EXPLORING STUDENTS' DEFINITIONS OF SUCCESS: A REVIEW OF THE LITERATURE

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Abstract – The term “success” has many different meanings for students and stakeholders in the academic environment [1]. The most common measure of student success employed by researchers and institutions is performance-based measures such as grades and graduation rates. The remainder of the definitions are inconsistent among the various stakeholders in the academic environment. Understanding the importance of the criteria used by students to define their success in Canadian undergraduate engineering programs, as well as the degree to which students are motivated to engage in each criterion with a mastery-based approach, could be useful for reconciling the differences between the student group and the other stakeholders in the academic environment and assist in designing teaching strategies that align with these criteria and thus promote a mastery-based view of success.

This paper summarizes three achievement motivation frameworks and contributes a synthesis of the literature regarding student and other stakeholder definitions of student success to identify opportunities and methodologies in preparation for a research study on this topic as it applies to success in the context of Canadian undergraduate engineering students.

Keywords: Student success, achievement goals, motivation, CEAB, engineering education.

1. INTRODUCTION

The term “success” has many different meanings for students and stakeholders in the academic environment, which often encompass more than simply high grades and graduation rates [1]. The literature does not reflect the different, nuanced, meanings of the term success but instead consistently uses GPA and/or graduation rates as the de facto measure. Simplistic institutional performance-motivated definitions of success can be internalized by students and even expected from employers in the future, which is troublesome since external measures of success in the workplace are not always as clearly defined as they are

in university, and also because success in the workforce requires complex epistemological, interpersonal, and intrapersonal development [2]. Additionally, following success criteria outlined by the university that does not align with the students internalized success criteria can be problematic for students since the internal conflict can leave them feeling unhappy and lost [2]. There are many traditional institutional factors that affect students' success, but there are also many non-institutional factors (like spending time with family and friends or working a part-time job) that also affect students' success. The latter are not typically taken into account in the institutional definition of success and, if included, would include a more diverse population of students [3, 4]. Therefore, a richer and broader definition of student success is necessary to encompass the wide variety of students attending Canadian engineering programs, as well as to reflect the current and evolving needs in the engineering workforce [3, 5].

2. STAKEHOLDER DEFINITIONS OF SUCCESS

There are inconsistencies between how different stakeholders in the engineering academic environment and engineering industry define success. The respective definitions of success from the point of view of researchers, students, institutions, and industry professionals will be explored, with inconsistencies being noted between the student's definitions with those of the other stakeholders.

2.1. Researchers' Definitions of Student Success

Some researchers have a very narrow view of how they define success when studying university engineering students, with the predominant measures both nationally and worldwide being GPA and graduation rates, both of which are performance-based measures [6-10]. This has been critiqued in the literature by various international researchers [3, 4, 11]. Yorke identifies that each student's definition of success is very different and likely includes non-academic criteria influenced by other demands on their time, which could change based on their demographic variables [11].

Some of the literature does offer alternative definitions, but there is little consistency. It is clear that success can be defined using both “hard” outcomes like GPA and “soft” outcomes like engagement with learning to achieve personal goals [4]. Student success is defined by New Zealand researchers, Zepke et al., as engagement, persistence, completion [of courses], graduation, and entry to employment [4]. They extend this definition to include achievement of both hard and soft outcomes as well as the engagement with learning to achieve both personal and political goals [4]. An English researcher explicitly defines general short-term student success as “the extent to which the student is able to adjust to the demands of higher education” with the signals of this being engagement (attendance, fulfilling curriculum requirements) and performance (grades) [11]. The same researcher then defines long-term student success as employability, lifelong learning, personal development, and betterment of society [11]. A commissioned American government report on postsecondary student success explicitly defined student success as “academic achievement, engagement in educationally purposeful activities, satisfaction, acquisition of desired knowledge, skills and competencies, persistence, attainment of educational objectives, and [post-university] performance” [3]. These definitions have common themes of achievement of personal goals and lifelong learning, which are lost in outcomes-based definitions.

