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Motivation for Learning Mathematics: A Study Across Disciplines

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Abstract

Learning mathematics is associated with the assumption as a killer subject that are struggled by many students. This subject is not strictly for one particular field but learners are coming from different disciplines as well. Differences between the disciplines in education may results in difference motivation towards learning mathematics. Thus, this study aims to investigate the motivation of learning mathematics across three disciplines, science and technology, social sciences and business. This quantitative research was conducted by distributing a set of questionnaires to 234 students in a public university in Malaysia. The instruments from the questionnaire with a total of 24 items, consisted of three sections, namely, affective components, expectancy components and value components. The findings reported that learners from social science showed higher mathematics anxiety compared to science and technology and business students yet, it was also a positive attitude to encourage themselves to do better in Mathematics as they believe they can excel in Mathematics. In addition, data presented that learners from Social Science and Business priorities in achieving a good grade to show their ability to others. Eventually, this study provides an insight for the educators towards learners' motivation from different disciplines to learn Mathematics as well as helps educators to provide a suitable treatment and improve teaching quality to students according to their disciplines. In addition to that it is also hoped that the findings of

this study add to the existing theoretical framework in the motivations for learning in general and specifically for motivations in the learning of Mathematics.
Keywords: Mathematics Learning, Motivation, Science And Technology, Business, Social Science

Introduction

Background of Study

Basically, every learner cannot escape from enrolling in Mathematics subject since it is a significant subject that contributes to the development of Science, Technology, engineering and mathematics (STEM) education as well as in achieving Industrial Revolution 4.0 (IR4.0). Mathematics is an essential subject that requires problem-solving skills and a lot of practice to master that subject matter. What is notable about this is that numerous studies have taken into account the significance of exploring how to get learners interested in learning mathematics (Rozgonjuk et al., 2020).

Most people think that Mathematics is only for talented and gifted people especially learners from the science and technology field (Li and Schoenfeld, 2019). However, in reality, other disciplines such as business, social science, medical and arts also use and learn mathematics (Cezikturk, 2018; Li et al., 2019; Zwart et al., 2020). On the other hand, the skills needed vary depending on the course outcomes of that discipline. Thus far, the domains of engineering majors are largely quantitative, engineering students must have a solid mathematical foundation to thrive in them. As a result, having strong mathematical foundations is essential to their success. Students in the business discipline must pass several mathematical courses, such as business mathematics, business statistics and other related mathematics field. The subject matters are more practical. Finally, social science students are required to pass basic mathematics to graduate. However, regardless of any discipline, learners' motivation is one of a factor that can contribute to their achievement in academics (Chik and Abdullah, 2018). Motivation can be described as the process by which goal-directed behaviour is initiated and maintained (Cook and Artino, 2016). Learners that are motivated are more likely to complete a task or activity to the end and succeed in it, regardless of how difficult or challenging it may be (Gopalan et al., 2017). Thus, this validates the need to conduct a research to investigate the motivation of learning mathematics across the disciplines.

Statement of Problem

The generalizability of Malaysian Education Blueprint has offered a great deal to the development of STEM indeed raising awareness of the significance of understanding mathematics is essential to this advancement. It is hoped that the initiative will be one of the keys to create the awareness. Hence, the present research explores by investigating the motivation of learning the subject matters. According to Chik et al (2018), positive motivation will lead to a better academic achievement. A past study by Arthur et al (2022) revealed that mathematics performance was significantly impacted by motivation for learning mathematics. Prior research from Ryan and Deci (2017) indicates motivation as a resource that provides the energy required to persevere and complete activities whereas a study from Smith et al (2012) presented that students' interests in a variety of academic areas are sparked by motivation. In addition, students' interest to learn was significantly impacted by the quality of the instruction given by the educators (Fauth et al., 2019). In accordance to

Pintrich and De Groot (1990), learners' motivation can be measured based on three domains, namely; value components, expectancy components and affective components.

In the same vein Yeh et al (2019) in their research notes that, low mathematics performance was seen as also having low motivation. Similarly, the motivation of some engineering students can be depreciated due to lack of understanding the relevance of learning mathematical in engineering (Loch and Lamborn, 2016). Conversely, they created video related to engineering which apply mathematics skills in order to help the students foresee the applications. On the other hand, research from Opstad (2020) showed that female students from business discipline had a harder time learning statistics and needed to put in a lot more effort compared to male students. Having difficulties in Mathematics will eventually decrease the motivation to learn that subject matter as well as affect their achievement.

Collectively this study is done to investigate how learners' motivation to learn Mathematics across discipline is portrayed through Pintrich and De Groot (1990) concept. This investigation is done to answer the following questions;

- In the learning of mathematics, how does the value components differ across disciplines?
- In the learning of mathematics, how do expectancy components differ across disciplines?
- In the learning of Mathematics, how do affective components differ across discipline?

Literature Review

Motivating Factors in learning Mathematics

There are many factors that can motivate learners to learn mathematics in literature. Motivation to learn can be fostered from the internal or external or both. Research administered by Vaara et al (2021) revealed that students had a special interest in learning Mathematics. They believe that Mathematics is important to their future academic endeavors. Thus, it will be a push factor to always work hard to achieve excellent results in Mathematics. It was also agreed by Yunos et al (2021) that learners' desire to learn Mathematics was influenced by how much importance they gave to the learning process.

Not only depending on the learners themselves, but mathematics educators can also influence students' motivation in learning mathematics. According to Heffernan et al (2020) students are interested to study mathematics if the educators actively facilitate them since mathematics requires problem-solving skills. They need someone who can always refer to so that they are not lost while answering the questions. This is a very crucial support that educators should provide because usually when educators are playing their role, students tend to feel excited to solve the question until they are finally confidence that they can figure out the question on their own.

Recent research conducted by Alzahrani (2022) reported that another factor that kept the learners motivated was the innovative strategies used by the educators while teaching Mathematics. The metacognitive strategies used help to boost learners' confidence in their skills and eventually make them feel they can successfully manage their learning. As a result, these skills help students perform better in mathematics class.

Demotivating Factors in Learning Mathematics

There are several reasons that have been discovered as the reasons that demotivates learners to learn Mathematics which are anxiety and lacks understanding of mathematical concepts.

It has been found that mathematics anxiety is a universal problem experienced by people all over the world (Lutterberger et al., 2018). Mathematics anxiety is defined by Richardson and Suinn (1972) as the feeling of tension and anxiety that would intervene with his or her ability to not only manipulate but also to solve numbers and mathematical problems in life and academic situations (Dowker & Sheridan, 2022). This implies that having anxiety towards mathematics causes a learner to have issues in figuring out the numbers and therefore makes him to feel unmotivated in learning mathematics.

