EEC: Choose your PATH: A First Look

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EEC: *Choose your PATH*: A First Look

Introduction

In a student's undergraduate career, there may be points where they pause and question whether they should persist along their degree path, take a hiatus from their education, redirect to a different engineering major or institution, or leave the engineering degree pathway entirely. These academic decision points (ADPs) are important moments for students who are designing their future and for university retention statistics. Quantitative studies often use large data to explore factors related to binary choices like retention, persistence, or transfer by comparing students who transferred or left engineering to those who did not [1, 2, 3, 4, 5]. Qualitative studies typically look at a specific outcome [6] or demographic of interest, asking students to retell their past experiences [7, 8]. We understand many factors that can help to retain students and many reasons why students are not retained, such as academic performance or feelings of belonging [9, 10, 7, 11]. What we do not yet understand is how often ADPs happen and the factors and resources involved in student decision making [12]. Based on Gottfredson's Theory of Circumscription and Compromise [13], once someone decides a particular career pathway is no longer reasonable, it is highly unlikely for that decision to be revisited or reversed.

Purpose

The purpose of this paper is to share the initial model development of the PATH framework with the engineering education community.

Framework Development

In many models of decision making, choices lead to learning or greater understanding [14, 15]. For students who are considering changing their major or leaving their degree pathway, there are few opportunities to learn from making these decisions. Disrupting a degree pathway often costs time and money, especially in heavily structured degrees like engineering, which can create ripple effects felt by students across their lifetime. Therefore, traditional models of decision-making and persistence are not directly applicable for considering ADPs.

To support the overall project of understanding undergraduate engineering ADPs, a new framework for ADP decision-making was developed. To create this initial model, four theories commonly used in decision-making and persistence literature (Social Cognitive Career Theory, Self-Regulating Decision Making, Network Theory of Social Capital, and Expectancy-Value Theory of Achievement Motivation) were combined with typical constraints found in higher education. These contributed to the PATH framework, a model for understanding ADPs.

Social Cognitive Career Theory (SCCT)

SCCT (Figure 1) is a useful model for evaluating ADPs. In this model, choices related to career selection and development are made based on a number of inputs. These choices are evaluated and act as learning experiences for future career development choices. When entering an engineering major, students have already gone through this cycle a number of times. In reconsidering their major, they are drawing upon the factors in the SCCT model. Person inputs, background influences, and learning experiences are factors that contribute to an ADP. Proximal

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influences may create an inciting event, or the reason for an ADP. Choice goals, proximal influences, and expectations map are used to make a decision, while the decision itself is a choice action.

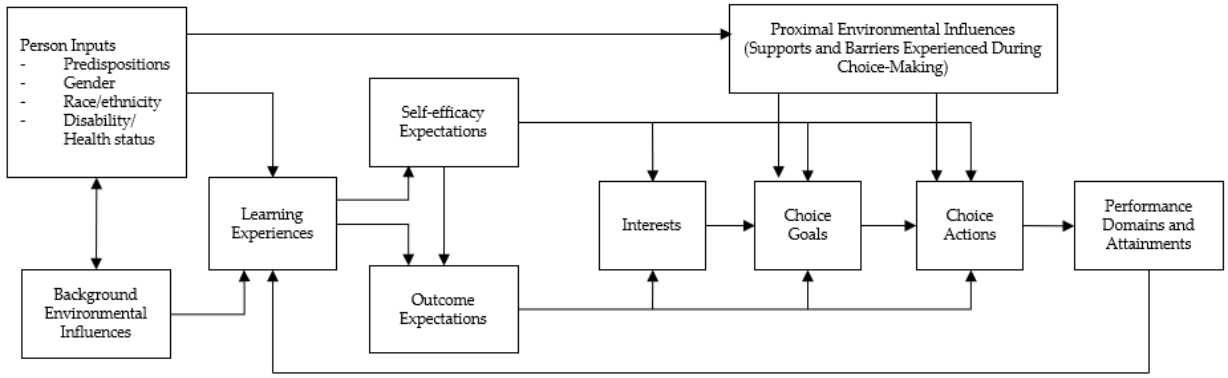

Figure 1. Social Cognitive Career Theory, from [14]

Self-Regulating Decision Making (SDRM)

In SRDM, Figure 2, there are three main phases to self-regulating decision-making. The generation phase begins when there is an event that makes an individual realize that a decision must be made. Possible decisions are generated during this brainstorming-like phase. Next, the options are evaluated over a number of dimensions including how likely the goal would be achieved, the resources required, and social or moral considerations. As with any engineering design process, the individual may move back and forth between the phases to develop a reasonable solution. Finally, the decision is implemented and the outcome is observed, (hopefully) leading to learning for future decisions. Moderating factors including stress, inadequate knowledge, can have an impact during any stage.

