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Undergraduate Motivations for Choosing a Science, Technology, Engineering, or Mathematics (STEM) Major

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Chancellor's Honors Program Senior Thesis

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Abstract

In the past ten years the growth of science, technology, engineering, and mathematics (STEM) professions in both the public and private sectors has been unprecedented in the United States, and government initiatives, such as Educate to Innovate, contributed over $700 million USD towards STEM education since November 2009 (The White House). This project investigates the external and internal factors and motivations that influence undergraduate students to choose a STEM major at the University of Tennessee, Knoxville. This was accomplished by distributing a comprehensive survey to undergraduate STEM students (n=95), which asked about previous academic, extracurricular, and professional experiences with STEM activities and individuals. The STEM motivations survey provided insight into influencing factors for choosing a STEM major. This study found that 77 participants had at least one parent with a bachelor's degree and 30 participants indicated at least one parent had an advanced degree (Master of Science/Art, PhD, or Professional Degree) indicating that level of parental education could be a prominent influencing factor for students choosing a STEM major. The highest responses for motivations to choose a STEM major were "interest" or "love" of the discipline and/or "salary" or "job stability" in STEM. These motivations are fundamentally very different; however, 25 participants indicated that "interest" or "love" alongside "salary" or "job stability" to be influencing factors for choosing a STEM discipline. Findings from this research could be useful for the federal government and academic institutions to better utilize STEM recruitment resources, as well as for high school and university advisors to better cater to the needs of prospective and current STEM students.

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Also, thank you to the students of Qualitative Methods course (GEOG 516) for their feedback and suggestions in developing the methodology for this project. Thank you to my family and friends that supported and encouraged me throughout the duration of my Chancellor's Honors Program Senior Thesis. Lastly, I would like to thank the participants who filled out the survey for your insights and time. This project would not have been possible without help from each and every one of these people.

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INTRODUCTION

The growth of science, technology, engineering and mathematics (STEM) professions in both the public and private sectors has been unprecedented in the United States over the last 10 years. In November 2009, President Barack Obama launched the Educate to Innovate initiative "to move American students from the middle to the top of the pack in science and math achievement" (The White House). Since November 2009, Educate to Innovate has assembled over $700 million USD in public-private partnerships towards STEM education (The White House). And, in a report by the U.S. Education Department's National Center for Education Statistics, 28 percent of bachelor's degree candidates declared a STEM major from 2003-2009 (Chen 2013). Of those that had entered a STEM major, however, 48 percent of students seeking a STEM degree had left the STEM field by spring 2009 (Chen 2013). Because of government initiatives advocating for STEM careers and the substantial amount of money in STEM, it is important to examine why students select STEM fields to better understand how to attract and retain undergraduate students.

This thesis investigates the external and internal factors and motivations that influence undergraduate students to choose a STEM major at the University of Tennessee, Knoxville. The findings provide insight into the individual motivation behind choosing a STEM major and also whether or not social, economic, or governmental motivations are influencing factors. This Chancellor's Honors Program Senior Thesis began with a literature review to examine existing literature regarding undergraduate students that choose a STEM major. Thereafter, I designed a survey questionnaire for undergraduate students at the University of Tennessee. The survey was first tested through a pilot study (n=3), and then, after participant feedback, relaunched as the final STEM motivations survey (n=95). The responses from the STEM motivations survey were

analyzed using Microsoft Excel, which provided insight into why undergraduate students at the University of Tennessee, Knoxville choose a STEM discipline. The findings of this project also raised questions for further research as well as ideas for methodology enhancement.