2.2. Students’ Definitions of Success

There have been studies that explore the idea of how students themselves define their success, as well as identify some factors that affect the variation in personal definitions such as gender and age. A study of first-generation Australian university students found that some students rejected the traditional ideals of success like grades and getting a ‘good’ job. Instead, they defined success based on factors such as: validation received from professors, TAs, or honour roll lists; defying the odds such as proving someone wrong, balancing busy time commitments, or persevering through adversity to learn; and emotional reasons such as loving what they do, passion, or being happy [1]. A study of African American engineering students found that they most often defined success as graduating, happiness, starting a career, spending family time, or making money, which includes both internal and external measures [12]. This study also found variations based on gender, parental education, and engineering discipline. A study of Canadian engineering students at a Montreal engineering school found that half of the students did not list their studies as their top priority, and two thirds were motivated to study to earn their degree rather than learn [13]. A study from York University that found that 75% of the students agreed that their motivation for studying engineering was not for the financial benefits that result from having an engineering degree [5]. These

various motivations for studying and different success criteria demonstrate that students’ definitions of success at university are highly inconsistent as discussed in the literature.

2.3. Industry’s Definition of Success

The effectiveness of engineering programs are often measured by the students’ acquisition of certain skills, without considering the benefit of these skills to the students’ careers [14]. There are also criteria that are important to a student’s success that are not always measured by grades. The most significant competencies related to engineering career success are career insight, proactive personality, openness to experience, and lifelong learning [14]. In most academic literature, these skills are not generally integrated into the discussion of engineering student success (with the exception of lifelong learning) despite their importance.

Career success can be broken into 2 categories: objective career success (extrinsic measures such as salary or managerial level), and subjective career success (self-defined intrinsic measured like career and salary satisfaction) [15]. Career success is often judged only according to extrinsic organizational terms. Subjective definitions of career success differ from the point of view of each individual [16]. A study of British managers in the telecommunication field found that female managers were less inclined to define career success using extrinsic measures such as hierarchical or financial progression [16]. This is an interesting finding, suggesting that gender may be a significant factor in defining and understanding success in the context of engineering students.

2.4. Institution Definitions of Success

Engineering departments at Canadian institutions are guided by graduate attributes related to academic success as defined by the Canadian Engineering Accreditation Board (CEAB). All graduating engineering students in CEAB accredited institutions must demonstrate these performance-based criteria to successfully complete their program [17]. The twelve attributes are: a knowledge base for engineering, problem analysis, investigation, design, use of engineering tools, individual and team work, communication skills, professionalism, impact of engineering on society and the environment, ethics and equity, economics and project management, and life-long learning [18]. These attributes are not always well understood by all stakeholders in the university [19].

A study of University of Manitoba engineering students, faculty, and engineering industry professionals asked each stakeholder to rank what they thought the importance of each CEAB graduate attribute would be for a working engineer [20]. It was found that all stakeholders ranked the twelve CEAB graduate attributes as nearly equally

important [20]. If a relative importance rating of 8.3% measured equal relative importance, all attributes scored between 6.1% and 10.9% relatively important [20]. Meanwhile, the course content and assessment modes were comprised of approximately 50% knowledge base for engineering, with the five lowest ranked graduate attributes comprising less than 2% of course coverage and assessments each [20]. This suggests an inconsistency between what stakeholders in the academic environment understand is needed to be successful in engineering schools and after graduation, with what is actually being assessed and taught in the programs.

There have been studies done internationally regarding the characteristics that lead to becoming a successful engineer, which illustrate significant inconsistency in the responses between engineering students and engineering professionals [21, 22]. While these studies are outside of North America and are over ten years old, other indicators suggest that this may currently be apparent in the Canadian context.

2.5. Indicators of Student Success

Increasing attainment values in engineering students has been linked to higher success (defined by graduation rate) as well as higher levels of interest and lower levels of perceived “cost” of completing the tasks [23]. Attainment values relate to the personal importance of doing well on a task, particularly relating to the degree to which engagement in the task is consistent with the learner’s self-concept of their ability to do well at the task and their interest in the task [23]. Women in engineering tended to have lower levels of attainment values than men which includes having feelings of inconsistency with their self-concept [23]. This inconsistency can be caused, in part, by lack of exposure to career possibilities and activities that particularly interest them [23]. Again, this raises the importance of gender in the discussion of student success, as well as the importance of trying to align student self-concept and institutional concepts of success.

