A Tale of Two Continents: Factors Influencing Students to Major in Mathematics

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Students consider the selection of their college major as one of the critical decisions in their life. Literature suggests that influencing factors can differ based on the academic discipline, student status (freshmen, declared, etc.), and geography. We select two countries, the United States and Sri Lanka, with contrasting education systems and study the factors which may have influenced students to become mathematics majors. We consider the effect of ten influencing factors, which form three clusters, namely, "Career-Related", "Math-Related", and "Other". The study first reveals that the factors and clusters significantly affect student decisions in the two countries. One of the critical conclusions of the study is how the "Math-Related" cluster influences students' decisions significantly more than the other two clusters. We also look at the difference in the impact of specific influencing factors on the two populations and find that factors related to the nature of mathematics influence US students more than Sri Lankan students. The study's conclusions should benefit teachers and recruiters when guiding future math majors.

Keywords: college major, mathematics major, major choice, academic choice

INTRODUCTION

A significant number of students worldwide consider mathematics a challenging subject. Yet, despite this, we see many students passionately embracing mathematics as their college major (Bressoud, 2018). Educators worldwide have contributed to a large body of research on strategies to improve student's learning of mathematics (Adams et al., 2014; Boaler, 2015; Freeman et al., 2014; Kulik et al., 1990). There is also considerable research on interventions to help students overcome bottlenecks in specific topics (Bhatia et al., 2014; Mkhatshwa, 2020) and use technology to enhance delivery and engagement (Cline & Zullo, 2011; Maxson & Szaniszlo, 2015; Premadasa et al., 2016). Over the years, with significant success, math educators have striven to improve the learning of the subject while adding to the subject's beauty through disciplinary research.

However, there is a difference between a student successfully learning from particular math classes versus becoming a mathematics major. Selecting a major in college is a student's life choice, and the decision will likely contribute to both the financial success and personal happiness in the student's life.

Why students select mathematics as a major is worth investigating. It might shed light on finding better ways to teach mathematics and help enhance strategies to recruit mathematics majors. So, what possible factors could influence mathematics majors in their decision?

The considerable collection of growing careers and their high pay are certain factors that may influence math majors (US Bureau of Labor Statistics, 2021). For example, the US Bureau of Labor Statistics (2021) reports that the median annual wage for mathematicians was $110,860 in May 2020. In addition, the bureau projected a 33% growth of overall employment of mathematicians and statisticians from 2019 to 2029. According to the bureau, such change is much faster than the average of all occupations. In addition to these facts, careers related to mathematics often appear on top among those which combine high pay and low stress (Coplan, 2015; Kiersz & Hoff, 2021; US Department of Labor, 2021).

However, it is fair to acknowledge that non-career related factors affect students to become math majors. For example, in mathematics, we know an appeal in the subject itself attracts people. The history of mathematics goes far beyond when lucrative career options became available. It is fair to say that almost all great mathematicians before the nineteenth century became attracted to the subject through the intrinsic motivational factors that mathematics offers. In addition, many mathematicians would say that mathematics-related factors such as the challenge of problem-solving, connections between seemingly disconnected concepts, and real-life applications contribute to their attraction to mathematics (Lang, 1985).

In general, students consider the selection of their college major as critically important. Studies show that an inappropriate selection of a major is one of the top regrets college students have (Roese & Summerville, 2005). When considering majors in general, career-related factors influence a student's selection process (Aldosary & Assaf, 1996; Edmonds, 2012; Kim et al., 2002). Selecting a major is not only a career decision but also a life decision, so factors beyond those that are career-related must be considered. We see that the interest in the discipline, as well as how the discipline's nature aligns with the student's personality, will also affect the student's choice (Astin, 1993; Caspi et al., 2019; Malgwi et al., 2005; Porter & Umbach, 2006; Pryor & Adams,1994; Smart et al., 2000; Strasser et al., 2002).

Among other factors that influence a student's decision to select a major are parental influence (Fass & Tubman, 2002; Ma, 2009; Simpson, 2001), high school mathematics preparation (Astin, 1993; Simpson, 2001), and self-efficacy (Bandura, 1986, 1997; Betz & Hackett, 1983; Eccles, 1987; Lent et al., 1984). Studies also show that race and ethnicity affect students' selection of academic majors (Leslie & Oaxaca, 1998; National Research Council, 1994).