LITERATURE REVIEW

Previous research has examined the attributes that make for a "successful" STEM student. Gasiewski et al. (2011) studied factors that appear to help undergraduate students succeed in STEM majors by creating idealized composite representations of an "Engaged STEM Student". The successful qualities of the "Engaged STEM Student" included detailed career goals, strong preparation for college, and taking advantage of multiple learning avenues (supplemental instruction, recitation, research, group work, student-faculty interactions) (Gasiewski et al. 2011). Other studies echo the findings by Gasiewski et al. and specifically focus on the influence of high school preparation on the choice of a STEM major. Students that display early math and science achievement, have higher SAT scores, higher grade point averages, and enroll in advance science courses in high school are more apt to major in a STEM discipline in college (Moakler et al. 2014; Wang 2013; Federman 2007; Tyson et al. 2007; Ware et al. 1985). While in college, undergraduate students in STEM disciplines tend to have higher grades and enjoy introductory science courses (Wang 2013; Ware et al. 1985). Undergraduate STEM students also tend to spend more hours studying or doing homework in comparison to non-STEM students (Moakler et al. 2014). In addition, undergraduates that choose STEM academic majors expect to earn a graduate or professional degree (Wang 2013; Gasiewski et al. 2011). Moreover, most of these students are "satisfied" with doing science, believe that their respective STEM field is satisfying, and that their work aligns with their personal interest and values (Litzler et al. 2014: Robertson 2000).

Furthermore, students that exhibit general high achievement and exhibit overall confidence in mathematics are more likely to pursue a STEM degree (Moakler et al. 2014; Maltese and Tai 2011). Existing literature also suggests that undergraduate students with parents with STEM occupations as well as parents with higher levels of education are more prone to choose a STEM major (Moakler et al. 2014; Ware et al. 1985). However, despite research supporting the notion that specific qualities such as, interest, high school achievement, and parental education level could influence undergraduate students to choose a STEM major, Maltese et al. (2014, p. 959) concluded that, "the general results support the notion that there are many pathways to STEM with no clear preferential pathway."

Currently, the research regarding what factors contribute to an undergraduate STEM student being successful in a STEM discipline is very extensive. However, we lack information about what factors influence undergraduate students to actively choose a STEM major. The literature suggests that high school preparation does greatly influence students' decisions. What the literature does not examine is if undergraduate students are actually motived and passionate about STEM majors and careers. Or, conversely, if due to social, economic, or governmental motivations, undergraduates think that they will have more financial security, workplace stability, rapid opportunity for advancement, etc. and choose a STEM major.

METHODS

In order to study the factors that influence undergraduate students to pursue a STEM major, I designed an online survey for students enrolled in STEM disciplines at the University of Tennessee. Surveys are useful tools to collect "rich accounts" from participants while giving participants the anonymity and time to sufficiently respond to sensitive questions (McGuirk and O'Neill 2010). Surveys are also cost-effective, practical, far reaching geographically and they

can quickly garner large number responses (McGuirk and O'Neill 2010). There are, however, limitations to the distribution of surveys, such as lack of access to a computer, smart phone, or tablet. Since this survey targeted students in STEM disciplines it can be assumed that most students have a personal computer or access to a computer at the university.

I conducted a literature review before designing the survey questions. The process of developing and designing the survey helped to narrow down and refine the research questions. As described by Sarantakos (2005) questions for the survey were developed by examining existing literature, creating themes from the literature, transforming these themes into indicators which then became the questions for the survey. By identifying the major themes from previous research on undergraduate student motivations in STEM disciplines, I was able to categorize existing themes and identify areas in the literature where themes were lacking or nonexistent. This aided me in developing questions about the influencing factors for undergraduate students choosing a STEM major for the survey, which helped to express and validate the overall significance of the project (Monk and Bedford 2010). Every question in the survey related to the research question, which ensured that every question in the survey served a meaningful purpose (McGuirk and O'Neill 2010).

I submitted a research proposal to the University of Tennessee's Institutional Review Board (IRB). Originally, I intended to conduct interviews alongside a survey; however, due the limited scope of this project and time constraints, interviews would be too time-consuming. The IRB required consent statement language on the welcome page of the survey (which is included in Appendix A). When participants clicked "submit," they were giving consent to participate in the research study. The IRB approved sample survey questions and participant recruitment

emails that were sent to the Chancellor's Honors Program and faculty STEM advisors at the University of Tennessee, Knoxville.