An American study indicated that pre-university indicators (such as high school grades or standardized test scores) of student success (defined as GPA) showed unique predictors for engineers compared to other academic programs [6]. Additionally, the Canadian context may introduce subtleties and differences to this area that may not exist in other countries due to differences in culture, value systems, and institution structure [9].

3. ACHIEVEMENT GOAL FRAMEWORK

There are a number of frameworks to consider when investigating student motivation and goal formation. A theory framing the orientation of university students

toward achievement goals has been under developed by Elliot and colleagues for many years.

3.1. 2x2 Achievement Goal Framework

The 2x2 Achievement Goal Framework developed by Elliot & McGregor in the year 2001 is a theory that explains how a person is motivated to achieve their goal [24]. They can either be motivated to achieve success or motivated to avoid failure of the task. The student can also either compare themselves to the performance of others or to their own mastery of the task. Each of these factors can interact with the others, forming a 2x2 matrix of interaction shown below in Table 1. This gives the four orientations of: performance-approach, performance-avoidance, mastery-approach, and mastery-avoidance.

Table 1: 2x2 Achievement Goal Framework [24]

	Compared to self/ task	Compared to others
Approaching Success	Mastery-Approach	Performance-Approach
Avoiding Failure	Mastery-Avoidance	Performance-Avoidance

Mastery goals are often associated with intrinsic motivation and portrayed as the ideal [24]. They are also positive predictors of deep processing of class material [24]. Performance approach goals are usually associated with external motivation, are negative predictors of deep processing, and are positive predictors of surface-level processing and disorganized studying [24]. A performance approach is actually the only approach that is a positive predictor of exam performance [24]. These goal orientations are measured using the Achievement Goal Questionnaire, devised by Elliot and McGregor. McGregor published an update to the measurement questionnaire in 2008, called the Achievement Goal Questionnaire-Revised [25].

3.2. 3x2 Achievement Goal Framework

Ten years after publishing of the 2x2 Achievement Goal Framework, the same author, Elliot, published an updated achievement goal model that splits the Mastery framework into its two distinct components, achievement relative to task and achievement relative to self, shown below in Table 2 [26].

Table 2: 3x2 Achievement Goal Framework [26]

	Compared to task	Compared to self	Compared to others
Approaching Success	Task-approach	Self-approach	Other-approach
Avoiding Failure	Task-avoidance	Self-avoidance	Other-avoidance

This framework was devised as an improvement to the 2x2 framework because after further research there was found to be a statistical difference between the comparison-to-the-task orientation and the comparison-to-ones-past-self orientation. This framework was further developed in 2017 to include the reasons behind each of these goal orientations. Each orientation could be caused by either autonomous reasons (challenge, excitement, personal significance), or controlled reasons (internal or external pressures) [27]. For example, a person could be seeking to improve upon a task, a self-approach goal, with the reason for doing being that it is an exciting challenge (autonomous reason) or because it would be a boost to the ego (controlled reason).

4. EXPECTANCY-VALUE MODEL

Another way of looking at students' motivation and success in their goals is through the expectancy-value model. The expectancy-value model attempts to explain people's choices of achievement goals as well as their success in them [28]. The values/motivations behind their choices can directly influence performance and success in different tasks [28]. How people view their future success as well as how they value an activity can be shown through the expectancy-value model. The model is shown below in Table 3, outlining the various ways a person can value a task or are otherwise motivated to achieve a task.

Table 3: Components of Subjective Task Value [29, 30]

Component	Description
Attainment Value	The personal importance of doing well on the task.
Intrinsic Value	The personal enjoyment of or interest in engaging in a task.
Utility Value	How well a task relates to personal goals.
Relative Cost	The negative aspects of engaging in the task, like opportunity cost or fear of failure.

