were applied in two distinct moments: beginning the course and weekly through the course. The method, named EMMECS (Evaluation Method of Motivation and Engagement of Computing Students) was created to be easy and simple to apply, and it considers the student motivation longitudinally. It was applied with 245 students from different programs in four different universities in southern Brazil. We carried out several simulations of prediction, using ten different classification algorithms and different datasets. As a result, using support vector machine and AdaBoostM1 algorithms, we identified more than 90% of the failing students in the first week. Although this index has reduced slightly after that, the value of recall remained near or above 80% in the other weeks. The results show that the proposed method is effective compared with related works and it has as advantages its independence of programmatic content, specific assessments, grades, and interaction with learning systems. Another advantage of the EMMECS is that its application is simple and fast, it is possible to predict at-risk students since the first few weeks, and it allows replication independent of the course context or specific tools. Furthermore, the method allows the weekly prediction, with good results since the first few weeks. The main contribution of this work is to develop a method that makes it possible to identify in advance at-risk students in introductory computing courses. Each of the instruments allowed us to find factors related to the outcome and motivation of students. In several case studies, we found evidence of the relationship of the students' outcome to four aspects of initial motivation, fifteen educational factors, the professor's perception, and motivation through the course.

References

*Schoeffel, Pablo. Cechinel, Cristian. Ramos, Vinicius C.F. Wazlawick, Raul (2020). **A Method to Predict At-risk Students in Introductory Computing Courses Based on Motivation.** The ACM Transactions on Computing Education (TOCE). "unpublished.*