The survey was designed using Qualtrics, an online survey software and data analysis program provided by the University of Tennessee. I took a short seminar about Qualtrics, organized by the Office of Information and Technology on March 9, 2016. In this seminar I learned about the different types of questions that could be used in a Qualtrics survey, how to electronically distribute a survey, the function of skip and display logic, the data analysis Qualtrics is capable of, and how to export data collected in Qualtrics for further analysis. After taking the Qualtrics seminar I was more familiar with how to effectively and efficiently use this survey software in my research.

After I had designed the survey using Qualtrics, I conducted a pilot study (n=3). The pilot study was part of a fieldwork assignment for a Qualitative Methods course (GEOG 516) at the Department of Geography at the University of Tennessee, Knoxville. The participants in the pilot study were undergraduate STEM students at the University of Tennessee majoring in Biochemistry and Cellular and Molecular Biology. I requested that these participants provide feedback on the flow and content of the survey, and their overall experience after taking the STEM motivations survey.

One participant's feedback indicated that they did not understand the flow of questions regarding the influence of specific individuals on undergraduate students to pursue a STEM major (see Appendix A). The respondent thought that the question about participant's connection to the influencing individual would be answered in the open-response about how the individual influenced the participant, making the questions redundant. I remedied this issue by reordering

and rephrasing the question that asks about the participant's connection to the influencing individual.

In the pilot study, the participant's responses were not nearly as in-depth or as informative as I expected or hoped they would be. The participants provided very limited responses to open-response questions despite large text boxes for answers, or the participants simply skipped questions. When I improved the flow of the survey this issue was less prevalent after the survey was officially launched on March 28, 2016.

All of the participants indicated that a back button would be useful especially when asked to elaborate on selected answers from a previous question. After considering if the rigor of the survey would be compromised if a back button was added to the survey, I decided that a back button would actually be helpful for participants. The STEM motivations pilot survey was also examined by other students in the Qualitative Methods course (GEOG 516) and they echoed the pilot participant's suggestions of making the flow of the survey more logical and adding a back button for participants in the survey.

The criteria for participation in the survey were that 1) participants are undergraduate STEM students, 2) enrolled at the University of Tennessee, Knoxville and 3) are 18 years of age or older. The survey was distributed to undergraduate STEM students at the University of Tennessee, Knoxville (n=125). Twenty-six participants were excluded for not being undergraduate STEM majors and 4 participants were excluded for not being undergraduate students at the University of Tennessee, Knoxville. This reduced the total number of respondents to (n=95).

Research participants were recruited using faculty STEM advisors who were asked to distribute the STEM motivations survey via email to their advisees. The survey was also

distributed to the list serve of the University of Tennessee Chancellor's Honors Program (CHP). The use of these two different sampling techniques reduced self-selection bias. I do not know how many students or the names of students that faculty STEM advisors email the survey to; only that the survey link was forwarded from the faculty STEM advisors to their undergraduate advisees. The same is true for the CHP list serve.

This study tried to involve as many experiences of undergraduate STEM students and aimed to include various undergraduate student motivations for choosing a STEM major at the University of Tennessee as possible. A wide sample is important because students at different points in their academic career have different motivations, and their family background, socioeconomic status, high school preparation, and career goals are likely to influence their career choice as well. For example, freshmen students are less familiar with course work or professional opportunities, whereas senior students are more focused on post-graduation careers or specific academic plans.

The survey included closed questions about demographic information (age, gender, and class standing) and open-ended questions about why undergraduate students chose a specific STEM major, including parental factors and economic advantages to pursue a STEM discipline. These two types of questions and the ordering of questions in a logical sequence allowed me to obtain diverse but comprehensive answers about the factors that influence undergraduate students to pursue a STEM major (see Appendix A).

The survey was conducted between March 28, 2016 and April 8, 2016. While the survey was open, 125 undergraduate STEM students at the University of Tennessee participated in the survey. Twenty-six participants were excluded for not being undergraduate STEM majors and four participants were excluded for not being undergraduate students at the University of

Tennessee, Knoxville. Thus, the total number of undergraduate STEM students at the University of Tennessee that participated in this project was (n=95).

