A Conceptual Approach to Adapting the Science Motivation Questionnaire (SMQ) II to Explore Motivational and Background Factors Influencing Student Enrollment on College Technology Programmes

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Abstract

Lack of student enrolment on college technology programmes persists. Extant research suggests motivation to learn impacts enrolment on STEM programmes. Furthermore, background factors can influence motivation to learn. While studies have been conducted internationally, few use a validated model to empirically assess motivation to learn. This study proposes the Science Motivation Questionnaire (SMQ) II to explore how motivational and background factors influence student enrollment on a college technology programme.

1. Introduction

Technology is a key driver of change in the Irish economy and improved digital skills are vital for Ireland's future [1, p.10]. An estimated further seven million technology workers will be required across the EU by 2025. However, the number of students enrolling in, and graduating from, technology programmes is decreasing globally. This is despite enormous efforts to promote Science, Technology, Engineering, Mathematics (STEM), and technology in particular. Of further concern, is an enrolment gender chasm, as approximately 85% of entrants to technology programmes and 80% of current technology graduates are male [2, p.95], despite technology skills action plans repeatedly targeting this issue.

A lack of student motivation to learn technology acts as an impediment to the knowledge required to make an informed decision to enroll on a technology programme in college [3]. Furthermore, background factors [4] influence motivation to learn technology [5], [6], [7], [8], [9]. Research by [10], [11], [12], and [14] further conclude that students' motivation prior to entry to a programme of study, also significantly impacts on retention. While these issues have been studied widely in the United States [8], [14], [9] and indeed across the world [15], [16], [17], [18], [19], [20], very few studies have taken place in Europe with the exception of some in the UK [21]. There is a gap in the literature in understanding how background factors influence motivation to learn technology in an Irish context.

The Expert Group on Future Skills Needs (EGFSN) [2] report extends the key concepts of Ireland's National Skills Strategy 2025 [1] which is closely aligned with *Enterprise 2025 Renewed* [22]. Central to these reports is a theme of *Digital Transformation* blurring the lines and creating strong linkages between technology and business [2, p.18 and p.92]. Strong international competition for skilled graduates creates an economic imperative to develop and retain graduates with high-level technology skills to satisfy demand across the Irish economy. Likewise, it is imperative for Ireland to be able to continue to attract and serve the RandD activities of high-tech manufacturing and global services companies that are important for Ireland's economic growth [2, p.5]. The availability of high-level technological skills is also a unique selling point in attracting investment and growing businesses across all sectors of the economy.

One of the key findings of the EGFSN [2, p.40] report was the serious difficulty organisations experience in hiring graduates with technology skills. Despite improvements in the supply of technology graduates from third-level institutions in recent years, the numbers are insufficient [2, p.8]. This was further emphasized in the *Enterprise 2025 Renewed* report [22], which states *"since the publication of Enterprise 2025, the disruption to global business models and to ways of working are now becoming a reality for all businesses. Disruptive technologies are starting to take hold with the potential to have a transformative impact on productivity, innovation, and profitability. A new set of personnel will be required to build, maintain, operate and regulate these emerging technologies"*.

The business response and rapid digitalization of businesses during the Covid-19 pandemic has further increased demand for high tech graduates. Universities have a major role to play in addressing the shortfall and developing graduates with high-level technology skills. Thus, research to inform and develop appropriate and timely interventions to diminish impediments undermining enrolment on technology programme is welcomed at local, national, and indeed international levels.

The 2012–2018 ICT Skills Action Plans aimed to improve the gender balance by encouraging more

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females to engage in technology careers. Despite these ambitions, approximately 85% of entrants to technology programmes and 80% of current technology graduates are male [2, p.95]. A similar ratio is evident in China [20], as the percentage of male students in the top 10 STEM majors was over 80%. This is attributed to "*traditional gender codes that tend to associate women with social sciences and family life*" [20]. While the recommendations of the EGFSN [2] are welcome, very little research has been conducted in an Irish context on this topic, and very little is known about why female students are less motivated to apply to technology programmes.

