The Influence of Self-Regulation on Cognitive Strategy, Self-Efficacy, Intrinsic Value and Test Anxiety

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Abstract
Pre-university students are secondary school leavers who are adapting to university life. Many reports suggested that new university students mostly lack self-regulation and this could negatively affect their academic performance and cause unnecessary stress. The purpose of this study is to find out the influence of self-regulation on pre-university students' cognitive strategy, self-efficacy, intrinsic value, and test anxiety. Six research questions were developed for this study and a quantitative survey was conducted on 115 pre-university students from Pusat Asasi Universiti Teknologi MARA and INTEC Education College in Malaysia who went through a challenging secondary school experience due to the COVID-19 pandemic. The instrument used was divided into three sections with a total of 44 items which are demographic profile, motivational beliefs, and self-regulated learning strategies. From the findings, it was discovered that there are positive relationships between self-regulation and cognitive skills, self-efficacy, and intrinsic value but weak positive with test anxiety. Despite challenges faced during the pandemic, the students are found to be coping quite well during the endemic. Respondents have reported that they are motivated to learn and have applied self-regulation strategies but are a bit anxious about tests. To assist pre-university students in coping with the new study environment and demands, both lecturers and students need to understand and apply the knowledge on self-regulation strategies for students to better prepare for their tertiary education.

Keywords: Self-regulation, Cognitive Strategy, Self-Efficacy, Intrinsic Value, Test Anxiety, Pre-University.

Introduction
Background of Study

Self-regulation in learning is an ability a student should have to achieve their desired performance in academic achievement. Students should be able to actively identify their level of understanding of a particular concept and autonomously find a way to improve their understanding of the concept. In other words, students should realise that the most responsible persons towards their academic performance are themselves. Studies conducted in Malaysia found that students from secondary schools entering universities lack readiness in facing university academic and social environments (Terpstra-Tong & Ahmad, 2018; Davies, 2019). The students are found to be having difficulties in learning independently, doing research-based assignments, time management skills, and critical thinking skills. University students must develop the ability to learn independently. According to Bandura (1991), students who can monitor and observe their methods of learning would be able to audit themselves and steer in a direction towards better academic goals like excelling in a test. Bandura (1991) highlighted, when humans are aware of their abilities and goals, they would be self-motivated. Goal setting plays a crucial role in developing motivation. A person who has a clear academic goal would develop better motivation than those who do not (Bandura, 1991). While Pintrich & de Groot (1990) described that self-regulators would plan, monitor, and strategise their thinking abilities to be able to block distractors and device cognitive strategies to understand the contexts of topics discussed in class. Schunk & Zimmerman (2003) stated that self-regulated learning could change a learner's mindset from being a passive receiver of educational content to an active learner which is an important trait for a university student. This study focuses on determining the influence of self-regulation on cognitive strategies, self-efficacy, intrinsic values and test anxiety in pre-university students in Malaysia.

In Malaysia, students between the age of 18 to 19 enrolled in pre-university foundation programmes are accepted based on their good Sijil Pelajaran Malaysia (SPM) results. Youths around this age are inclined to be affected by many types of pressure especially when they are university students (Browning et. al., 2021). Students who responded to the set of items for this study were accepted into the foundation programmes based on good SPM results. They have undergone the least amount of face-to-face interactions with teachers and peers in secondary schools due to the lockdown that started on 18th March 2020. Experiencing online learning due to the lockdowns during school years might have different impacts on secondary school students. Some students might not be interested in participating in the online class activities and some have no difficulties in participating. Students with clear goals for their SPM examination results would endure the new method of teaching and learning delivery and manage to score good results to secure a place in a pre-university programme. They have applied learning and self-regulation skills to a certain extent that resulted in positive outcomes in their SPM results. During their pre-university studies, the students should be adapting to the new university system that is different from secondary school settings in many ways. Ali Sabri Radeef et. al (2014) gathered that university students are affected by many sources of academic and non-academic stressors that would affect their mental health. Some are self-regulation related. The information gained from this study would give an insight into how foundation students manage their academic challenges to

achieve their goals and prepare themselves for their next academic journey in their respective universities.