The next reason that demotivates learners is their lack of understanding of mathematical concepts (Irna & Agung, 2022). This finding is in tandem with a study done by Putra et al (2020) which found that learners found trigonometry and probability as the two hardest mathematical concepts to understand and they shun from learning these concepts. Therefore, it can be said that when learners are not able to understand the concepts, it would make it difficult for them to participate in the learning process. This results in the learners being demotivated to learn mathematics.

To conclude, having anxiety towards mathematics and lacking understanding of mathematics are some of the reasons for learners' problems in learning Mathematics.

Past Studies

Past Studies of Demotivation for Mathematics across Disciplines

Many studies have been done to investigate the demotivation for Mathematics across disciplines. Mathematics is often perceived as difficult and this makes many students dislike learning Mathematics. As a result, some students are diagnosed to have mathematics anxiety. There have been many past studies on the investigation of the way to overcome the problem in learning mathematics. The study by Ukobizaba et al. (2021) is done to investigate what makes students dislike mathematics and seeks potentially effective Mathematics teaching practices, in order to increase the interest of the students towards Mathematics. The study involved 94 participants that included 60 lower-level secondary school students and 34 Mathematics teachers from 5 schools in Karongi District, Western Province Rwanda. By using questionnaire responses, the data were analyzed by descriptive statistics. They found that students demotivated to like Mathematics is related to how Mathematics is taught, low scores in tests or exams, carelessness when writing the answers of exams, and teachers' harshness. Most of the teachers agree that for the indicators of effective Mathematics teaching practices, the teacher should be able to show the relevance of Mathematics in an everyday situation, teaching students to remember mathematical facts, and showing them lots of working examples. Moreover, preparing the lesson before teaching, and providing homework to students are other factors for effective Mathematics teaching practices.

Next, the study by (Akhter & Akhter, 2018) also looked at the factors of difficulties in learning mathematics. The research was to investigate the difficulties the students encounter while learning mathematics. The respondents were 647 from high school students in Pakistan.

The tools of data collection of this study were questionnaires. Students express uneasiness in revising mathematics for examination even though they understand their mathematics lessons. The study revealed five factors influencing students learning mathematics that lead to the difficulties such as lack of understanding in mathematical concepts, lack of comprehension, lack of curriculum support, lack of experience and appropriate training and lack of knowledge of the wide range of assessment.

Prior research administered by Rozgonjuk et al (2020) investigated the mathematics anxiety among STEM and social science students with a total of 234 respondents. A set of questionnaires were given to the respondents. The findings revealed that students in STEM and social sciences experience similar levels of anxiety when it comes to mathematics. The feelings could lead to demotivation for the students to learn mathematics.

Past Studies of Motivation for Mathematics across Disciplines

In contrast to that, there are also numerous past studies have been done to investigate the motivation to learn Mathematics across discipline. For instance, in terms of issues like combining curricular mathematics with experimental science content as well as on how a technology can enhance learning in secondary school mathematics and science using gardens as a teaching-learning context to improves students' performance in the experimental sciences (Hillmayr et al., 2020; Monferrer et al., 2022). Other than that, mathematics also has been studied in commerce includes elementary algebra and arithmetic, probability and statistics (Patil, 2020).

There have been many past studies on the motivation in learning of mathematics in science and technology, social science, and business. The study by Monferrer et al (2022) is done to investigate an issue learning mathematics in science and technology field by combining mathematics and experimental science content. It was about 21 studies of analysis included research method, research instruments used, curricular content, age of participants, impact in educational, and duration of project has been analyzed. The respondents are among students aged in between 3 to 16 years old. The curricular contents included mathematics, experimental sciences, languages, as well as fine and gross motor skills. The instruments used are using interviews, questionnaires, and classwork. Several implications had found such as improvement in mathematics, advancement in experimental science project, improves attitudes to the environment, improves in academic performance, develop creations and creativity, as well as improves learning and mindsets.

Next, the study by Hillmayr et al (2020) also looked at learning in mathematics and sciences but in terms of digital tools to enhance the mathematics and sciences subject in secondary schools. All studies which about 92 have been compared of learning outcomes of students using digital tools. The respondents' level in between grade 5 to 13 which around N=14910 of students in secondary schools. It was found that the provision of teacher trainings on digital tool was a major affected to the student performances. The effect size was larger when the digital tools were used to other instruction methods and not as a substitute.

On the other hand, Tanveer et al (2015) conducted a study among undergraduate business students to investigate the relationship between students' attitudes about business

mathematics and their overall CGPA from prior semesters. Based on the 108 respondents, the result showed that getting a good CGPA will increase their interest in mathematics.

Conceptual Framework

This study is rooted from Motivational Scales by (Pintrich & De Groot, 1990). According to Pintrich & De Groot (1990), the factors that influence learners learning Mathematics are the (a) value components, (b) expectancy components and also (c) affective components. In the context of this study, in the learning of Mathematics, the motivational factors can differ across learners of different disciplines. Learners from the Science and technology, social sciences, and business studies have different motivational factors when it comes to learning Mathematics.

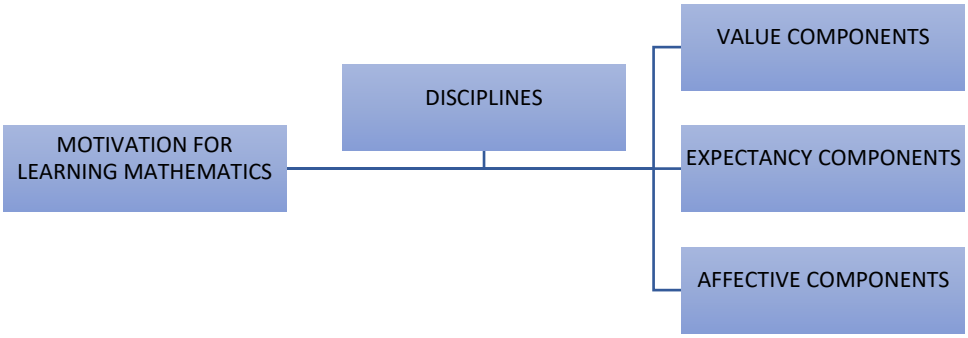

Figure 1-Conceptual Framework of the Study- Motivational factors for the learning of mathematics across disciplines.

Value Components

Value components are divided into intrinsic goal orientation, extrinsic goal orientation and task value belief. Intrinsic goal orientation refers to learners doing something that are meaningful to them. Pintrich & De Groot's (1990) reference of motivation deals when the class work is challenging so they can learn new things. Besides, it also refers to have a course material that arouse their curiosity, even if they are not easy to learn. Next, it describes their satisfaction of the course is about the understanding the content of the course itself. Finally, it also refers that learners tend to choose the assignments that they can learn from.