Evidence in the literature suggests this is not a problem unique to Ireland. In fact, the Global Junior Achievement (GJA) [23], [24], [25], surveys report declining interest in STEM across all genders. A review of extant literature published between 2005-2023, reveals further evidence that motivating students to enroll in STEM programmes is a global problem, with evidence from the US, UK, Serbia, Indonesia, India, China, Greece, Portugal, Qatar, Philippines, Germany, Nigeria, and many other countries. Research by [10], [11], [12], [3], [9], and [20], further conclude that students' motivation to learn technology significantly impacts retention.

While a number of research models exist to explore motivation to learn STEM, by far the most cited and validated model, is the Science Motivation Questionnaire (SMQ II) [14].

SMQ II is a revised version of previous iterations of SMQ [26], [27], [28] to refine its construct validity and validate its five motivation components: Intrinsic Motivation, Self-Determination, Self-Efficacy, Career Motivation, and Grade Motivation as depicted in Figure 1. SMQ II has been adapted for use in a plethora of studies over the past decade [14], [29], [3], [30], [15], [16], [17], [18], [19], [20].

However, motivational factors are just one dimension of the story. It is evident from the literature, that background factors [4] can influence motivation to learn technology [5], [6], [7], [8], [9]. Several studies show that motivation to learn technology can be influenced by background factors such as gender, grades, parental education, socioeconomics, location, a relative working in the profession, familiarity with profession, awareness of careers and salaries, faculty engagement, access to information, etc. [5], [6], [7], [8], [9], [3].

Thus, of critical importance to this study, is how background factors influence motivation to learn technology, acting as an impediment to the knowledge required to make an informed decision to enroll on a college degree programme in technology. Table 1 presents the Background Factors identified from the literature for this study, which will be used to guide the discussion of the literature in the remainder of the paper.

Factor 1. Intrinsic motivation
- Learning science is interesting
- I am curious about discoveries in science
- The science I learn is relevant to my life
- Learning science makes my life more meaningful
- I enjoy learning science

Factor 2. Career motivation
- Learning science will help me get a good job
- Understanding science will benefit me in my career
- Knowing science will give me a career advantage
- I will use science problem-solving skills in my career
- My career will involve science

Factor 3. Self-determination
- I study hard to learn science
- I prepare well for science tests and labs
- I put enough effort into learning science
- I spend a lot of time learning science
- I use strategies to learn science well

Factor 4. Self-efficacy
- I believe I can earn a grade of "A" in science
- I am confident I will do well on science tests
- I believe I can master science knowledge and skills
- I am sure I can understand science
- I am confident I will do well on science labs and projects

Factor 5. Grade motivation
- Scoring high on science tests and labs matters to me
- It is important that I get an "A" in science
- I think about the grade I will get in science
- Getting a good science grade is important to me
- I like to do better than other students on science tests

Figure 1 Motivation Factors SMQ II [3]

Background Factors
Social
Gender
Socioeconomics
Location
Relative in the Profession
Parental Education Level
Awareness
Awareness of the Profession
Awareness of Careers
Awareness of Salaries
Awareness of Job Security
Awareness of Job Listings
Engagement
Engagement with College Course Leaders
Engagement with College Faculty
Engagement with College Staff
Engagement with College Open Days
Engagement with School Alumni
Engagement with Peers
Engagement with School Careers Officer
Information
Information in Newspaper Articles
Information on the TV and Radio
Information on the Internet/Web
Information on Social Media
Information on the College Website

Information in the College Brochure
Academic
Choice of School Subjects
School Subject Learning Experience
Grades
School
Participation in Related Extra-Curricular Activities

Table 1 Background Factors [8], [9], [14].

It is clear that before we can develop appropriate and timely interventions to manage the background and motivational factors acting as impediments and undermining enrolment on a college degree programme in technology, or indeed student retention, we must first analyse student motivation to learn technology so that we may characterize (un)motivated students as accurately as possible [3]. However, we must first understand what we mean by motivation to learn technology. Thus, the formal study objective is '*to investigate how background and motivational factors influence student enrolment on a college technology programme'*.