While there are studies that investigated the intention of high school students to become mathematics majors (Caspi et al., 2019), we see the importance of examining the factors that current mathematics majors, in retrospect, say influenced their decision.

In this study, we consider the absolute and relative influence of several factors that may have affected current math majors' decisions. First, we group the possible influencing factors into three clusters ("Math-Related," "Career-Related," and "Other") and study the factors' influence on students' decisions. Next, we consider student populations in two countries (with contrasting education systems) and find the significance

of how these factors and clusters influence these students. Finally, we see the relative effect of the factors and the clusters on the two populations.

Literature Review

Literature has identified many factors, including interest in the major, the influence of family and peers, academic ability, reputation of the major, future job availability, and potential salary, as influential for college students in deciding their academic major (Fass & Tubman, 2002; Malgwi et al., 2005; Yazici & Yazici, 2010). Different studies have identified factors from the above as the most influential under various academic majors. It is also essential to notice that these findings spread among multiple student populations varying from first-year students to seniors and students with declared and undeclared majors. This literature review investigates the connections between the influencing factors of selecting college majors, academic majors, and student status.

Al-Khathlan and Al-Mandil (1989), in a study conducted at an engineering school in Saudi Arabia, reported that most first-year students did not commit to a major. They found the lack of knowledge (of the major) and the freedom to change as the main reasons. The authors also reported that students' main factors in deciding their major were future employment opportunities, personal performance, and geographic linkages with better employment opportunities. A follow-up study at the same institution among first-year students revealed that job availability, salary, and reputation of the major, in that order, as the most influencing factors in deciding a college major (Aldosary & Assaf, 1996). Interestingly, Aldosary and Assaf also reported that among the students in the same group who later decided on an environmental design major found their interest in the major as the predominant factor which affected their decision, followed by personal ability, job availability, and salary. These two studies indicate the possible shift of the influencing factors among engineering students as they progress through their academic journey.

Some areas of study and occupations follow certain personality traits. Thus, students tend to choose their major based on how their personality matches those personality traits (Pringle et al., 2010). In addition, students in some disciplines believe they have a calling or social responsibility in choosing their major (Duffy & Dik, 2009). The authors suggested that influencing factors are internal and originated within either case. Although students are not selecting some majors because of their interest in that particular major, they choose the major due to personal preference.

Porter and Umbach (2006) analysed students' entrance and exit data of three cohorts from a liberal arts college to identify relationships between the college major and six other variables. The variables are demographics, parental influence, academic preparation, future views of the academic career, political views, and Holland personality scales (Holland, 1997). The authors found that Holland's personality scales and political views strongly predict students' college major choices. We also see a relationship between students' personality and their choice of college major (Astin, 1993; Smart et al., 2000). They also found that academic preparation, family influence, and academic self-efficacy can predict the student's choice of college major. However, personality overrides the significance of the impact of those factors.

Parental influence can also positively influence a student's decision to select a major (Fass & Tubman, 2002; Ma, 2009; Simpson, 2001). In addition, high school SAT math scores, and a solid high school mathematics preparation can positively influence students to select STEM majors (Astin, 1993; Simpson, 2001). Finally, we also see self-efficacy (Bandura, 1986, 1997; Betz & Hackett, 1983; Eccles, 1987; Lent et al., 1984) influencing a student's decision.

In addition to the above factors, race and ethnicity also seem to play a significant role in a students' choice of college major (Porter & Umbach). This finding complements the previous results, which show a lesser representation of people of color (Leslie & Oaxaca, 1998; National Research Council, 1994) in STEM-related areas. It is important to note that the Porter and Umbach study data did not contain any international students.

Beggs et al. (2008) investigated the factors influencing college students to decide their major. Both qualitative and quantitative analyses agreed that the interest in the subject was the most influential factor. The study also revealed the available sources of information as the least important factor in deciding on a college major. A study by Adams et al. (1994) on the factors influencing students to become accounting

majors shows that a genuine interest in the subject to be the most influencing factor. It is important to notice that Beggs et al.'s study complements such findings, and their study consists of students with declared majors from across all disciplines. Edmonds (2012) hypothesized practical influences (future job, scholarships, etc.) would outweigh personal (interest in the significant, passion, etc.) and interpersonal effects (parents or peers, etc.). However, he found no significant difference between the three categories in influencing choosing a college major. Participants of Edmond's study were from several different colleges, namely, the College of Liberal Arts and Science, the College of Fine and Performing Arts, the College of Communications, the College of Education, the College of Health & Exercise Science, the College of Business and the College of Engineering. Interestingly, influencing categories were not significantly different across the colleges.

