

Empowering Students to be Adaptive Decision-Makers: Bringing it All Together

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Abstract

This paper provides an update on activities and accomplishments of an NSF CAREER project about empowering students to be adaptive decision-makers. According to the Self-Regulated Model of Decision-Making, to make adaptive decisions, individuals need knowledge of the context, an understanding of themselves, and effective strategies. Our study is designed to support these components by rigorously studying the context of major changes, developing an instrument to explain student's decision-making competency and map to academic choices and outcomes, and packaging these results along with strategy tools and resources in an academic dashboard. Specifically, we summarize our progress and accomplishments in these three areas: (1) the identification of curriculum-specific indicators of overpersistence (which refers to when a student persists in a major yet does not progress toward attaining a degree for that major) conducted through Chi-Square Automatic Interaction Detector (CHAID) analysis; (2) development and validation of the Multidimensional Inventory of Decision-Making Competency (MIDC); and (3) the design process of the Academic Dashboard for students with functionalities such as tracking their study habits, predicting exam grades and developing their meta-cognition attributes.

Project Overview

The main purpose of this project is to help students learn to make adaptive decisions to be successful in their academic lives. There are three goals that are updated in this paper. Our first goal is to explore the curriculum pathways through understanding the concept of overpersistence (when a student persists in a particular major but does not make the required progress in a timely manner). Our second goal is to develop our decision-making competency instrument and share the results of a confirmatory factor analysis (CFA) on the most recent phase of data collection. Finally, our progress continues on the third goal of developing the features of the Academic Dashboard. As the main goal of the dashboard is embracing the student-centric approach, we have identified key features to include in the Academic Dashboard. Some of these features include metacognition attributes, self-regulated learning activities, and study tracker.

Exploring Curriculum Pathways

Based on our first goal, we continued to explore curriculum pathways in order to understand overpersistence. During this exploration we began to ask questions about our original inclusion criteria for the population of potential overpersisters and the operationalization of the definition that we were using [1]. In discussions with the research team and project evaluator, we updated our criteria to classify students who enroll in their first degree-granting major for at least three semesters and do not graduate within six years as overpersisters [2]. The updated definition better identifies overpersisters because students who switch majors early are no longer flagged as overpersisters and students who switch majors later in their academic careers, but spend a long time in their first major, are still included as overpersisters.

Using our updated definition of overpersistence, we have started drafting a journal article about overpersistence in Mechanical Engineering at a single institution. The draft paper includes the

variables that have been used in our Chi-Squared Automatic Interaction Detection (CHAID) analysis to identify indicators of overpersistence. When presenting the results, our goal is to balance predictive power and usefulness in predicting overpersistence. For example, students' majors at the end of semester eight are very predictive in whether or not a student will overpersist in Mechanical Engineering, but requiring eight semesters of data to make that determination is not very useful. Our analysis shows that a low grade in the mechanical engineering sophomore laboratory is an early indicator that a student may overpersist in mechanical engineering. We are still finalizing the corresponding strategic pathways for these students, but preliminary results show that in addition to the expected pathways of Industrial Engineering and Civil Engineering, many students who struggle in the ME lab find success in Computer Science. This finding will be important because often students are only advised about other engineering majors. Through the Dashboard and feedback to advisors, we can make sure students are aware of options outside of engineering that might appeal to them.

Instrument Development

After many iterations [3], [4], we are preparing to publish our Multidimensional Inventory of Decision-Making Competency (MIDC) so that it can explain student's decision-making competency in more detail and in congruence with the Self-Regulation Model of Decision-Making. This instrument will be used to map decision-making competency to academic choices and outcomes. We have been evaluating the validity of the instrument and its underlying model for use with first-year engineering students by conducting one- and two-level CFAs. Preliminary results show that both models are acceptable. We favor the two-level model as it provides a clear structure for how each of the four factors relates to the overall decision-making competency construct. We are also testing alternate versions of three items. The next steps for the MIDC are to develop feedback for students to understand their decision-making strategies and to help overcome obstacles such as impulsivity or perfectionism.

Bringing it all together - Academic Dashboard

Finally, as we are nearing completion of our first two goals, we are preparing to bring it all together into a student-centric tool we call the Academic Dashboard. As the technical development of a dashboard is beyond the scope of this project, our emphasis is on developing content in modules that could be combined into one standalone system or integrated into existing platforms. We have documented the landscape of existing platforms and key features to be included in the Dashboard [5] and are creating mockups to explore with focus groups.

When a student is on a path that is likely to lead to overpersistence, the Dashboard will suggest strategic alternate pathways and provide appropriate context and tools to help students consider their options. Video testimonials from students who have found their fit in a new major or changed their habits to be more successful in their first major will provide "story-prompting" to help students to write their own story that they tell themselves and others about their choices. Students will be able to take the MIDC and get feedback about their decision-making strengths and tools to overcome their challenges. They will be encouraged to use self-regulated learning tools like tracking their study habits and assessing their understanding. Ultimately our goal is to empower students to make adaptive decisions and take the driver's seat in their education.

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