Statement of Problem

The outbreak of the COVID-19 pandemic in 2020 has impacted many countries' higher education institutions. To contain the spread of COVID-19, schools and universities in 178 countries were closed, affecting roughly 1.3 billion learners worldwide. During these times, many institutions were closed and switched to online learning resulting in great challenges for all actors in the educational context (ie teachers, students, and parents). The containment measure has created challenges for physical well-being as educators are forced to develop a new 'emergency teaching method' to ensure the continuation of the lessons without any disruptions. To counteract these negative developmental outcomes, much research has been done on the effects on learners' psychological well-being in terms of motivation and self-regulated learning during the times of COVID-19. Holzer et al (2020) reported on the investigation of basic psychological need satisfaction among higher education students in terms of experienced competence, autonomy and relatedness with their positive emotions and intrinsic motivation learning. Furthermore, a similar study by Pelikan et al (2021) reported on how the role of self-regulated learning, motivation and procrastination affects the student's perception of competence. However, despite many studies have been done on the psychological impact on the learner during the pandemic, no studies have been done on the influence of self-regulation on cognitive strategy, self-efficacy, intrinsic values, and test anxiety for post covid's learners, specifically pre-university students.

Objective of the Study and Research Questions

This study is done to explore the perception of learners on their motivation and use of self-regulation strategies. Specifically, this study is done to answer the following questions;

- How does self-regulation influence learning?
- How do learners perceive the use of cognitive strategy in learning?
- How does self-efficacy influence learning?
- How does intrinsic value influence learning?
- How does test anxiety influence learning?
- Is there a relationship between self-regulation and cognitive strategy, self-efficacy, intrinsic value and test anxiety?

Literature Review

Motivation to Learn

Despite having self-regulated learning (SRL) skills, motivation to study is also a crucial factor in student achievement and has shown a strong correlation with the student's SRL technique. Motivation is defined as the human tendency to choose a certain action, to persist in that behaviour, and is the set of processes that affect the direction, intensity, and persistence of human behaviour and their ability to exert effort while working towards a goal. Motivation to learn will reflect the reasons why students engage in a class (Erhel et al., 2022). The general expectancy-value theory states that motivation consists of three components: an expectancy component (e.g., self-efficacy), a value component (e.g., intrinsic motivation), and an affective component (e.g., test anxiety) (Pintrich & De Groot, 1990). Intrinsic motivation and self-efficacy are two of the most influential motivational factors that have a significant and tremendous effect on students' academic performance and their use of SRL strategies

(Lim & Yeo, 2021; Martínez et al., 2016). Intrinsic motivation refers to the extent to which people engage in activities because of their innate curiosity and interest (Pintrich & De Groot, 1990). On the other hand, self-efficacy is a personal assessment of one's ability to achieve specific goals. Students with high intrinsic and self-efficacy values may have better learning strategies, which would consequently lead to better learning and academic performance.

Self-Regulation in Learning

Over the last four decades, self-regulated learning has gained much attention in the higher education research area as it is one of the vital aspects of college teaching and learning. Self-regulated learning is defined as a self-directive process which refers to the transformation of a learner's mental ability into academic skills (Zimmerman, 2002). In other words, students who actively regulate their learning are often more motivated to learn and actively engage with their studies. They set their goals, monitor their progress, and adjust their strategies accordingly to their needs (Zimmerman, 1986). Also, they are aware of their thinking methods and posse's meta-cognitive skills such as self-reflection and self-assessment to achieve their academic goals (Schunk, 1995).