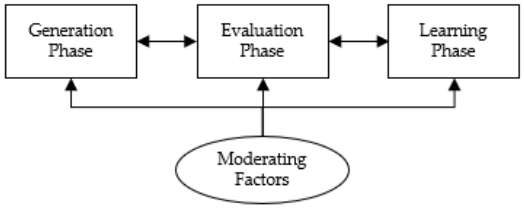

Figure 2. Self-Regulating Decision-Making Model, from [15]

Network Theory of Social Capital

In this initial model, a social capital lens will be used to understand the social networks and resources that students use within their engineering ecosystem when considering their options such as peers, advisors, and family. Social capital is the resources that are gained from relationships which can uncover inequalities based on available resources [16].

Expectancy-Value Theory of Achievement Motivation

In understanding how students use their resources and contributing factors to make decisions, Expectancy-Value Theory is employed. This theory explains achievement-related choices based on expectations for success and subjective task value [17]. In evaluating their options, students

are likely to make choices that align with their values. They are likely to be successful when they expect to be successful.

Academic Constraints

Considering academic constraints, two initial design decisions were made. The framework is linear, rather than cyclic, as ADPs are unlikely to contribute to future ADPs. This is a foundational assumption that may need to be updated during the validation process once student questioning patterns are better understood. The second decision was to state the four possible decision outcomes: Persistence, or remaining in the major; Attrition, or leaving engineering as a major either in transferring majors, institutions, or leaving higher education; Transfer, or staying as an engineering student but transitioning to a different major, concentration, or institution; and Hiatus, or pausing their education with the intention to return, typically through a leave of absence like parental or medical leave. In combining the four theoretical models and the constraints of academic decisions, the PATH framework was developed.

PATH Framework

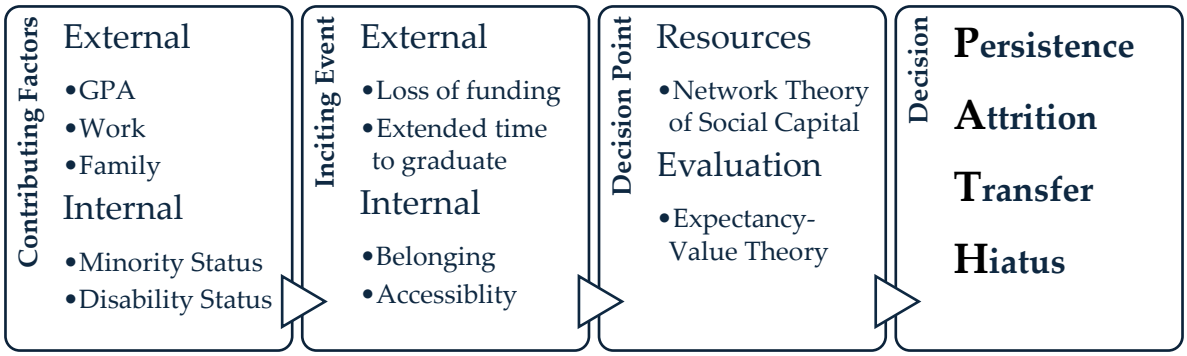

Figure 3. PATH Academic Decision Point Framework

The PATH Framework is a four-step process. Social Cognitive Career Theory (SCCT, Figure 1) [14] and Self-Regulating Decision Making (SRDM, Figure 2) [15] have been pared down and combined to create a model that culminates in the decision rather than cycling back. Decisions may be contributing factors in future ADPs but are not necessarily incorporated in a learning feedback loop. Within the four-step model, two additional theoretical frameworks commonly used in persistence research are used to understand how students navigate the decision point, Network Theory of Social Capital [16, 8] and the Expectancy-Value Theory of Achievement Motivation [17].

Future Work

The PATH framework is a theoretical model that has not yet been validated. The grant supports a mixed-methods study to validate the framework and develop educational materials to support students who are facing an ADP. Initially, large-scale quantitative data collection will be implemented to understand ADP patterns. This data will shed light on the frequency of ADPs, inciting events, and resources used by undergraduate engineering students. Interviews from selected participants will further explore ADPs using phenomenology. The results from the

qualitative and quantitative research will contribute to updating, validating, and expanding the PATH model. Educational materials using this model will be developed based on the results.

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