Once the survey was closed on April 8, 2016, the survey data was analyzed and coded using Microsoft Excel. Data from the survey was automatically anonymized in Qualtrics by generating a random Response ID code of letters and numbers for each response to protect the identity of participants. For the purposes of analysis, participants were also given pseudonyms to further protect their identity, and to also allow for anonymity with use of direct quotations from the STEM motivations survey. In this study the pseudonyms Sarah, John, Steve, Josh, and Gracie were used.

For analysis, themes from existing literature were compiled and sorted into categories based on thematic similarity. For example, some influencing factors were: high school, college, career goals, individuals, and learning style. Sub-themes were developed as responses were analyzed (i.e. parental and high school teacher influence became sub-themes of individuals, and interest/love for and job/salary stability became sub-themes for personal factors). For this study, I analyzed the influence of individuals, specifically parents and high school teachers, level of parent education, and personal factors for deciding to pursue a STEM major.

ANALYSIS

The data collected from the STEM motivations survey designed in Qualtrics was exported and analyzed using Microsoft Excel. Data from demographic and open-ended questions were analyzed by creating themes that emerged in existing literature. Those themes were divided into sub-themes after analyzing participant open-ended responses. Of the 25 questions that participants were asked in the STEM motivations survey, I selected three questions from the survey for analysis due to high participant response rates of these three open-ended questions.

The demographic data regarding gender and academic standing (n=95) in STEM at the University of Tennessee was compiled in Figures 1 and 2.

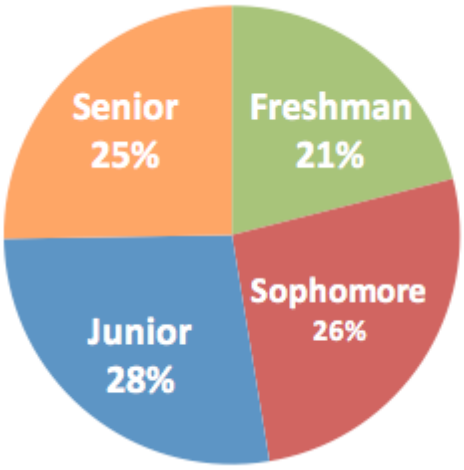

Figure 1. Academic Standing. This is the reported academic standing of the 95 undergraduate participants that completed the STEM motivations survey. A wide sample is important because students at different points in their academic career have different motivations, along with other differing factors like family background, socioeconomic status, high school preparation, and career goals.

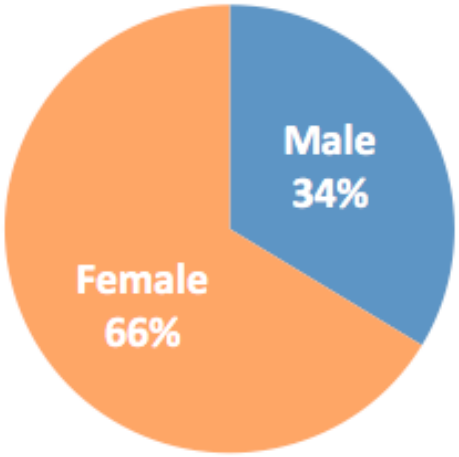

Figure 2. Gender Demographics. The reported gender of the 95 undergraduate STEM participants that completed the survey. Sixty-six percent of the survey respondents were female, much higher than the national average of 24% (Beede et al. 2011).

Participants were asked if "any individuals specifically influenced your decision to choose a STEM discipline (parent, sibling, other family member, neighbor, friend, teacher, etc.)." Of the 95 participants, 29 participants did not respond, 34 participants listed a teacher, and 29 participants indicated that a parent had influenced their decision to choose a STEM major. The participants were then asked to explain how that individual influenced the decision to choose