Past Studies on Motivation to Learn

There have been many past studies on methods used to improve student motivation and how these methods can impact academic outcomes in higher education. Motivation affects behaviour's direction, intensity, and persistence. Motivation is particularly pertinent to education because it reflects the reasons why students engage in a course (Bae & DeBusk-Lane, 2018; Erhel et al., 2022; Grabner-Hagen & Kingsley, 2023). A study by Erhel et al (2022) was done to investigate the power of social media, specifically Twitter, one of the most popular social media platforms, to help students remember course concepts and stimulate their motivation to learn. This three-year study compared Twitter users with non-users among 488 undergraduate students in a first-year course of cognitive psychology. This study was done in a 'naturalistic' educational environment by using Twitter to remind students of course concepts and asking them questions every week for one semester. Findings revealed that this Twitter-based method increased students' intrinsic motivation and interest during the semester, and most importantly, it reduced apathy. Similar to this, a two-year study by Grabner-Hagen & Kingsley (2023) on two different groups of elementary students showed that students who took part in activities within the gamified classroom reported higher levels of autonomous motivation and engagement despite experiencing both intrinsic and extrinsic motivation. In addition, students stated that the classroom was supportive of their psychological needs and provided them with high degrees of autonomy, competence, and relatedness.

Past Studies on Self-Regulated Learning

There have been many past studies on the relationship between self-regulation, self-efficacy, test anxiety and motivation. Self-regulation is a process of self-discipline and self-control where a conscious effort is being used in suppressing overpowering responses to aim for a higher goal (Duckworth, 2005). A study by Adesola et al. reported on the relationship between test anxiety with the components of motivational beliefs which are self-regulation, self-efficacy, intrinsic value, and cognitive study strategies as well as test anxiety with academic performances (Adesola, 2018). The research method used in this study is ethnography which permits the viewing of real-life situations and thus can be discussed and

understood. The respondents involved in this research were twenty-four students which comprised 14 males and 10 females from the Department of Computer Science, Federal College of Education (Special), Oyo, Nigeria. The students were taught two topics in Computer Science and the sessions were recorded. After each session, the videos were played and analysed by researchers and students before a questionnaire was distributed to further obtain more data and clarification. The outcome of the research revealed that there is no correlation between motivational beliefs to test anxiety. However, there is a high correlation between test anxiety and academic performance. Additionally, this study also indicated that students with high self-regulation are more likely to apply high cognitive strategy and self-efficacy in achieving their goals which resulted in better academic performance. On the contrary, students with low self-regulation resulted in high test anxiety and led to poor performance in their examinations. Another similar study by Tosuncuoglu reported on an investigation of the relationship between self-regulated learning components such as cognitive strategy use and self-regulation with motivational components such as goal orientation, self-efficacy, intrinsic value and test anxiety in Karabük University, Turkey (Tosuncuoglu, 2019). The study was conducted by applying MSLQ questionnaires to 233 students in the English language and Literature Department who are from all grades. All respondents are students attending regular (daytime), evening and distance education classes in the 8–9-month English Preparatory Programme. The data obtained through the survey were analysed using variance analysis (ANOVA). The results from this study revealed that a moderate ratio of goal orientation, self-efficacy, intrinsic value, test anxiety, cognitive strategy use and self-regulation can be stated from these three types of student education (ie. regular (daytime), evening and distance education). However, based on the statistics, the mean score for regular students is higher than for distance education students in terms of self-efficacy belief, intrinsic motivation and cognitive strategy used. Also, it was found that self-regulation influences goal orientation, self-efficacy, and cognitive strategy usage at different levels. Furthermore, there is a mutual relationship between self-efficacy, self-regulation as well as self-evaluation and academic performance.