Achievement goals and the expectancy-value model have been shown in research to be related. Research has suggested that achievement goals partially mediate the relationship between task-values shown in Table 3 as well as success outcomes [31].

5. LEARNING ORIENTATION

Student's orientation towards learning can be categorized into four distinct categories: vocational, academic, personal, and social [32]. Vocational goals involve using university as a tool to get a job, academic goals involve the academic and learning side of university, personal goals involve personal improvement, and social

goals involve the social side of university [32]. Each of these four categories can be subdivided as by the intrinsic or extrinsic motivation of the student.

5.1. Intrinsic and Extrinsic Motivation

Intrinsic motivation refers to motivational forces that are internal and independently rewarding, such as curiosity, interest, and satisfaction. In contrast, extrinsic motivation refers to motivational forces that are external to the self and are seen as a means to an end, such as doing well on a test. High intrinsic motivation is often associated with success, and the mastery goals discussed above [33]. Although often considered opposite, intrinsic and extrinsic motivation can coexist within a learner [33]. For example, a student may be motivated by both a curiosity into a subject and a motivation to obtain a specific grade that will allow them to further their studies at a prestigious university. Not only can intrinsic and extrinsic motivations coexist, they can be harnessed symbiotically by teachers [33]. Educators can create an extrinsic scaffold for students to build knowledge and skills to provide learners with the reinforcing sense of efficacy that in turn fosters intrinsic motivations [33].

5.2. Learning Orientation Model

Table 4 shows how each of these four learning orientation categories can be divided by the intrinsic and extrinsic motivation of the student. The "personal intrinsic" dimension was not included in the initial publication of this theory. It was an addition proposed at a later date by a different team of researchers [34].

Table 4: Student's Learning Orientations [32]

Orientation	Student's Aim
<i>Vocational</i>	
Intrinsic	Relevance to future career
Extrinsic	Obtaining a qualification of recognized worth
<i>Academic</i>	
Intrinsic	Academic interest
Extrinsic	Achieving grades
<i>Personal</i>	
Intrinsic [34]	Self-improvement, seeking challenge
Extrinsic	Proof of capability
<i>Social</i>	
Intrinsic	Helping people, contributing to society
Extrinsic	Having fun at school

This combined theory of students' orientation to learning outlined in Table 4 focuses on *what* students are trying to achieve while at university [32, 34]. This theory has a distinctly different goal than the previously mentioned achievement goal framework and expectancy-value model [26-28].

6. DISCUSSION

The three frameworks discussed each seek to categorize and explain different components of the student's decision-making process while at university. The learning orientation theory focuses on *what* the student is motivated to do while at university [32, 34]. The expectancy-value model focuses on *why* students choose to engage with certain tasks [28]. The 3x2 achievement goal theory focuses on *how* they approach their goal [26, 27]. These three frameworks will be used to categorize and develop an understanding of undergraduate engineering students' goals and motivations at university. This understanding can assist in reconciling the inconsistencies between the student groups' view of success with the other stakeholders in the academic environment. An understanding of student's view of success could also be used to inform program goals and teaching approaches by introducing scaffolding techniques to help students transition from extrinsically-motivated mindsets to intrinsically-motivated mindsets [33]. The future research study will involve developing an instrument to gather detailed student success criteria. The instrument will be improved and validated by a pilot study of a selection of engineering graduate students before being implemented in a population of undergraduate students for primary data collection to better understand students' views of success.

7. CONCLUSIONS

The usual measures of student success defined by researchers and institutions are grades and graduation rates, which is a performance-based measure that is a positive predictor of surface processing of academic material [24]. Otherwise, there are inconsistencies around how different stakeholders (students, researchers, industry professionals, and institutions) measure and define success. Although there is indication of inconsistencies of how success is defined, there is minimal research investigating students' opinions about their success criteria, especially engineering students, and particularly Canadian engineering students. By adapting the numerous motivational theories and developing a specific instrument to understand how engineering students define and seek to attain success, the authors plan to undertake a research study to make progress toward resolving these questions and the inconsistencies between the student group and the other stakeholders in the academic environment.

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