Extrinsic motivation refers to a person's goal to achieve due to external cause. This includes the satisfaction of getting a good grade in class. This also indicates that they priorities their improvement to achieve a good grade. Lastly, it also refers that they want to do well to show their ability to their family, friends or others.

Task value beliefs refers to learners' perceptions of the interest, value and significance of the course. According to Pintrich & De Groot's (1990) reference, it also refers to the learners' perception in transferring the knowledge from one course to the other courses. Next, it specifies on how important and useful the course material to be learned. Task value belief motivation also refers to the learners' preference to the course. Finally, it also refers to the significance of understanding the subject matter.

Expectancy Components

Expectancy components refer to a person's belief that effort will result in the desired performance outcomes. According to expectancy components by Pintrich & De Groot's

(1990), motivation for performance is influenced by two factors: (a) students' perception of self-efficacy, and (b) control beliefs for learning. For the first factor, it indicates the feeling of believe that they will receive excellent grades in the classes. Besides, it also refers to the level of confident that they can understand the most complex materials presented by the instructors and they manage to do an excellent job on the assignments and tests in the courses. Finally, it specifies that considering the difficulty of the courses, the teachers, and my skills, they think they will do well in the classes.

According to Pintrich & De Groot's (1990), the second factor is regarding to the learner's control belief for learning. It indicates that a person who thinks completing the task achievable when they are putting efforts. According to Pintrich & De Groot's (1990), learners believe that if they study in appropriate ways, then they will be able to learn the material in the courses of this program. Lastly, learners also believe if they try hard enough, then they will understand the course materials.

Affective Components

Affective components refer to a person feeling of "pleasantness" or even "unpleasantness" in dealing with a situation. Pintrich & De Groot's (1990) reference of motivation deals with how poorly the learners felt when they took a test. This also refers to how they felt about the items on other parts of the test they could not answer. Next, it refers to how they thought of the consequences of failing the test. Affective motivation also refers to the feeling of upset when they took an exam. Finally, it also refers to how their heart beats when they took the exam.

Methodology

This quantitative study is done to investigate motivation to learn Mathematics across disciplines. 234 participants were purposely chosen from a public university in Malaysia. The instrument (refer to table 1). used is a survey adapted from in Pintrich & De Groot (1990) Apart from the demographic profile in Section A., there are 4 other sections. Section B has 12 items on value components, section C has 7 items on expectancy components, and section D has 5 components on affective components.

Table 1
Distribution of Items in Survey

SECT	CONSTRUCT		VARIABLE	No of Items	Total Items
A	VALUE COMPONENTS	(a)	Intrinsic Goal Orientation	4	12
		(b)	Extrinsic Goal Orientation	3	
		(c)	Task Value Beliefs	5	
B	EXPECTANCY COMPONENT	(a)	Students' Perception of Self-Efficacy	5	7
		(b)	Control Beliefs for Learning	2	
C	AFFECTIVE COMPONENTS				5
	TOTAL NO OF ITEMS				24

Table 2
Reliability Statistics

Cronbach's Alpha	N of Items
.884	24

Data is collected via goggle form and analysed using SPSS version 26. With reference to table 2, the SPSS analysis revealed a Cronbach analysis of .884; thus, showing high internal reliability for the instrument. A one-way ANOVA is performed to explore whether there are significant differences for motivation factors across disciplines. Data is presented in terms of percentage for the demographic profile and mean scores to answer the research questions. In addition to that, ANOVA test is performed on the main components to check for significant differences across disciplines.

Findings

Findings for Demographic Profile

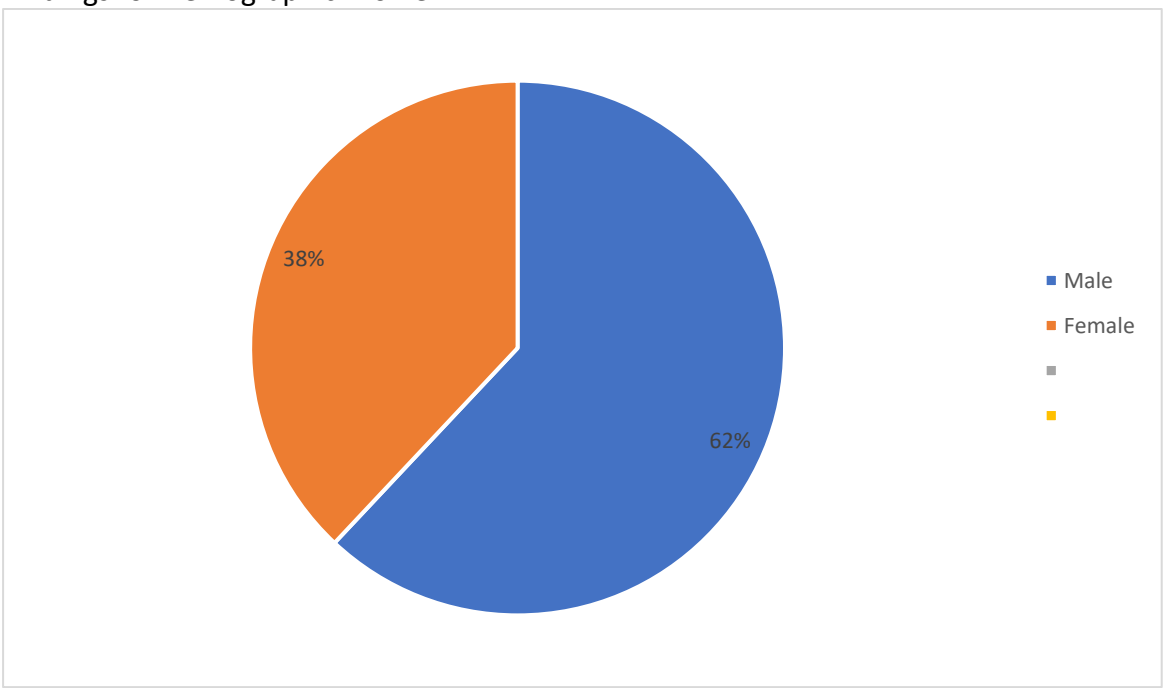

Figure 2 - Percentage for Gender

Figure 2 indicates that there are 38% female and 62% male respondents.