Conceptual Framework
Figure 1 shows the conceptual framework of the study. This study explores the relationship between self-regulation with cognitive strategy, self-efficacy, intrinsic value and test anxiety. Motivated learners have confidence in the way they learn and this confidence makes them self-regulated learners (Rahmat et. al., 2021). According to Pintrich & De Groot (1990), learners are driven by motivational beliefs. These are (i) self-efficacy, (ii) intrinsic value, and (ii) test anxiety. In addition to that, in today's world of independent learning, learners are driven to be self-regulated. They are known to display (i) cognitive strategy use and self-regulation.
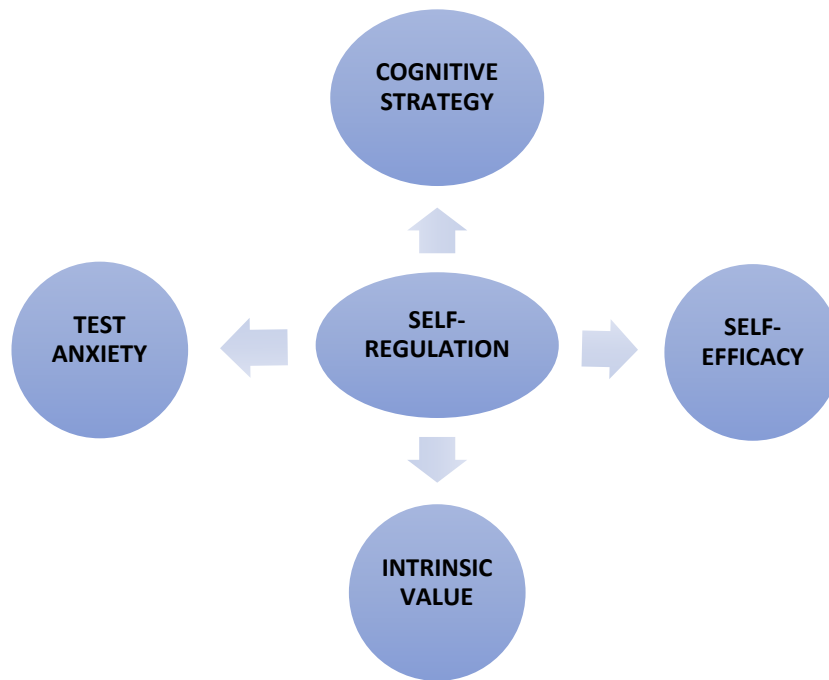
Figure 1- Conceptual Framework of the Study-
The Influence of Self-Regulation on Cognitive Strategy, Self-Efficacy, Intrinsic Value and Test Anxiety

Methodology

This quantitative study is done to explore motivation factors for learning among undergraduates. A purposive sample of 115 participants responded to the survey. The instrument used is a 5 Likert-scale survey and is rooted in Pintrich & De Groot (1990) to reveal the variables in Table 1 below. The survey has 4 sections. Part one has items on the demographic profile. Part one has 22 items on motivational beliefs. Part three has 22 items on self-regulated learning strategies.

Table 1
Distribution of Items in the Survey

PART	STRATEGY		SCALE	Items	Total Items
TWO	MOTIVATIONAL BELIEFS	A	SELF-EFFFICACY	9	22
		B	INTRINSIC VALUE	9	
		C	TEST ANXIETY	4	
THREE	SELF-REGULATED LEARNING STRATEGIES	D	COGNIVE STRATGY USE	13	22
		E	SELF-REGULATION	9	
	TOTAL NO OF ITEMS				44

Table 2
Reliability of Survey

Reliability Statistics

Cronbach's Alpha	N of Items
.909	44

Table 2 shows the reliability of the survey. The analysis shows a Cronbach alpha of .909 thus, revealing a good reliability of the instrument chosen/used. Further analysis using SPSS is done to present findings to answer the research questions for this study.