Lefevre et al. (1992) studied the attitudinal, affective, and performance variables related to mathematics as possible predictors of the choice of college majors. They reported that students anxious about mathematics avoided majors with moderate or higher mathematics requirements. On the other hand, students who reported being more fluent in arithmetic and more interested in mathematics were more likely to follow majors that required more mathematical requirements. These complement the previously reported findings (Adams et al., 1994; Beggs et al., 2008). However, the study did not specify if the students were currently majoring in mathematics or other majors that require moderate to higher amounts of mathematics, thus limiting the conclusions we can make specifically about the mathematics majors and the corresponding influencing factors.

On the one hand, Business majors have ranked future employment opportunities and starting salary at the top as influential factors in choosing Business as their college major (Kim et al., 2002). On the other hand, the interest in the subject as the most influential factor is also reported among Business majors (Malgwi et al., 2005; Strasser et al., 2002). Malawi et al. further showed how different genders ranked other factors. For women, the next most influential factor was aptitude in the subject, whereas, for men, the second-ranked influencing factor was the potential for career advancements and job opportunities. Even within the same major, interest in the subject and the factors related to career are reported differently as the most influential factor in choosing the college major.

Math anxiety can play a crucial role for students possibly not pursuing mathematics further (Ashcraft, 2002; Ashcraft & Moore, 2009; Lefevre et al., 1992). It is equally or perhaps more important to know what makes students further their study of mathematics. Lantz and Smith (1981) investigated the factors influencing the choice of nonrequired mathematics courses among high school students. Their study showed the best predictors of taking additional mathematics courses regardless of gender are encouragement from significant others and subjective value placed on mathematics. Students who had the same subjective value to mathematics but less confidence in mathematics did not enroll in nonrequired mathematics courses later, despite their intention to take such courses. In a different educational setting, where students must select their discipline(s) at the end of the ninth grade, Caspi et al. (2019) investigated the influencing factors of choosing STEM disciplines of the ninth graders from two Israeli urban middle-schools at the end of the school year. The majority of the students, regardless of gender, reported interest in the subject's usefulness as the main motivation to choose STEM disciplines, followed by positive perceptions of peer interest and student's ability.

The above discussion provided evidence to support that interest in the subject, career-related factors, interpersonal, and self-efficacy factors are among the top influencing factors affecting a student's college major decision. It is, however, important to notice that the rank of these influencing factors varies among the different student groups. Furthermore, it is reasonable to assume that these factors depend on the discipline, geography, and whether the student has declared the major. Thus, we propose investigating the influencing factors of choosing a mathematics major through a survey given to students currently majoring in mathematics. From the discussion above, we also note how influencing factors could affect students around the world differently. Therefore, we conduct the study in two countries with contrasting educational systems. Thus, during this study, we ask the following research questions.

RQ 1: *Do the influencing factors have an overall effect on students' decision to become math majors?*

RQ2: *Do the influencing clusters have an overall effect on students' decision to become math majors?*

RQ 3: *Do the influencing factors affect students' decision to major in mathematics in two different countries differently?*

RQ4: *Do the influencing clusters affect students' decision to major in mathematics in two different countries differently?*

RQ5: *For students in each country, do certain influencing factors significantly affect students' decision to become math majors more than others?*

RQ6: *For students in each country, do specific influencing clusters significantly affect students' decision to become math majors more than others?*

METHODOLOGY

Our study presented a survey to current mathematics majors in two countries (the USA and Sri Lanka). The survey has questions based on ten possible factors of the above potential influence areas: Math-Related, Career-Related, and Other.