2. Science Motivation Questionnaire

SMQ-II consists of five motivation components: Intrinsic Motivation, Self-Determination, Self-Efficacy, Career Motivation, and Grade Motivation as depicted in Figure 1. The motivational factors are designed to serve as empirical indicators of components of motivation to learn science in college courses. Although SMQ-II was validated with science majors and non-science majors in college courses [14], it has been adapted by many researchers in numerous studies including chemistry [29], [30], biology [15], mathematics [18], science [20], and even high school adolescents [3], [17], [19].

SMQ-II is widely used because of its simple language [14]. SMQ II is operationalized by a series of statements. It is clear from the design, its validation, and reviews of its application that it is very firmly grounded in prior theoretical models of SDT, SCT and SCCT. Thus, SMQ-II is recognized as a robust and valid framework to examine student motivation to learn STEM across all disciplines [20]. This study adapted the SMQ II statements to study motivation to learn technology as shown in Table 2.

Statements
1. The Information Technology I learn is relevant to my life
2. I like to do better than other students on Information Technology tests
3. Learning Information Technology is interesting
4. Getting a good Information Technology grade is important to me
5. I put enough effort into learning Information Technology
6. I use strategies to learn Information Technology well
7. Learning Information Technology will help me get a good job
8. It is important that I get an ''A'' in Information Technology
9. I am confident I will do well on Information Technology tests
10. Knowing Information Technology will give me a career advantage
11. I spend a lot of time learning Information Technology
12. Learning Information Technology makes my life more meaningful
13. Understanding Information Technology will benefit me in my career
14. I am confident I will do well on Information Technology labs and projects
15. I believe I can master Information Technology knowledge and skills
16. I prepare well for Information Technology tests and labs
17. I am curious about discoveries in Information Technology
18. I believe I can earn a grade of ''A'' in Information Technology
19. I enjoy learning Information Technology
20. I think about the grade I will get in Information Technology
21. I am sure I can understand Information Technology
22. I study hard to learn Information Technology
23. My career will involve Information Technology
24. Scoring high on Information Technology tests and labs matters to me
25. I will use Information Technology problem-solving skills in my career

Table 2 SMQ II for Technology [14]

3. Motivation to Learn

Motivation is a multi-component construct [27], [14], [18], [20]. In the context of the SMQ II survey adapted for this study, Intrinsic Motivation, Self-Determination, Self-Efficacy, Grade Motivation, and Career Choice are identified as the key components of motivation to learn.

3.1. Intrinsic Motivation

Intrinsic motivation is our inherent satisfaction in learning for the sake of learning [5], [31] driven by a desire to do something we consider interesting or enjoyable [5]. Our only reward is the joy of engaging in the intrinsically motivated activity. Therefore, intrinsic motivation is a key factor influencing academic achievement and it is often construed as curiosity, interest, satisfaction, and sense of purpose in the context of learning [5], [18], [20]. In the context of this study, intrinsic motivation to learn technology is a student’s innate desire or interest [32], [14], [20] in learning technology.

3.2. Self-Determination

Self-determination is our belief that we have autonomy, control and indeed can self-regulate our actions [33], [14], [18], [20]. Autonomy is an individual’s need to be the source of their own behaviour, and in an educational setting, encourages engagement with specific content or in a contextual activity [32], [5], [18, [20]. In an educational context, self-determination is our perceived control or autonomy over our learning or indeed a student’s self-regulation [33], [18], [20] to learn technology. Thus, feelings of autonomy have a positive impact on choice [20] and thus, influence motivation to learn technology.

3.3. Self-Efficacy

Self-efficacy is our belief in what we can accomplish given our capabilities or skillset [34], [35] or in our capacity to perform a particular behaviour [36] or in our perceived task performance competencies in specific content and contexts [5], [14], [18], [20]. Competence refers to our capacity to change the outcome or to experience mastery. Competence enables attainment of our goals and it engenders satisfaction from performing an activity [32], [5], [18]. Self-efficacy evolves as the requirements for perceived competency change, which subsequently requires revision of our self-efficacy to function in the new environment [37]. In the context of education, self-efficacy refers to a student’s belief that they can perform well [38], [20], and thus, it is a strong indicator of academic achievement [39]. It is also suggested [40], [41], that self-efficacy to learn technology is a primary component of what motivates a student to apply for an IT programme.