Findings
Findings for Demographic Profile
Only a few demographic profile information were gathered for this study which are the gender of the respondents, their discipline or field of study, and their respective institutions.
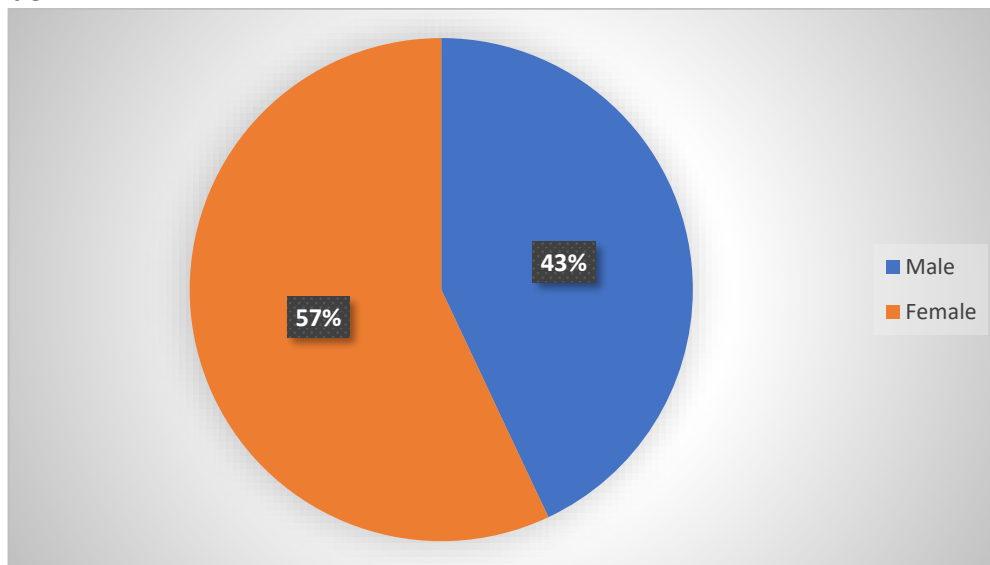
Q1. Gender

Figure 2- Percentage for Gender

Out of 115 respondents, there is a higher percentage of female students (refer to figure 2) who participated in the study (57%) as compared to male students (43%). From a general point of view, more female students responded to this study than male students so there would be more opinions coming from the female students.
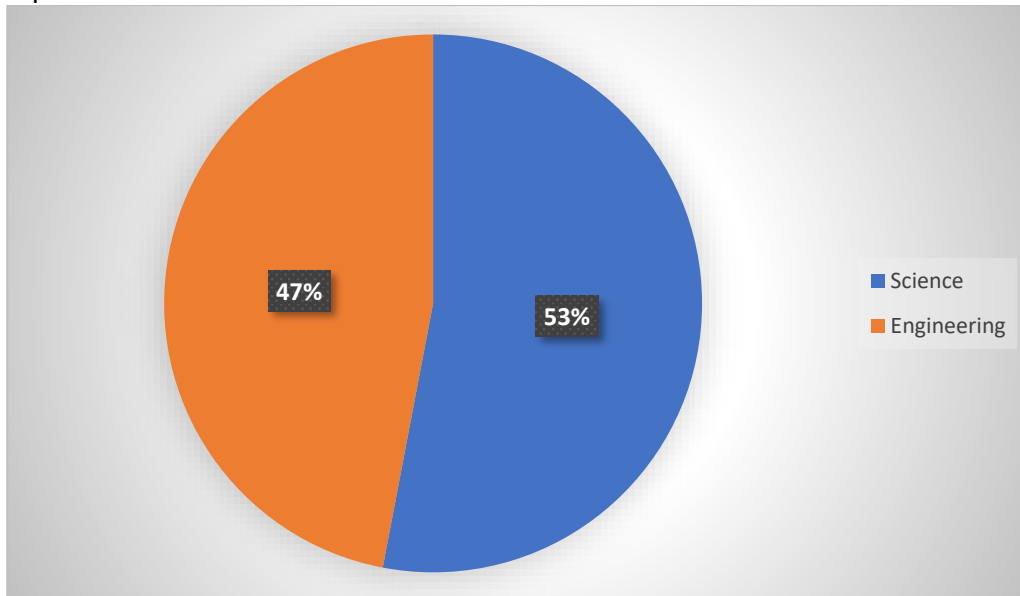
Q2. Discipline