a STEM major. These responses were coded using "Parents working in STEM," "Encouraging or Supportive Parents (towards STEM)," and "Encouraging or Supportive Teachers (towards STEM)" (see Figure 3). Sixteen participants indicated in their responses that their "parents came from STEM backgrounds" (i.e. engineer, physician, etc.) and 14 participants said that their parents "encouraged" or "supported" the students to pursue a STEM major. Participant "Sarah" said, "My parents encouraged my fascination with science and the natural world from a young age. They never tried to push me into the family business or any other route" (participant 25). Twenty participants said that a high school teacher had "encouraged" or made STEM subjects "interesting" which influenced the student to choose a STEM discipline. Fifty-seven participants said that no specific individual influenced their decision to choose a STEM major (see Figure 3). Participant "John" said, "There were phenomenal teachers that made the subject [STEM] challenging but extremely satisfying. I realized I love science because of them" (participant 16). The literature mainly focuses on STEM activities and STEM qualities that influence students to choose a STEM major (Wang 2013; Gasiewski et al. 2011; Ware et al. 1985). My project found that specific individuals influence a students' decision, which is important information for student recruitment to STEM disciplines. This is also supported by Moakler et al. (2014) who found that undergraduate students with parents in STEM occupations are more likely to choose STEM disciplines than students with parents who do not have a STEM occupation.

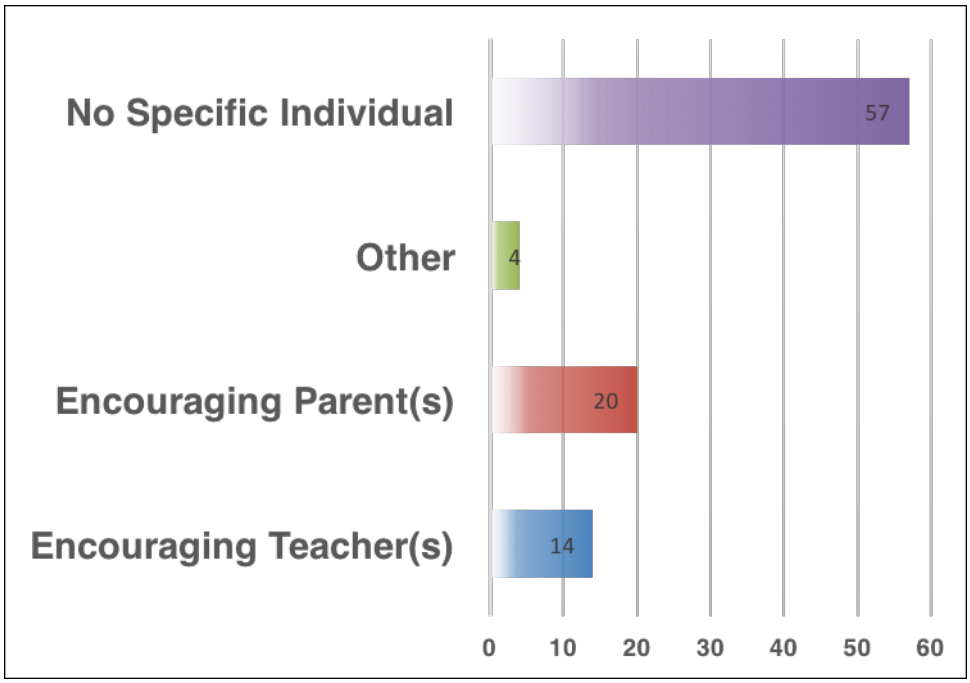

Figure 3. Coding example. Coding results of participants' responses (n=95) to the question which individuals influenced their decision to pursue a STEM major. Sub-themes were assigned based on commonalities within participant responses under the main theme of individual influence.

Participants were also asked to provide their parent(s) highest level of education (see Figure 4). Each participant was given the opportunity to list the education of 'Parent 1' and 'Parent 2' and responses were recorded from "some high school" to "PhD" or "professional degree" (see Figure 4). Of these responses, 77 participants indicated that at least one parent had received a bachelor's degree and 30 responses indicated at least one parent had an advance degree (Master of Science/Art, PhD, or Professional Degrees). In this limited sample, the majority of STEM participants have parents with higher levels of education, which supports the findings of Ware et al. 1985 suggesting that parental education level can impact a student to pursue a STEM major.