3.4. Grade Motivation

Extrinsic motivation to learn is a means to a tangible end, such as a career or a grade [42]. Thus, when we are extrinsically motivated, we perform an activity or engage in a behaviour that results in tangible outcomes [5]. In an educational context, defined tangible outcomes such as grades, are short-term goals [5]. Grades are important short-term goals because they are measures of college success and are part of the entry criteria for many careers [7]. Grade Motivations and Career Motivations are often described as two extrinsic motivators at opposite ends of a continuum in education. Grade motivations encourage students to study because they expect good grades as an extrinsic reward [14], [18], [20].

3.5. Career Motivation

Career motivations are at the opposite end of the spectrum to Grade Motivation because in achieving good grades students expect better career options, thus, endorsing the value of the extrinsic goal [12], [14], [18], [20]. Careers are important long-term goals [11] and career motivation is a key positive factor of a student's career success [7], [11], [12], [20] and a key motivator in choosing a technology programme in college [40], [43], [44]. If students have greater clarity of career direction, then educational institutions will experience enhanced outcomes in terms of academic performance, interest in coursework, and indeed retention [12], [45]. A career focused choice of specialism can even have positive long-term impact on retention of graduates within a profession [11], [12]. Having discussed student motivation to learn technology and its impact on student enrolment on a technology programme, our focus now turns to how background factors influence student motivation to learn technology.

4. Background Factors Influencing Motivation to Learn Technology

Motivational factors are just one dimension of the story. Several studies show motivation to learn technology can be influenced by background factors including social factors, awareness factors, engagement factors, information factors and academic factors [3], [9], [14] as shown previously in Table 1.

4.1. Social

A student’s social background has a significant influence on motivation to enroll on a STEM programme [46]. A student’s demographic background, gender, race/ethnicity, and socioeconomic status are the most common variables influencing students’ choice of programme, and subsequently, academic performance, and prospects of completing their studies [47]. Some studies [3], [20] reveal higher motivational scores among males than females in the context of choosing a STEM programme. Professor Kersten Mey of the University of Limerick contends “*there is a lingering prejudice that certain scientific subjects are hard core subjects for men and women do the softer options*" [48]. However, although females are less likely to express an interest in STEM, that once enrolled, they outperform their male counterparts [49].

4.2. Awareness

One reason students apply to Computer Science is *"the features of computing careers"* [41, p.126]. Some studies underline the importance of the perceived image of IT professionals, while the reputation of the programme can also influence student enrolment [43], [9]. Other studies identify salary, prestige, and job security as significant factors influencing enrolment in a technology programme [6], [50], [51].

However, citing a study by [52], it is suggested some students still harbor misunderstandings about technology careers (i.e.) technology graduates work is repetitive and singular and that graduates sit at a computer all day [53]. This may be because students are not sufficiently informed of the variety of careers in technology from an early age to decide about a career in technology [8], [54]. It is argued that we must overcome these misconceptions promoted by the media and indeed cinema [53]. To increase enrolments, some researchers argue we increase school students' knowledge of the technology profession and careers [9]. Furthermore, job listings are an important factor in programmatic choice, but students must be aware of such [47]. Future studies should evaluate how "*fully informed and aware students are of the typical work characteristics and occupational rewards*" of technology careers [8 p. 50].

4.3. Engagement

Several studies reveal that students are more motivated to learn technology when they engage with motivated academics and receive individual encouragement from professors [47], [50], [55], [56]. Family members are also a strong influence [47], [55], [56]. This engagement also has a bigger influence on females than males, thus potentially assisting in their recruitment [47], [50]. Previous studies also highlight the importance of peers as some students primarily learn about technology programmes by engaging with faculty, while student peers are a secondary source [43], [57].