TABLE 1
INFLUENCING FACTORS AND THE CORRESPONDING CLUSTERS

Factor Label	Influencing Factor	Abbreviation	Cluster
f1	There are many jobs available to math majors.	Many Jobs	Career-Related
f2	Jobs for math majors tend to have high pay.	High Pay	Career-Related
f3	Jobs for math majors tend to have low stress.	Less-Stress	Career-Related
f4	A specific career that I'm interested in requires (or strongly encourages) a math major.	Specific Career	Career-Related
f5	I enjoy solving problems.	Enjoy Problem-Solving	Math-Related
f6	I like math because the problems tend to have exact and provable answers.	Exact and Provable.	Math-Related
f7	I like applying math to real-world problems.	Real-Life Applications	Math-Related
f8	I like seeing patterns and making connections between seemingly unrelated topics.	Connections	Math-Related
f9	I was always good at math, and I just kept at it.	Always Good	Other
f10	I had a particular teacher (or teachers) who encouraged me to pursue math.	Teacher Influence	Other

We created a survey to determine how the above factors may have influenced students to become math majors. One of the underlying questions we had during this study was whether a student's decision to become a math major is influenced more by the career prospects or by the intrigue towards mathematics. We shared the questions one through ten that involve the influencing factors, with the following: How

influential was each of the following on your decision to become a math major? (1= not at all influential; 7 = extremely influential). We provided seven boxes with numbers one through seven for the students to check their preferences for these questions.

Data Collection

Our methodology was to collect data from students in two countries and different geographical regions from students doing a math major or a dual major (including math). We selected the United States and Sri Lanka as the two countries. Unlike in the United States, education in Sri Lanka is free to a bachelor's degree. However, only a select few get university education (Department of Examinations, Sri Lanka, 2019; University Grants Commissions, Sri Lanka, 2020). In addition, Sri Lankan students face two very competitive standardized exams at the entrance to high school (called the General Certificate of Education (Ordinary Level) exam) and at the exit (called the General Certificate of Education (Advance Level) exam). During colonial rule, the British introduced both exams (with different names) (Liyanage, 2013).

Access that Sri Lankan students have to a particular university depends on their performance at this high school exit exam. As all universities do not offer a comprehensive set of academic programs, this initial screening hinders a student's ability to freely select a university that provides the ultimate choice program (Siribaddana, et al., 2012; University Grants Commissions, Sri Lanka, 2020). Therefore, compared to the United States, Sri Lankan students often do not have the opportunity to pursue their most passionate area of study. However, once inside a university, a student has a reasonable choice of majors. In addition, due to the very competitive entrance exam, Sri Lankan students have a solid and uniform mathematics preparation when they enter the university.

On the contrary, US students have greater access to postsecondary education and have greater freedom to decide their future area of study but often come from different high school preparation levels. Therefore, we planned to see whether students from two educational systems in two corners of the world show any significant difference in the factors that made them choose a mathematics major. All institutions we chose are 4-year degree-awarding universities. In the United States, we collected data from students in three institutions. One institution is in an upper midwestern state, and the other two US institutions are in a southern and a northcentral state. In addition, one Sri Lankan institute is located in its capital city and the other in a suburb.

RESULTS AND DISCUSSION

At the outset, for convenience of representation, we will label the influence factors f1 through f10 (See Table 1). We will also mark the influencing clusters "Career-Related," "Math-Related," and "Other" with labels c1 through c3. Also, the abbreviation SL denotes Sri Lanka, and US denotes USA. Let us now analyse the results and discuss the answers to the research questions RQ1 to RQ6.

Discussion on Question RQ1: Do the Influencing Factors Have an Overall Effect on Students' Decision to Become Math Majors?

It is natural to investigate if the influencing factors affect the students' decision to become math majors. Furthermore, if the overall impact is statistically significant for each country, it is important to investigate if that overall effect is or is not similar between the two countries. Thus, we utilized one-way repeated measures ANOVA with the ten influencing factors as the within-subject factor and the country as the between-subject factor. First, we tested the sphericity assumption that is needed for repeated measures ANOVA using Mauchly's Test of Sphericity. We found that the sphericity assumption was not met (p-value < 0.0001). Then we checked the Greenhouse-Geisser epsilon value ($= 0.661 < 0.75$) and observed that it is met by the data set of the study, providing the validity to proceed with the ANOVA analysis.