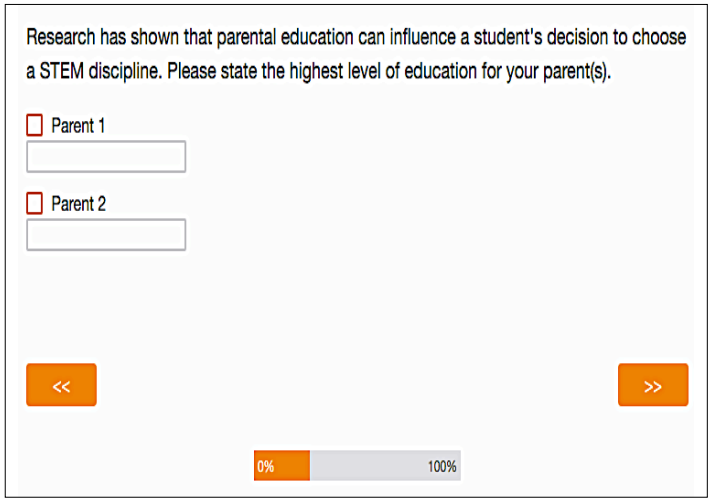

Figure 4. STEM motivations survey question. 75 respondents indicated that at least one parent obtained a bachelor's degree or higher (Masters, PhD, or Professional Degree).

Participants were asked to "Select any of the following factors that possibly influenced you to choose a STEM major: Job stability, Prestige, Salary, Interest, Influence, Advancement opportunity, Other _____." Each participant was then given the opportunity to elaborate on the top two factors that influenced them to choose a STEM major. Of the 95 responses, 27 participants chose not to answer this question, 42 indicated that they were "interested" or "loved" their STEM discipline. For example, "Steve" said, "I study physics because I'm interested. It certainly isn't for money" (participant 10). In addition, 46 respondents said that "salary" or "job stability" heavily influenced their STEM decision. Participant "Josh" said:

> The job market for people with Computer Science degrees is growing larger and larger every day. I think this career path offers a lot of room to grow and advance myself due to the ever increasing need and demand for computer software. The pay for computer science jobs is significantly higher than other professions and as there are also advantages

> to moving up a corporate ladder as well as high base pay, this career path seemed logical (participant 38).

This quotation from Josh shows that salary and job stability are very important factors for students that choose a STEM major. This information is important because the literature examined in my literature review did not inspect external factors like salary and job stability, which appear to be defining factors that influence undergraduate students to choose a STEM major.

Yet 25 participants indicated that their top two influencing factors were "interest" and "salary" or "job stability" for choosing a STEM major. "Gracie" responded, "I wanted to work with alternative energy, so I thought I could pursue these interests through an engineering career [and] engineering salaries are much higher than most careers, which was also appealing to me" (participant 50). This confirms the findings by Litzler et al. 2014 that undergraduate students chose a STEM discipline because the work "aligned with their interests and values" and students found the work "satisfying." It is noteworthy that of all the participants that responded to this question (n=68), 37 percent indicated that a combination of job and salary stability and interest or love for a STEM discipline influenced their decision to choose an undergraduate STEM major. Interestingly, this motivation was not mentioned in studies included in my literature review. The combination of economic factors and an interest in STEM disciplines is significant in how funding is distributed to keep students interested in STEM subjects. It is also important to ensure that students' time and educational investment in STEM is rewarded in their career.

CONCLUSION

Existing literature suggests that undergraduate students with parents with STEM occupations as well as parents with higher levels of education are more prone to choose a STEM major (Moakler et al. 2015; Ware et al. 1985). As the small sample of this study shows, 77 participants indicated that at least one parent obtained a bachelor's degree and 30 obtained an advanced degree. This information shows that it is important that government and other initiatives target undergraduate students with parents with lower levels of education to increase their interest in STEM majors.

What is interesting about this small study is that of the 95 responses, 42 participants indicated that they were "interested in" or "loved" their STEM discipline, 46 respondents said that "salary" or "job stability" heavily influenced their STEM decision, 27 participants chose not to answer this question, and 25 participants indicated that "interest" or "love" and "salary" or "job stability" were the top two influencing factors for choosing STEM as an undergraduate major. These findings are significant because based on my literature review, very limitedly examines these factors as motivations for undergraduate students to choose a STEM major. Refining the STEM motivations survey and incorporating interviews with STEM undergraduate students as well as faculty STEM advisors would provide further insight into the impact of these specific factors on influencing and motivating students to choose STEM majors.