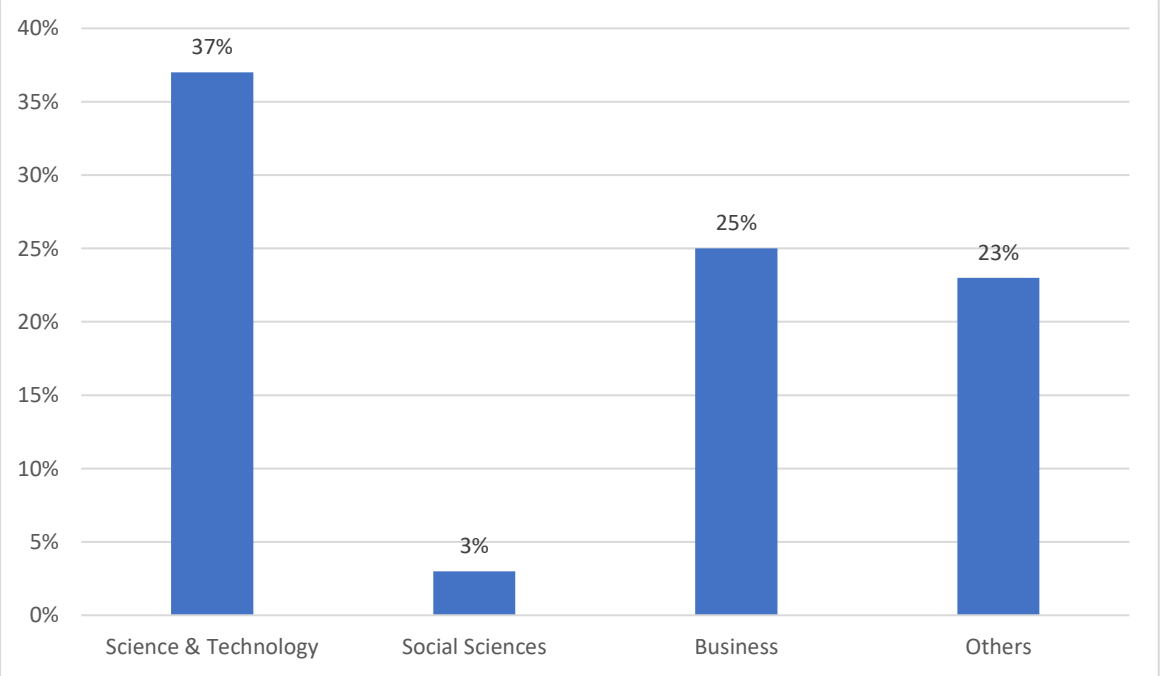

Figure 3 - Percentage for Discipline

Figure 3 presents the percentage of discipline from the total respondents. There are 37% respondents from science & technology, 25% from business, 23% from others and 3% from social sciences.

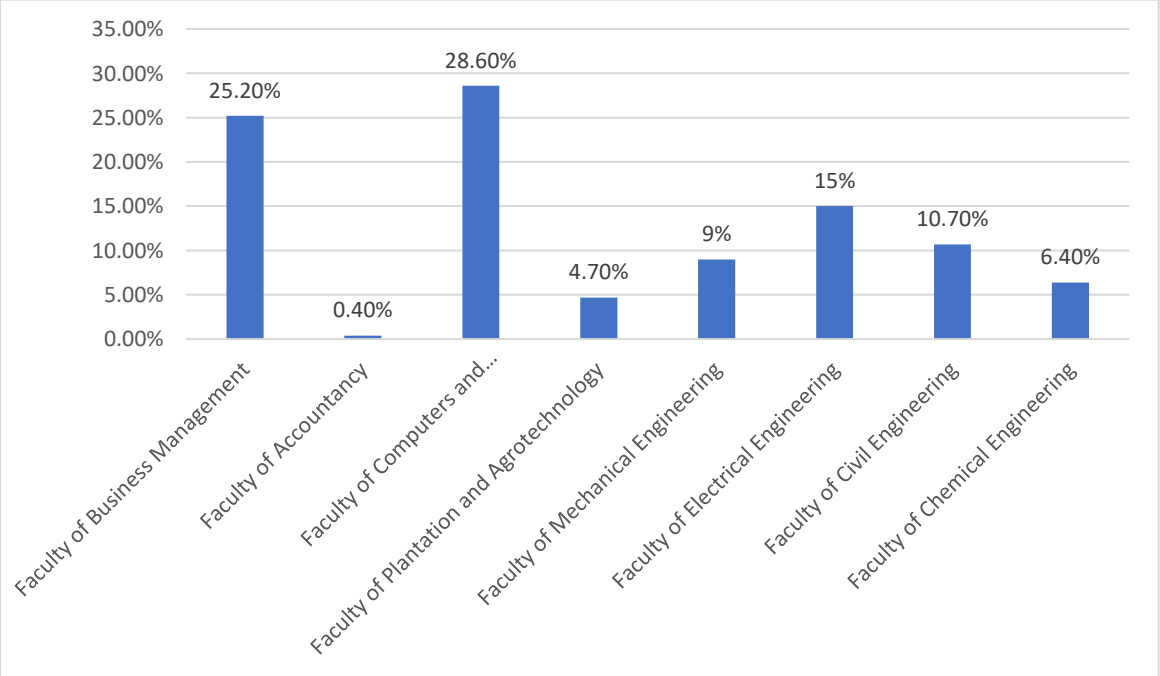

Figure 4 - Percentage for faculty

Based on Figure 4, the majority of respondents were from the Faculty of Computers and Mathematical Science which was 28.6%, followed by 25.2% from the Faculty of Business Management. Next, there were 15% of respondents from the Faculty of Electrical Engineering and 10.7% from the Faculty of Civil Engineering. While 9% of respondents were from the

Faculty of Mechanical Engineering. 6.4% was from the Faculty of Chemical Engineering, 4.7% from the Faculty of Plantation and Agrotechnology and 0.4% from the Faculty of Accountancy.

Findings for Value Components across Disciplines

This section presents data to answer research question 1: In the learning of mathematics, how do the value components differ across disciplines? The answer to research question 1 is presented in 2 sections; one section reports the ANOVA test and the next section reports the comparison of mean across each sub-components in this value component.

Findings for Significant Difference

The first section presents the results of ANOVA test to investigate if there are significant differences across disciplines for the main value component as well as sub-components of (a) intrinsic, (b) extrinsic, and also (c) task value beliefs.

Table 3
ANOVA Test for Value Components.

Factors	Science & Technology		Social Sciences		Business		Other		F	Sig
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Value	**3.964**	**0.515**	**3.988**	**0.462**	**3.877**	**0.544**	**3.877**	**0.544**	**0.429**	**0.732**
Intrinsic	3.77	0.594	3.785	0.487	3.495	0.637	3.611	0.651	2.493	0.061
Extrinsic	4.252	0.743	4.238	0.599	4.378	0.696	4.218	0.709	0.613	0.607
Task Value Beliefs	3.871	0.617	3.942	0.55	3.884	0.641	3.802	0.65	0.292	0.831

Table 3 above represents the differences on values component between disciplines. The results of intrinsic goal orientation showed the social sciences is the highest mean (Mean=3.785, SD = 0.487) and business showed the lowest mean (Mean = 3.495, SD = 0.637). ANOVA analysis results show there is no significant differences in intrinsic goal orientation that the F (3, 230) = 2.493. p = 0.061 when 0.061 greater than the value of 0.05. In conclusion, there is no significant differences on intrinsic goal orientation between disciplines.