TABLE 2
RESULTS OF ANOVA WITH A GREENHOUSE-GEISSER CORRECTION FOR THE OVERALL EFFECTS OF INFLUENCING FACTORS

Country	Type III Sum of Squares	df	Mean Square	F value	Significance
SL	350.268	5.880	59.567	25.667	0.000
USA	592.346	5.509	107.527	25.455	0.000
Between countries	53.055	5.952	8.914	2.968	0.007

As per table 2, the one-way repeated measures ANOVA with a Greenhouse-Geisser correction revealed that, for both countries, the overall effect of the influencing factors is statistically significant (p-value < 0.0001). Furthermore, the interactions of the ten influencing factors between the two countries are statistically significant (p-value = 0.007 < 0.05). Thus, we can conclude that the overall effect of influence factors is different for the two countries. This conclusion invites us to compare how the influencing factors affect the two countries.

Discussion on Question RQ2: Do the Influencing Clusters Have an Overall Effect on Students' Decision to Become Math Majors?

Again, we utilized one-way repeated measures ANOVA with the three influencing clusters as the within-subject factor and the country as the between-subject factor. As in RQ1, we tested the sphericity assumption using Mauchly's Test of Sphericity and found that the assumption was not met (p-value < 0.0001). Moreover, Greenhouse-Geisser epsilon value (= 0.913 > 0.75) means that in this case, we go with the ANOVA results with a Huynh-Feldt correction.

TABLE 3
RESULTS OF ANOVA WITH A HUYNH-FEIDT CORRECTION FOR THE OVERALL EFFECT OF INFLUENCING CLUSTERS

Country	Type III Sum of Squares	df	Mean Square	F value	Significance
SL	42.387	1.981	21.397	25.852	0.000
USA	102.077	1.783	57.243	30.020	0.000
Between countries	11.021	1.863	5.916	4.589	0.013

As per table 3, the one-way repeated measures ANOVA with a Huynh-Feidt correction revealed that, for both countries, the overall effect of the influencing factors is statistically significant (p-value < 0.0001). Moreover, the interactions of the ten influencing factors between the two countries are statistically significant (p-value = 0.013 < 0.05). Thus, we can conclude that the overall effect of influence factors is different for the two countries. As in the previous discussion of RQ1, this conclusion invites us to conduct a countrywide comparison of the influence of the clusters.

Discussion on Question RQ3: Do the Influencing Factors Affect Students' Decision to Major in Mathematics in Two Different Countries Differently?

As we noted in RQ1, the overall effect of influence factors differs between the two countries. What factors do the students from the two countries rank similarly? In other words, we ask the question, do the influencing factors depend on the geographical location? The independent samples t-test reveals the following (Table 4). There is no evidence that the average ranks of seven influencing factors Many Jobs, High Pay, Less-Stress, Specific-Career, Real-World Applications, Always Good, and Teacher Influence for both samples are different (p-value > 0.05). In contrast, the average ranks of the three factors, Enjoys

Problem-Solving, Exact and Provable, and Connections, are different among the two samples (p-value < 0.05).

TABLE 4
INDEPENDENT SAMPLES T-TEST BETWEEN TWO COUNTRIES FOR FACTORS (MEAN DIFFERENCE = SL−USA)

Influencing Factor	t value	df	Significance	Mean Difference	Std. Error Difference
Many jobs	-0.208	134	0.836	-0.066	0.315
High pay	0.671	133	0.503	0.214	0.319
Low stress	1.065	134	0.289	0.307	0.289
Specific career	0.063	134	0.950	0.021	0.330
Enjoy problem solving[1]	-3.259	131.508	0.001	-0.782	0.240
Exact and provable[1]	-3.683	133.981	0.000	-0.983	0.267
Real world app	-0.827	133	0.410	-0.234	0.283
Connections	-2.798	134	0.006	-0.740	0.264
Always good	-1.425	133	0.156	-0.429	0.301
Teacher influence	-0.537	134	0.592	-0.206	0.383

Discussion on Question RQ4: Do the Influencing Clusters Affect Students' Decision to Major in Mathematics in Two Different Countries Differently?

We check the null hypothesis that the average ranks of influence for the two populations are equal for a specific cluster. For both clusters, Career-Related and Other, the corresponding t-test results show that we fail to reject the null hypothesis at 0.05 significance level (p-value = 0.619, 0.255 respectively) under the equal variance assumption. There is not enough evidence to conclude that the Career-Related and Other clusters influence the two populations differently.