Figure 3- Percentage for Discipline

Out of all participants, a little more than half of them were from the Foundation of Science Programme and the rest were from the Foundation of Engineering Programme. There is a slight difference in the percentage of participants from both programmes. Based on the percentage, more opinions would come from the science students but responses from the engineering students would also help in this study.
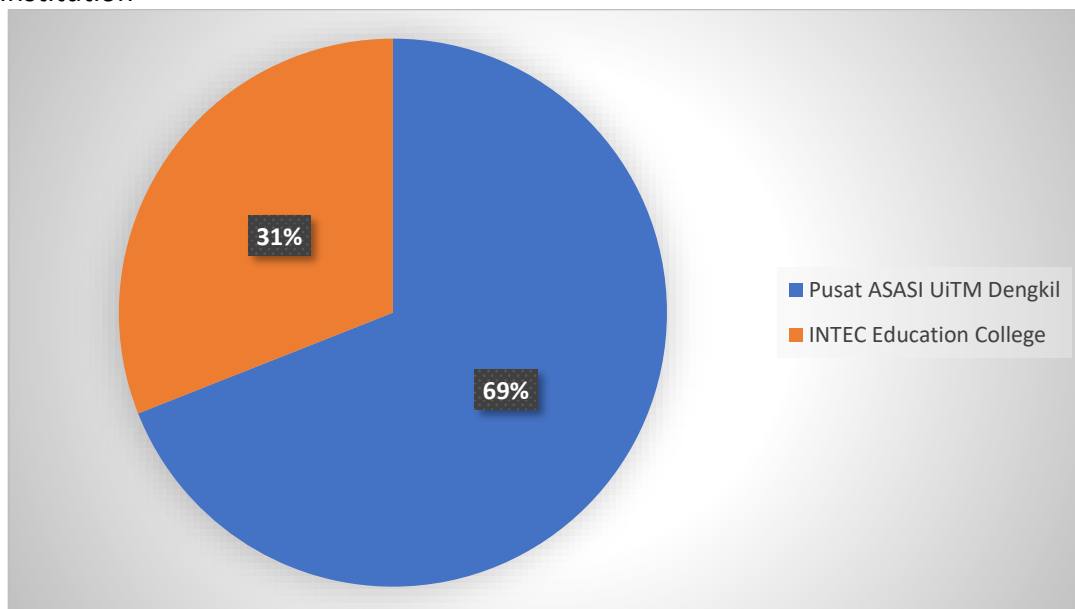
Q3. Institution

Figure 4- Percentage for Institution

The instruments were shared in the form of Google link to students in foundation programmes from two institutions which are Pusat Asasi UiTM, Dengkil (PI) and INTEC Education College (INTEC). Students in PI are preparing themselves to enrol in Malaysian universities whereas those from INTEC are preparing for international universities. With

reference to figure 4, 69% of students who responded were from PI and the rest were from INTEC. There are more science and engineering foundation students in PI as compared to INTEC and that might be the reason for this per cent distribution.