4.4. Information

Technology students tend to choose their specialism by self-sourced information on the Internet [53]. High numbers of students also report that their careers guidance counsellor was not helpful in providing information about technology programmes [53]. Alumni, the internet, newspapers, and television are also primary sources of information about college programmes [6]. Other studies reveal that a lack of information and considerable misinformation were significantly detrimental to programmatic choice [8], [58], [59]. However, one study discovered that none of the information sources in their survey scored above average as information sources, but that information listed on the college websites, brochures and information on the internet are most important [8].

4.5. Academic

Some studies suggest the primary reason students apply to Computer Science programmes is their "*early experiences with computers"* [41] and motivation to learn technology is linked to student participation in STEM related activities in school [60]. In one study, students "*reported that the traditional lecture and self-directed learning methods in high school technology classes are not beneficial and, in fact, contribute to their negative perceptions of technology careers*" [9, p.10].

Following this discussion of Motivational Factors and Background Factors, Figure 2 presents the Conceptual Research Model for the proposed study.

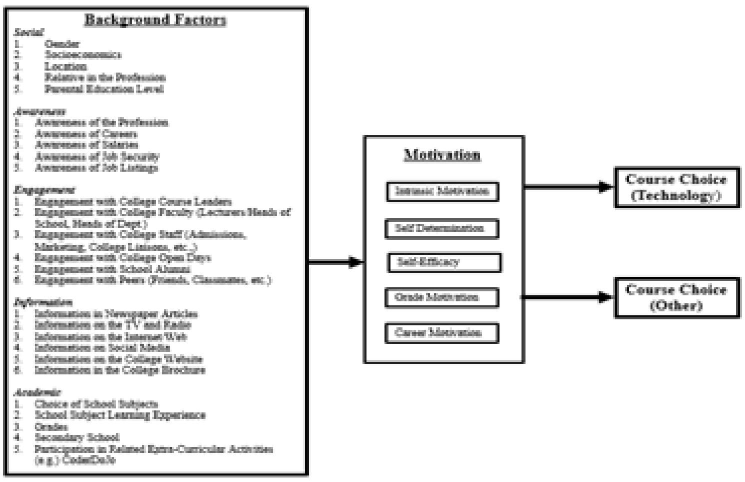

Figure 2 Conceptual Model [8], [9], [14]

5. Research Philosophy and Methodology

When approaching a research study, "*your first question should not really be 'which methodology' but 'what do I need to know and why?"* [61, p.139-140].

5.1. Research Philosophy

Ontology is "*the study of the essence of phenomena and the nature of their existence*" [62] and it assumes that a certain reality exists [63].
We can assert "*a phenomenon has a truth to it* (a reality) *which is independent of what individuals perceive, and thus it can be proved through the use of quantitative methods*" [64, p.319].

This study assumes an ontological stance accepting a reality where motivation to learn technology can be measured and the influence of background factors can be explained. Thus, an epistemological realist position, as opposed to an idealist position, asserts that the *"social world external to individual cognition is a real world made up of hard, tangible and relatively immutable structures"* [65].

Epistemology is the basis of this pursuit of reality [66]. It is the assumptions made about knowledge and how it is obtained [67]. Epistemology is defined as *"the branch of philosophy concerned with the study of the criteria by which we determine what does and does not constitute warranted or valid knowledge"* [62]. Extant research of motivation to learn technology and the influence of background factors assumes an objective reality is "*waiting to be discovered and that this knowledge can be identified and communicated to others*" [68, p. 401]. Thus, this research adopts an objective realist epistemological perspective.

Axiology defines how a researcher explains, predicts, or interprets the world. A key description of the axiology of research philosophies and related data collection methods is outlined by [69].

Positivism *'seeks to explain and predict what happens in the social world by searching for regularities and causal relationships between its constituent elements'* [65]. Positivist research tests theory in quantitative terms to increase the predictive understanding of phenomena [70]. Positivist research is characterized by *'formal propositions, quantifiable measures of variables, hypothesis testing and the drawing of inferences about a phenomenon from a representative sample to a stated population'* [71]. Positivism contends the subject and method of inquiry can be objectively chosen, the observer is independent of observations, and fundamental laws explain the regularities in observable occurrences [63], [67]. Thus, positivism is the appropriate philosophical position for this study as the researcher:

- seeks to test theory in quantitative terms drawing inferences about a phenomenon from a representative sample,
- the researcher is independent of the observation,
- the research is structured using quantifiable measures with an emphasis on protocol and techniques,
- the deductive method follows a logical and rational process,
- and the research objective is observed and interpreted through a lens of extant theory and experience.