The Math-Related cluster, however, does not satisfy the equal variance assumption (p-value = 0.001). We can also see from the corresponding t-test results that we can reject the null hypothesis (p-value = 0.002), which shows that the Math-Related cluster does influence the two populations differently. Finally, we see that the Math-Related cluster influences US students significantly more than SL students from group statistics.

TABLE 5
INDEPENDENT SAMPLES T-TEST BETWEEN TWO COUNTRIES FOR INFLUENCING CLUSTERS (MEAN DIFFERENCE = SL−USA)

Cluster	t value	df	Significance	Mean Difference	Std. Error Difference
Career related	0.499	134	0.619	0.120	0.241
Other	-1.143	134	0.255	-0.317	0.278
Math-Related[1]	-3.189	131.584	0.002	-0.691	0.217

Sri Lankan students have a higher tendency to use extrinsic motivation (career, social recognition, etc.) rather than intrinsic motivation ("Math-Related") for their learning (Dadigamuwa & Senanayake, 2012). This could provide a possible explanation as to why the "Math-Related" cluster affected them less than US students.

Discussion on Question RQ5: For Students in Each Country, Do Certain Influencing Factors Significantly Affect Students' Decision to Become Math Majors More Than Others?

During our discussion on RQ1 we see that the influencing factors significantly affect the decision of both US students and Sri Lankan students to become math majors. Among all the factors, which factors matter the most? In finding answers to that question, let us consider the pairwise effects on each population's influencing factors.

TABLE 6
PAIRWISE COMPARISON BETWEEN THE FACTORS FOR EACH POPULATION

Country	(I) Influence factor	(J) Influence factor	Mean difference (I-J)	Std. Error	Significant value
SL	f5	f1	1.333	0.198	0.000
		f2	1.093	0.203	0.000
		f3	2.347	0.215	0.000
		f4	0.387	0.172	1.000
	f6	f 1	0.960	0.199	0.000
		f 2	0.720	0.200	0.025
		f 3	1.973	0.211	0.000
		f4	0.013	0.211	1.000
	f7	f 1	1.187	0.207	0.000
		f 2	0.947	0.205	0.001
		f 3	2.200	0.207	0.000
		f 4	0.240	0.179	1.000
	f8	f 1	1.053	0.205	0.000
		f 2	0.813	0.202	0.006
		f 3	2.067	0.213	0.000
		f 4	0.107	0.188	1.000
US	f5	f 1	2.034	0.287	0.000
		f 2	2.102	0.291	0.000
		f 3	3.407	0.244	0.000
		f 4	1.237	0.271	0.001
	f6	f 1	1.814	0.297	0.000
		f2	1.881	0.324	0.000
		f3	3.186	0.261	0.000
		f4	1.017	0.264	0.013
	f7	f1	1.288	0.300	0.003
		f2	1.356	0.309	0.002
		f3	2.661	0.263	0.000
		f4	0.492	0.337	1.000
	f8	f1	1.661	0.301	0.000
		f2	1.729	0.314	0.000
		f3	3.034	0.285	0.000
		f4	0.864	0.293	0.203

The following is an exciting conclusion that we can arrive at straightaway for both student populations. The four Math-Related factors: Enjoys Problem-Solving, Exact and Provable, Real-Life Applications, and Connections significantly influenced the decision of both populations to become math majors than all other factors except the Specific Career factor (p-value < 0.05).

We do not see the statistical significance in the positive influence of any of the factors Enjoy Problem-Solving, Exact and Provable, Real-World Applications, and Connections over the Specific Career factor

among Sri Lankan students (p-value = 1.000). US students, however, feel that the factors Enjoy Problem-Solving and Exact and Provable answers influenced them significantly over the Specific Career factor (p-value < 0.05).

Unlike some US students who do not necessarily have a specific career plan while in college, most Sri Lankan students target a few future career paths even as early as their high school days. A question to pose at this point is the following: Is this phenomenon a reason for the lack of significance when comparing the "Math-Related" factors with the specific career factor for Sri Lankan students?

Discussion on Question RQ6: For Students in Each Country, Do Specific Influencing Clusters Significantly Affect Students' Decision to Become Math Majors More Than Others?

We perform an analysis similar to question RQ5 to answer this question. Table 7 summarizes all the statistics.