The importance of exposure to STEM before college through supportive and encouraging teachers was also shown in this small sample. Thus, it is important to invest in teacher education and the recruitment and retention of teachers to STEM disciplines. Recruiting teachers to STEM disciplines at the high school level and making sure that these teachers are capable of teaching STEM topics well and sparking students' interest in STEM is extremely important. Since

graduates from STEM programs are more likely to pursue a career in industry as the salaries are considerably higher in comparison to other fields.

However, it is also important that more than half of the participants were not specifically influenced by an individual to pursue STEM at all. This indicates that other possibly innate or external factors influence undergraduate students to choose a STEM major at the University of Tennessee, Knoxville. And from analysis of this data it appears that participation in STEM activities prior to college could have less impact on choosing a STEM major than the impact of teachers or parents as indicated from participant responses.

FUTURE RESEARCH

Since the sample size for this project is relatively small, in order to generalize the findings from this study a larger sample size is needed. The sampling techniques that I used in this study would be sufficient for future research, but it would be good to know how many students the STEM motivations survey was being sent to so that a participant response rate could be calculated. It would also be necessary to include more males in the sample since the national average for women in STEM is 24 percent versus 66 percent in this study (see Figure 2). Though this data is not representative of the national average of women in STEM, this does not mean that the data collected could not potentially be a representative sample at the University of Tennessee, Knoxville; however, more survey responses as well as a participant response rate are needed to generalize this finding.

The influence of government and institutional initiatives on undergraduate students to choose a STEM major is still unclear. It would also be helpful to include questions pertaining to parental and socioeconomic factors in the survey, which appear to be more influential than previously though according to existing literature. In addition, I would re-evaluate the questions

about STEM activities prior to college since these aspects appear to be less influential on the decision to pursue a STEM discipline. This additional information from future research could alter the way in which high school and university advisors serve prospective and current STEM students, helping attract and retain undergraduate students to STEM majors.

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APPENDIX A

Q1 STEM Discipline Influences

This is a study about the factors that influence undergraduates to pursue a science, technology, engineering, or mathematics (STEM) major. The survey will ask questions about your previous academic and professional experiences with STEM activities and individuals. The answers will provide insights into the motivations of undergraduate students in choosing a STEM discipline, which could have implications in policymaking at both the institutional and national levels. This is a research study, and you may refuse to participate or withdraw from this study without penalty at any time. The completion of the survey constitutes consent to participate. All answers will be anonymous as the data will be aggregated for the analysis. The survey takes approximately 9 to 15 minutes to complete.

If you have questions about your rights as a participant, you may contact:

- University of Tennessee IRB Compliance Officer at utkirb@utk.edu or (865) 974-7697

If you have any questions about the study, you may contact:

- Preston Mitchell, principal investigator, at pmiche7@utk.edu or (865) 974-6033
- Dr. Micheline van Riemsdijk, Associate Professor of Geography at the University of Tennessee, at vanriems@utk.edu or (865) 974-6033.

Thank you in advance for your participation!

Submit

Q2 Are you an undergraduate student at the University of Tennessee, Knoxville?

- ❍ Yes
- ❍ No

Q3 Are you an undergraduate student in a science, technology, engineering, or mathematics (STEM) major?

- ❍ Yes
- ❍ No

If No Is Selected, Then Skip To End of Survey

Q4 Age

If Age Is Less Than 18, Then Skip To End of Survey

Q5 What is your gender?

- ❍ Male
- ❍ Female
- ❍ Prefer not to answer

Q6 What is your major? (no acronyms or abbreviations)

Q7 Academic standing:

- ❍ Freshman
- ❍ Sophomore
- ❍ Junior
- ❍ Senior
- ❍ Other _____

Q8 The following set of questions will ask about individuals that may have influenced your decision to major in STEM. Information about your background with STEM professionals will help us better understand factors that contribute to deciding on a STEM academic major.

Q9 Research has shown that parental education can influence a student's decision to choose a STEM discipline. Please state the highest level of education for your parent(s).