Next, the results of extrinsic goal orientation showed the business is the highest mean (Mean = 4.378, SD = 0.696) and other disciplines showed the lowest mean (Mean = 4.218, SD=0.709). ANOVA analysis results show there is no significant differences in extrinsic goal orientation that the F (3, 230) = 0.613. p = 0.607 when 0.607 greater than the value of 0.05. In conclusion, there is no significant differences on extrinsic goal orientation between disciplines.

Then, the results of task value beliefs showed the social sciences is the highest mean (Mean = 3.942, SD = 0.55) and other disciplines showed the lowest mean (Mean = 3.802, SD=0.65). ANOVA analysis results show there is no significant differences in task value beliefs

that the F (3, 230) = 0.292. p = 0.831 when 0.831 greater than the value of 0.05. In conclusion, there is no significant differences on task value beliefs between disciplines.

Lastly, the results of values showed the social sciences is the highest mean (Mean=3.988, SD = 0.462) and other disciplines and business showed the lowest mean (Mean=3.877, SD = 0.544). ANOVA analysis results show there is no significant differences in values that the F (3, 230) = 0.429. p = 0.732 when 0.732 greater than the value of 0.05. In conclusion, there is no significant differences on values between disciplines.

Findings for Comparison of Mean

This section presents data report comparison of mean scores for (a) intrinsic, (b) extrinsic, and also (c) task value beliefs.

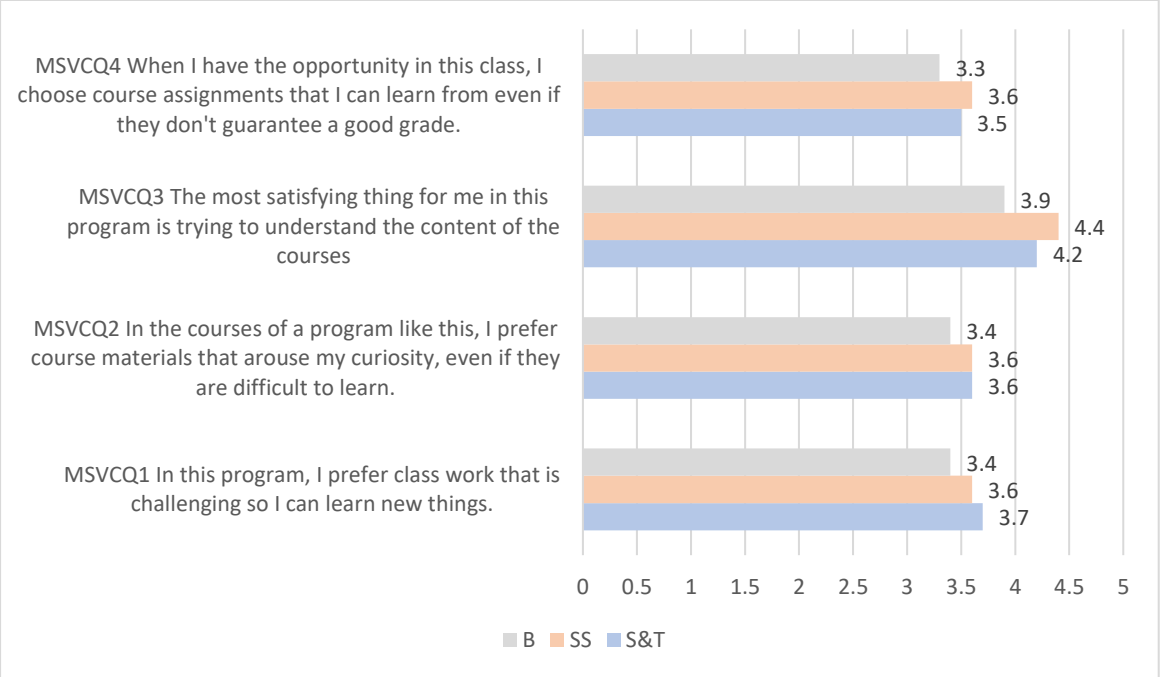

Figure 5 - Mean for Intrinsic Goal orientation

Based on the Figure 5, S&T has the highest intrinsic goal orientation of MSVCQ1 compared to SS and Business which are about 3.7, 3.6 and 3.4, respectively. However, in MSVCQ2, S&T and SS gave the similar values about 3.6 compared to business of 3.4. Meanwhile, SS reported the highest value of MSVCQ4 of 3.6 contrasted with the other field of study which is followed by S&T about 3.5 and lastly 3.3 of business study.