5.2. Research Methodology

Qualitative and quantitative research methods are founded on opposing paradigms and assumptions [62]. Qualitative research methods including action research, case studies, and ethnography were originally developed in the social sciences to enable researchers to study contextual social and cultural phenomena [62]. Qualitative research accentuates the socially constructed nature of reality, the intimate relationship between the researcher and what is studied, and the contextual constraints shaping inquiry [72]. Qualitative research emphasizes the value-laden nature of inquiry, seeking answers to questions that explore how social experience is created and given meaning [72], [73].

Quantitative research originates from the natural sciences, and especially positivism, and are widely accepted in research [73]. Methods for conducting quantitative research include surveys. Quantitative research enables objective measurement and analysis. It is an appropriate method to generate knowledge of how background factors influence motivation to learn technology, acting as an impediment to the knowledge required to make an informed decision to enroll on a college degree programme in technology.

According to [61, 139-140], methods are "*chosen and selected because they will provide the data you need to produce a complete piece of research*", while also enabling you to "*design the tools (data collection instruments) to do the job"*. A review of the literature reveals that a number of different theoretical bases have been used to study student motivation factors and how they influence student enrolment in college technology programmes. These include the Theory of Reasoned Action (TRA) [4], the Theory of Planned Behavior (TPB) [74], Self-Determination Theory (SDT) [32], Social Cognitive Theory (SCT) [75], the Social Cognitive Career Theory (SCCT) [76], [77], the Reasoned Action Model (RAM) [4] and the Students' Continuing Motivation for Science Learning (SCMSL)[78]. Past quantitative studies have also created surveys using the Students' Motivation Towards Science Learning (SMTSL) [15], the Students' Adaptive Learning Engagement in

Science (SALES) [79] and the Students' Continuing Motivation for Science Learning (SCMSL) [80].

However, over the past decade, the Science Motivation Questionnaire II (SMQ II) [14] has been proven to be the most reliable in this field. SMQ-II is widely used because of its simple language [3] and it is clear from the design, its validation, and reviews of its application that the SMQ II model is underpinned by SDT, SCT and SCCT. It is clear that the SMQ II motivational factors are very firmly grounded in the aforementioned theoretical models.

5.3. Research Objective and Questions

As previously stated, the formal study objective is '*to investigate how background and motivational factors influence student enrolment on a college technology programme'*. Two research questions were established to address this objective as follows:

Research Question 1

How do Background Factors Influence a Student's Motivation to Learn Technology?

In previous studies, a two-part (A and B) online procedure was adopted [3]. Typically, Part A asks students about factors such as socioeconomics, gender, age and academic background factors [3]. A "*two-part (A and B) online procedure"* was used by [14]. In Part A, [14] asked about individual differences (e.g. socioeconomics, gender, age, parent's income, etc.) and academic background (e.g. GPA), promoting candid responses by assuring confidentiality of student identities. In tech vs non-tech programme choice studies, first year Business Students are often the focus [8], [9], [43], [81]. First year business students were surveyed when trying to establish "*why are students not majoring in Information Systems*" [8]. This survey [8] was also used by [43] and [81]. Similarly, a mandatory first year IT class for both IS Majors and Non-IS Majors in a Business School was the subject of a survey to explore high school graduates' understanding of technology careers and the reasons they choose not to major in technology fields [9]. These studies [8], [9] provide some excellent questions measuring student background factors. Thus, Part A of this study asks questions related to background factors extracted from previous studies [8], [9], [14] outlined previously in Table 1 to answer Research Question 1 by measuring how background factors influence motivation to learn technology.

Research Question 2

How Does Motivation to Learn Technology Influence Student Enrolment in a College Technology Programme?