- ❑ Parent 1 _____
- ❑ Parent 2 _____

Q10 Did any individuals specifically influence your decision to choose a STEM discipline (parent, sibling, other family member, neighbor, friend, teacher, etc.)?

- ❍ Yes
- ❍ No

If No Is Selected, Then Skip To The following set of questions will a...

Answer If Did any individuals specifically influence your decision to choose a STEM discipline (parent, sib... Yes Is Selected

Q11 What is your connection to that individual (parent, sibling, other family member, neighbor, friend, teacher, etc.)?

Answer If Did any individuals specifically influence your decision to choose a STEM discipline (parent, sib... Yes Is Selected

Q12 How did that individual influence your decision to choose a STEM major?

Answer If Did any individuals specifically influence your decision to choose a STEM discipline (parent, sib... Yes Is Selected

Q13 What is that individual's occupation?

Q14 The following set of questions will ask about activities and courses that may have influenced your decision to major in STEM. Information about participation in STEM activities will help us better understand factors that contribute to deciding on a STEM academic major.

Q15 Did you take STEM courses in high school (i.e. chemistry, biology, calculus, etc. classes, or technology focused courses)?

- ❍ Yes
- ❍ No

If No Is Selected, Then Skip To Have your career goals changed from h...

Q16 Please list the science, technology, engineering, or mathematics classes you took in high school.

Q17 Did any of these high school classes directly influence your decision to select a STEM major?

- ❍ Yes (Please list those specific classes) _____
- ❍ No

Q18 Have your career goals changed from high school since entering the University of Tennessee?

- ❍ Yes
- ❍ No

If No Is Selected, Then Skip To Were you exposed to any of the follow...

Answer If Have your career goals changed from high school since entering the University of Tennessee? Yes Is Selected

Q19 Please describe your career goals in high school.

Answer If Have your career goals changed from high school since entering the University of Tennessee? Yes Is Selected

Q20 Please describe you current career goals.

Q21 Were you exposed to any of the following activities in high school, prior to entering a STEM major at UT (please choose at least 2 activities)?

	Select all that apply
Science competition (science fair, robotics competition, etc.)	❑
Research internship or fellowship	❑
Career guest speaker (engineer, chemist, etc.)	❑
University visit (department specific presentation, engineering day, etc.)	❑
Company visit (company outreach programs, engineering consulting firms, etc.)	❑
Enrichment camp (space camp, science camp, etc.)	❑
Other	❑

Q22 Did any of the STEM 2 activities you participated in specifically influence your decision to pursue a STEM major at the University of Tennessee?

Q23 How important were the 2 activities you selected in choosing a STEM major?

Q24 Please elaborate on the top 2 activities that you believe were most influential in choosing a STEM major (i.e. why you participated in/enjoyed those activities).

- Science competition (science fair, robotics competition, etc.)

-Research internship of fellowship

-Career guest speaker (engineer, chemist, etc.)

- University visit (department specific presentation, engineering day, etc.)

- Company visit (company outreach programs, engineering consulting firms, etc.)

- Enrichment camp (space camp, science camp, etc.)

-Other _____

❑ STEM Activity 1 _____
❑ STEM Activity 2 _____

Q25 The following set of questions will ask about other aspects that may have influenced your decision to major in STEM. Information about other influencing factors will help us better understand what contributes to deciding on a STEM academic major.

Q26 Please select any of the following factors that possibly influenced you to choose a STEM major:

- ❑ Job stability
- ❑ Prestige
- ❑ Salary
- ❑ Interest
- ❑ Influence
- ❑ Advancement opportunity
- ❑ Other _____

Q27 Please describe why and how 2 factors in the previous question influenced your decision to choose a STEM major.

- Job stability

- Prestige

- Salary

- Interest

-Influence

- Advancement opportunity

- Other_____

- ❑ Factor 1 _____
- ❑ Factor 2 _____

Q28 Please explain why you decided on a STEM major specifically at the University of Tennessee.

Q29 Would you like to tell us anything else regarding the factors that influenced you to choose a STEM major at the University of Tennessee?

Q30 Thank you for your participation!