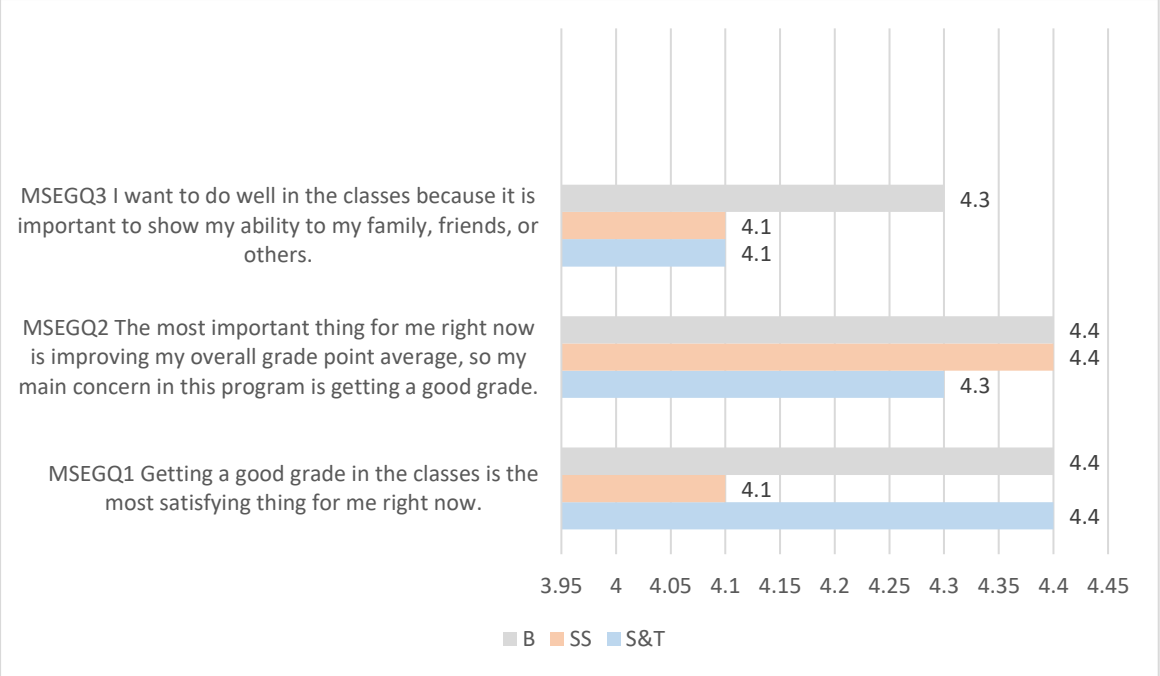

Figure 6 - Mean for Extrinsic Motivation

Data from Figure 6 illustrates the mean for extrinsic motivation. Science and technology and business showed higher mean (m=4.4) compared to science social for the statement "Getting a good grade in the classes is the most satisfying thing for me right now". Next, Science social and business had higher mean (m=4.4) than science and technology for the item "The most important thing for me right now is improving my overall grade point average, so my main concern in this program is getting a good grade". Finally, business had a higher mean (m=4.3) than the 2 disciplines for the item "I want to do well in the classes because it is important to show my ability to my family, friends, or others".

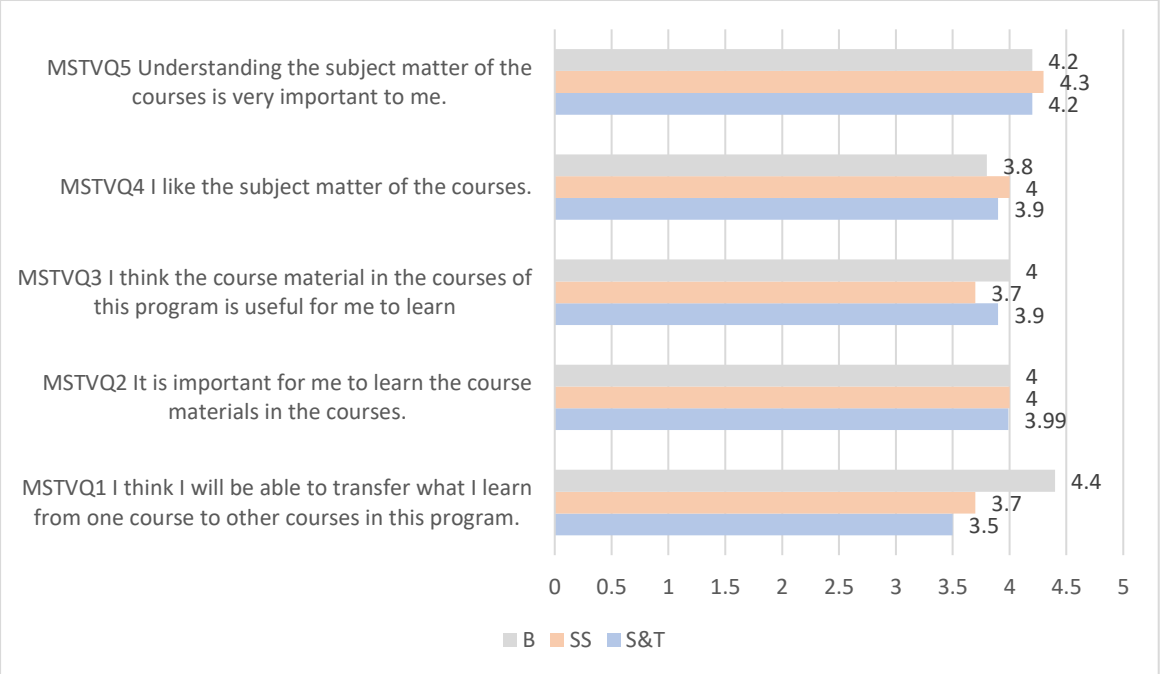

Figure 7 - Mean for Task Value beliefs

Figure 7 presents the mean for task value beliefs for participants across the three disciplines. The highest mean value for Science and Technology is 4.2 for the statement 'Understanding the subject matter of the courses is very important to me' while the lowest mean of 3.5 is for 'I think I will be able to transfer what I learn from one course to other courses in this program'. The highest mean for Social Science is 4.3 for the statement 'Understanding the subject matter of the courses is very important to me' while the lowest mean value at 3.7 are for 'I think I will be able to transfer what I learn from one course to other courses in this program' and 'I think the course material in the courses of this program is useful for me to learn'. As for Business Studies, the highest mean is at 4.4 for the statement 'I think I will be able to transfer what I learn from one course to other courses in this program' which contrasts with the other two disciplines. In addition, the lowest mean for Business Studies is 3.8 for the statement 'I like the subject matter of the courses'. In conclusion, the statement 'Understanding the subject matter of the courses is very important to me' is the most agreed upon for all the three disciplines.

Findings for Expectancy Components across Disciplines

This section presents data to answer research question 2: In the learning of mathematics, how do expectancy components differ across disciplines? The answer to research question 2 is presented in 2 sections; one section reports the ANOVA test and the next section reports the comparison of mean across each sub-components in this value components.

Findings for Significant Differences

The first section presents the results of ANOVA test to investigate if there are significant differences across disciplines for the main expectancy component as well as sub-components of (a) students' perception of self-efficacy, and (b) control beliefs for learning.

Table 4
ANOVA test for Expectancy Components

Factors	**Science & Technology**		**Social Sciences**		**Business**		**Other**		**F**	**Sig**
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**		
Expectancy	**3.734**	**0.694**	**4.014**	**0.798**	**3.75**	**0.546**	**3.763**	**0.567**	**0.446**	**0.72**
Student Perception of Self Efficacy	3.446	0.864	3.885	0.885	3.508	0.658	3.422	0.681	0.893	0.445
Control Beliefs for Learning	4.023	0.702	4.142	0.748	3.991	0.646	4.104	0.655	0.417	0.741

Table 4 above represents the differences on expectancy component between disciplines. The results of student perception of self-efficacy showed the social sciences is the highest mean (Mean = 3.885, SD = 0.885) and other disciplines showed the lowest mean (Mean = 3.422, SD=0.681). ANOVA analysis results show there is no significant differences in student perception of self-efficacy that the F (3, 230) = 0.893. p = 0.445 when 0.445 greater

than the value of 0.05. In conclusion, there is no significant differences on student perception of self-efficacy between disciplines.

Next, the results of control beliefs for learning showed the social sciences is the highest mean (Mean = 4.142, SD = 0.748) and science and technology showed the lowest mean (Mean=4.023, SD = 0.702). ANOVA analysis results show there is no significant differences in control beliefs for learning that the F (3, 230) = 0.417. p = 0.741 when 0.741 greater than the value of 0.05. In conclusion, there is no significant differences on control beliefs for learning between disciplines.