Although, SMQ-II was validated with science majors and non-science majors in core-curriculum college courses [14], a review of the literature reveals that both SMQ and SMQ-II have been adapted by many researchers in numerous STEM studies around the world [3], [14], [15], [16], [17], [18], [19], [20], [26], [27], [28], [29], [30], including in disciplines such as chemistry, biology, engineering, mathematics.

SMQ-II is recognized as being a robust and valid framework to examine student motivation to learn STEM across all disciplines [20]. Hence, the SMQ II framework [14] is adapted for this study to measure the motivational factors, replacing science with technology.

In Part B of previous studies students are typically asked to respond to the 25 items SMQ-II [14]. Similarly, Part B of this study adopts the same approach as outlined Figure 3. Five-point Likert scales are adopted to analyse responses.

5.4. Research Sampling and Deployment

Extant studies of motivation and background factors use comparative studies of students classified as tech specialists and non-tech specialists [8], [9], [14]. This study proposes purposive sampling with a group of first year technology students and a group of first year business students. All SMQ II based studies deploy quantitative survey instruments as testing theory in quantitative terms increases the predictive understanding of phenomena [81]. The author is proposing a quantitative method reflective of previous SMQ II studies [8], [9], [14]. This study will use an online survey hosted on Survey Monkey. The researcher considered it more appropriate in the survey design to ask questions related to the background factors first as these questions were more typical of what they would normally be asked in a student survey.

6. Conclusion

This paper explores how background and motivational factors influence student enrolment on a college technology programme. The paper adapts the SMQ II questionnaire, to study motivation to learn technology.

As per SMQ II and in the context of technology, Intrinsic Motivation refers to a student's interest in learning technology. Self-Determination refers to a student's self-regulation in learning technology. Self-Efficacy is used to describe students' confidence in performing well in technology learning. In the short term, students are driven by Grade Motivation to get into a college programme. By contrast, Career Motivation is a long-term goal and a key positive predictor of a student's career success. Thus, unlike Intrinsic Motivation, Self-Determination and Self-Efficacy which are internally generated, Career

In order to better understand what you think and how you feel about Technology subjects, please respond to each of the following statements from the perspective of "when I am in Technology course..."					
Statements	**Never 0**	**Rarely 1**	**Sometimes 2**	**Often 3**	**Always 4**
Intrinsic Motivation					
Learning Technology is interesting					
I am curious about discoveries in Technology					
The Technology I learn is relevant to my life					
Learning Technology makes my life more meaningful					
I enjoy learning Technology					
Career Motivation					
Learning Technology will help me get a good job					
Understanding Technology will benefit me in my career					
Knowing Technology will give me a career advantage					
I will use Technology problem-solving skills in my career					
My career will involve Technology					
Self-Determination					
I study hard to learn Technology					
I prepare well for Technology tests and labs					
I put enough effort into learning Technology					
I spend a lot of time learning Technology					
I use strategies to learn Technology well					
Self-Efficacy					
I believe I can earn a grade of "A" in Technology					
I am confident I will do well on Technology tests					
I believe I can master Technology knowledge and skills					
I am sure I can understand Technology					
I am confident I will do well on Technology labs and projects					
Grade Motivation					
Scoring high on Technology tests and labs matters to me					
It is important that I get an "A" in Technology					
I think about the grade I will get in Technology					
Getting a good Technology grade is important to me					
I like to do better than other students on Technology tests					

Figure 3 : Science Motivation Questionnaire (SMQ) II for the Technology Subject [14]

Motivation and Grade Motivation are motivational constructs that are externally generated (extrinsic).
The paper proposes that motivation to learn technology is potentially influenced by background factors including gender, grades, parental education, socioeconomics, a relative working in the profession, familiarity with the profession, awareness of careers and salaries, prestige of the profession, job security, faculty, alumni, subjects, information on TV, radio, internet, and college websites, participation in related extra-curricular activities, open days, brochures, and job listings.

The paper concludes that the SMQ II is an established model by which to measure motivation to learn technology. The paper also concludes that the background factors established by [8], [9] and [14] are compatible with this study reflective of research methods established in literature.

Future research will focus on the deployment of this study.

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