TABLE 7
PAIRWISE COMPARISON BETWEEN THE INFLUENCING CLUSTERS FOR EACH POPULATION

Country	(I) Cluster	(J) Cluster	Mean difference (I-J)	Std. Error	Significant value
SL	Career related	Math-Related	-1.049	0.141	0.000
		Other	-0.495	0.159	0.008
	Math-Related	Other	0.554	0.137	0.000
US	Career related	Math-Related	-1.860	0.208	0.000
		Other	-0.932	0.283	0.005
	Math-Related	Other	0.928	0.233	0.000

In terms of clusters, however, we can come to a clear conclusion that the "Math-Related" cluster influences students in both populations significantly more than the "Career-Related" (p-value < 0.001) and "Other" (p-value < 0.001) clusters. We feel that this is a crucial conclusion of our study. Students get attracted to mathematics majors mainly due to the attributes of the subject.

CONCLUSION

In the present study, we considered how ten influencing factors and three clusters formed by these factors affected current math majors in their decision to select mathematics. We studied student populations in two countries, the USA and Sri Lanka, two countries with contrasting cultures and educational systems. As explained earlier, US students have greater freedom over choosing majors, while Sri Lankan students have less space to select majors. The Career-Related cluster contains factors related to the availability of jobs, pay, stress, and whether the major targeted a specific career. Also, aspects about the intrinsic allures of mathematics such as the joy of solving problems, exactness, applications, and the connections form the Math-Related cluster. Finally, self-efficacy and teacher influence factors assemble the Other cluster.

The first natural questions to ask are whether the ten factors and clusters significantly influence the decision of all students and how they affect the two populations. We answer the significance of the influence in the affirmative for both populations. However, we also show that not all factors and clusters affect the students in the two countries the same way. For example, there is no evidence to show that the clusters related to careers, self-efficacy, and teacher influence ("Career-Related" and "Others" clusters) affect the two populations differently. However, the cluster associated with the attributes of mathematics (The "Math-Related" cluster) affected the USA students' decisions significantly more than the Sri Lankan students. When we see the effect of influencing factors, again, we see no evidence that all factors in the "Career-Related" and the "Other" clusters" affected the two populations differently. However, all the factors in the "Math-Related" cluster, except the "Real-Life Applications" factor, affected US students' decisions more

than the Sri Lankan students. The greater freedom the US educational system offers students in selecting majors based on their interest and passion could offer clues to explain these results.

We ask the next set of questions on the relative effectiveness of the factors and the clusters on each population taken separately. Through investigating these questions, we arrive at one of the key conclusions of this paper. We show that regardless of the student population, the Math-Related cluster affects the students significantly more than the Career-Related and Other clusters. We can arrive at a similar conclusion for the influencing factors. For Sri Lankan and US students, we see that all factors on the "Math-Related" cluster influence students more than all other factors except the "specific career" factor. For Sri Lankan students, none of the factors in the "Math-Related" cluster significantly influences them over the "Specific Career" factor. Sri Lankan students often target selected careers from high school days, which could explain this result. However, for the US students, "Exact and Provable Answers" and "Enjoys Problem-Solving" factors affect them significantly more than the "Specific Career" factor.

The domination of the "Math-Related" cluster over "Career-Related" and "Other" clusters corroborate with the earlier research findings (Porter & Umbach, 2006; Astin, 1993; Smart et al., 2000; Pryor & Adams, 1994; Malgwi et al., 2005; Strasser et al., 2002; Caspi et al., 2019) for majors in general. Interestingly, this pattern maintains across two student populations separated by several seas, cultures, and different educational systems.

Implications for Teachers and Recruiters

As we conducted this study on existing math majors looking at what influenced them retrospectively, our findings should guide teachers and recruiters who strive to create math majors. We encourage such teachers and recruiters to provide students with opportunities to enjoy the intrinsic properties of mathematics while showing career opportunities.

While there was no significant preference in influence among the four factors in the "Math-Related" cluster, the "Enjoys Problem-Solving" factor has the highest rank for effect. This result further reinforces our recommendation that teachers and recruiters provide intriguing problem-solving opportunities to students. We know that the allure for problem-solving has contributed to improving mathematics throughout history. Yet, today, despite the lucrative career options available, evidence indicates that the joy of problem-solving is still the most dominant temptation for most mathematicians.

ENDNOTE

1. Equal variances not assumed under Leven's Test for equal variance at $p = 0.05$.

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