Lastly, the results of expectancy showed the social sciences is the highest mean (Mean=4.014, SD = 0.798) and business showed the lowest mean (Mean = 3.75, SD = 0.546). ANOVA analysis results show there is no significant differences in expectancy that the F(3,230)=0.446. p = 0.72 when 0.72 greater than the value of 0.05. In conclusion, there is no significant differences on expectancy between disciplines.

Findings for Comparison of Mean

This section presents data report comparison of mean scores for (a) students' perception of self-efficacy and (b) control beliefs for learning.

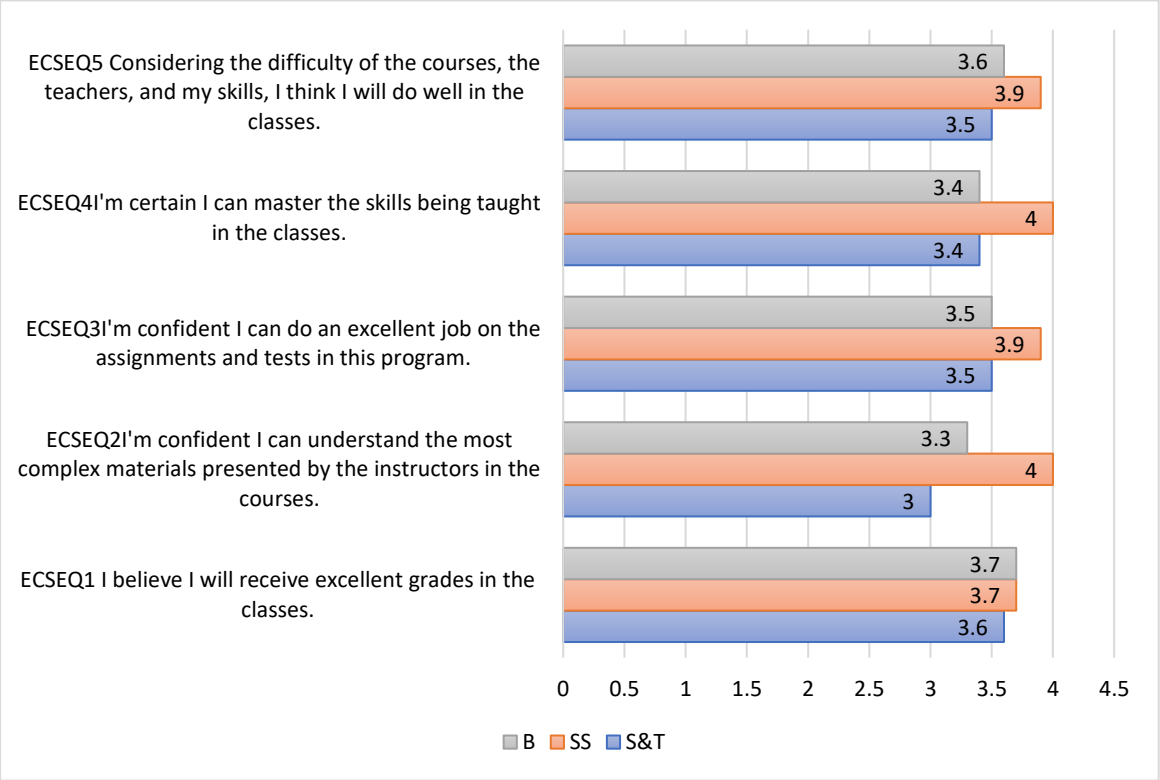

Figure 8 - Mean for Students' perception of Self- Efficacy

Figure 8 presents the mean for students' perception of self-efficacy. Learners from social science and business both had higher mean (m=3.7) than learners in the science & technology discipline for "I believe I will receive excellent grades in the class". Next, students from social sciences had the highest mean compared to the other 2 disciplines 3 items and they are; "confident I can understand the most complex materials presented by the instructors in the courses" (mean=4), "confident I can do an excellent job on the assignments

and tests in this program" (mean=3.9), "certain I can master the skills being taught in the classes." (mean=4) as well as for "Considering the difficulty of the courses, the teachers, and my skills, I think I will do well in the classes" (mean=3.9).

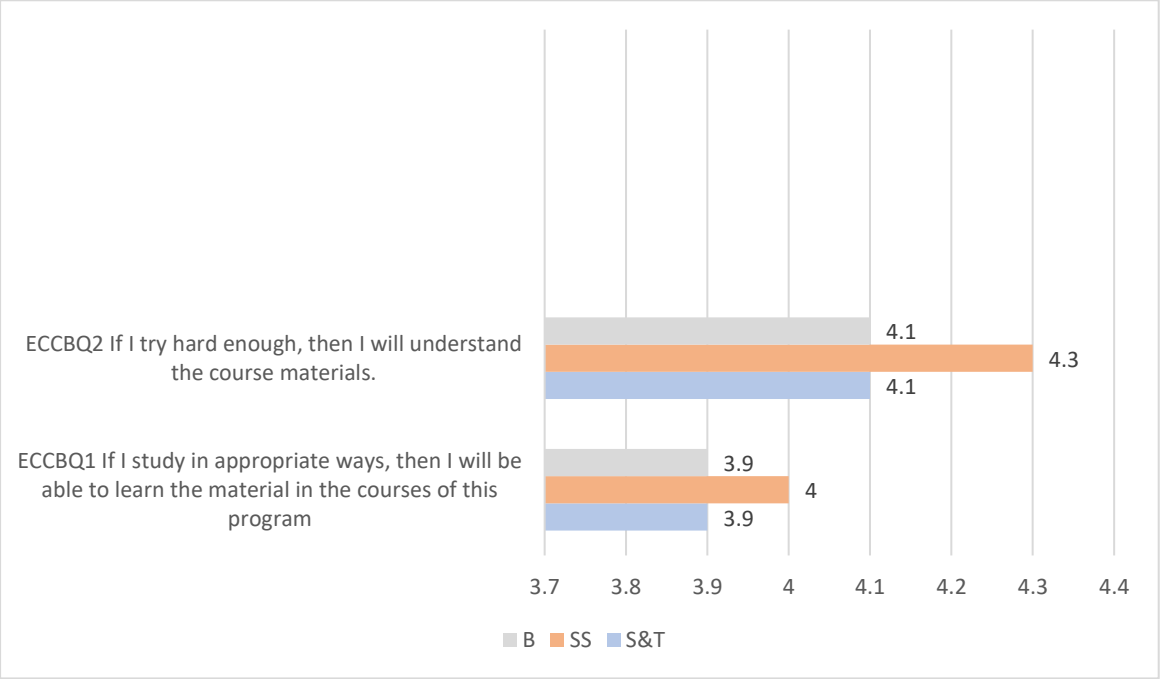

Figure 9 - Mean for Control beliefs for learning

Figure 9 shows the mean for control beliefs for learning. Learners from social science had the highest mean (m=4) compared to the other two discipline for two items and they are "If I study in appropriate ways, then I will be able to learn the material in the courses of this program" as well as "If I try hard enough, then I will understand the course materials" (mean=4.3).

Findings for Affective Components across Disciplines

This section presents data to answer research question 3: In the learning of mathematics, how do affective components differ across disciplines? The answer to research question 2 is presented in 2 sections; one section reports the ANOVA test and the next section reports the comparison of mean across each item in the affective components.

Findings for Significant Differences

The first section presents the results of ANOVA test to investigate if there are significant differences across disciplines for the affective component

Table 5
ANOVA Test for Affective Components

Factors	Science & Technology		Social Sciences		Business		Other		F	Sig
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Affective	**3.749**	**0.845**	**4.4**	**0.553**	**3.766**	**0.772**	**3.651**	**0.773**	**1.96**	**0.121**

Table 5 above represents the differences on affective component between disciplines. The results of affective showed the social sciences is the highest mean (Mean = 4.400, SD=0.553) and other disciplines showed the lowest mean (Mean = 3.651, SD = 0.773). ANOVA analysis results show there is no significant differences in affective that the F(3,230)=1.96. p = 0.121 when 0.121 greater than the value of 0.05. In conclusion, there is no significant differences on affective between disciplines.

Findings for Comparison on Mean

The next section presents data for the comparison of individual mean scores in the affective components across disciplines.

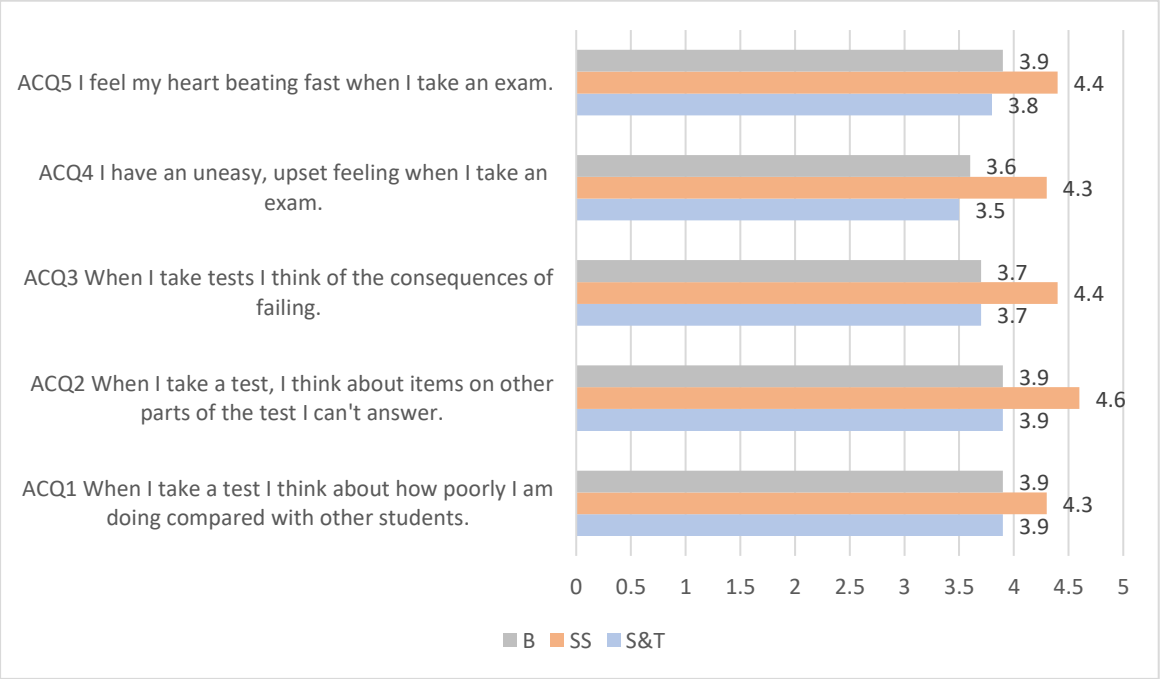

Figure 10 - Mean for Affective Component

Data from Figure 10 presents the mean for affective components. Learners from social science shows highest mean items compared to science and technology and business for all 5 and they are; “When I take a test, I think about items on other parts of the test I can't answer”, “When I take a test, I think about items on other parts of the test I can't answer”, “When I take tests I think of the consequences of failing ”, “When I take tests I think of the consequences of failing”, “I have an uneasy, upset feeling when I take an exam” and “I feel my heart beating fast when I take an exam” with mean of 4.3, 4.6, 4.4, 4.3 and 4.4 respectively.

Conclusion

Summary of Findings and Discussion

In summary, although there are no significant differences for all three components (value, expectancy, and affective), individual mean scores of individual items reveal interesting findings worth discussing. In general, the findings reported a high mean for ‘The most important thing for me right now is improving my overall grade point average, so my main concern in this program is getting a good grade’ for social science and business, followed by science and technology. These findings are coherent with previous research from Tanveer et al (2015), where business students who possess great achievement in Mathematics are

more likely to like the subject matter. These shows how much they value the outcome of the learning process which drive the motivation.

The data presents a high mean for "I believe I will receive excellent grades in the class" for social science and business. This could be due to the difference in difficulty level learned by the three disciplines. Mathematics for business and social science is more practical and easy to be applied compared to the science and technology field which is more conceptual. These findings are in accordance with the study by Putra et al. (2020) that difficulties in understanding the concept may lead to a lower confidence level in that particular subject.

Learners reported that social science students showed a higher mean for 'When I take a test, I think about items on other parts of the test I can't answer compared to the other two disciplines. This shows a symptom of mathematics anxiety. The results are slightly different from the studies by Rozgonjuk et al. (2020), wherein in their findings, STEM and social science students were equally anxious about Mathematics. The contradiction might be differed due to the basic mathematical knowledge and skills that the students had in their secondary schools. However, looking at a positive insight, mathematics anxiety could be a push factor for the students to perform well in Mathematics.

Pedagogical Implications and Suggestions for Future Research

Learners from different disciplines have different motivations in learning Mathematics. The educators must interact with the students from the beginning to boost their interest and confidence in learning Mathematics. Educators should treat each discipline according to their capabilities and provide continuous support. If that happens, learners will develop an interest in that subject as well as increase their motivation to achieve the best result in Mathematics.

Future research can be conducted to investigate the motivation to learn Mathematics across gender. Perhaps different gender may have a different motivations and investigate the suitable approach to boost their confidence level in learning Mathematics.

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