Findings for Self-Regulation

This section presents data to answer research question 1- How does self-regulation influence learning?
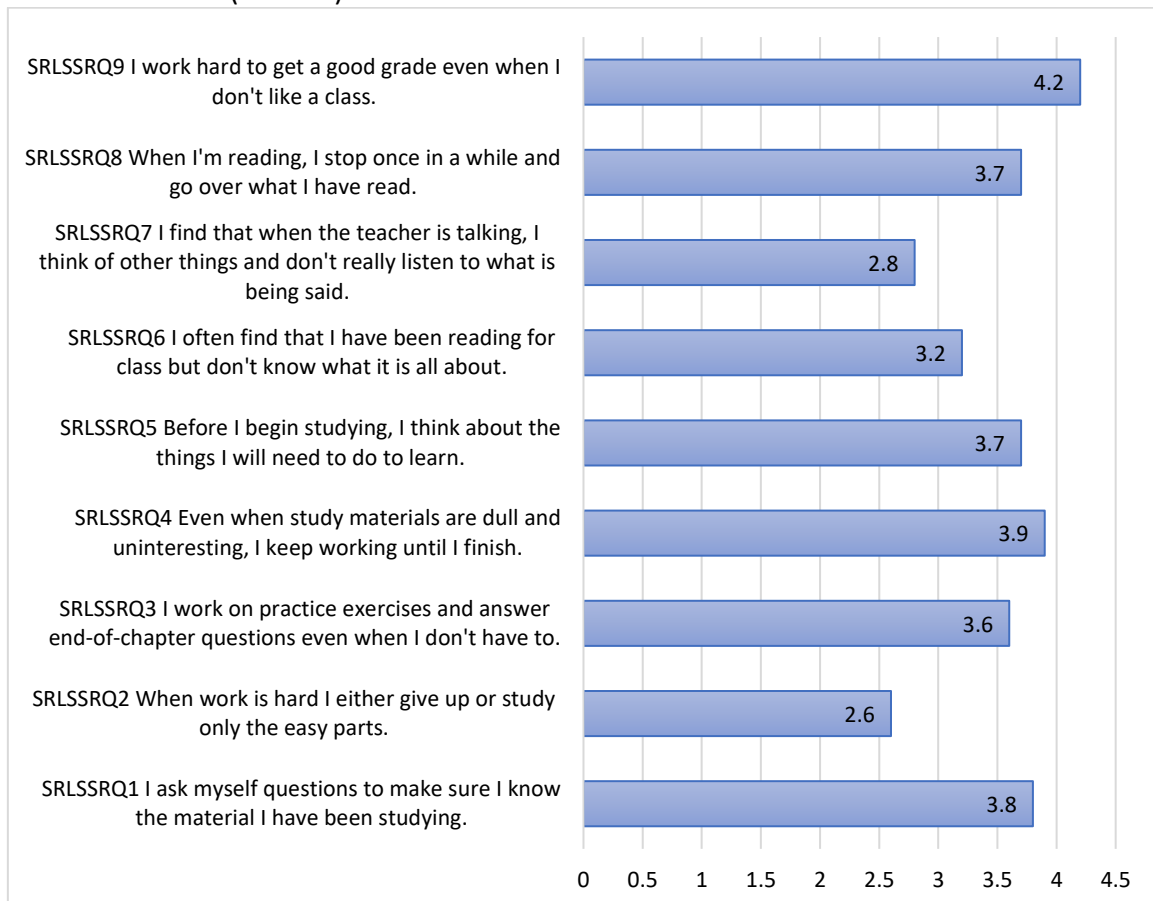
SELF-REGULATION (9 items)

Figure 5- Mean for Self-Regulation

Based on figure 5, there are 9 items in relation to self-regulated studies. As shown, most of the respondents claimed to work hard to obtain good grades although they did not like the class with the highest mean of 4.2. This is followed by the second highest mean of 3.9 which mentioned that the respondents keep studying despite the study materials being dull and boring. Items SRLSSRQ1 stated that the respondents questioned themselves to make sure they know their study materials are having a mean of 3.8. Subsequently, the respondents did their preparations prior to learning new things (SRLSSRQ5) with a mean of 3.7. Also, the responses on the voluntary practice exercises done at the end of the chapter show a mean of 3.6. Despite having been reading for class, most respondents reported were neutral on knowing what it was being read (mean of 3.2). The least mean of 2.6 is responded for the item SRLSSRQ2 which stated that when the work is hard the respondents either give up or study only the easy part.

Findings for Cognitive Strategy
This section presents data to answer research question 2- How do learners perceive the use of cognitive strategy in learning?
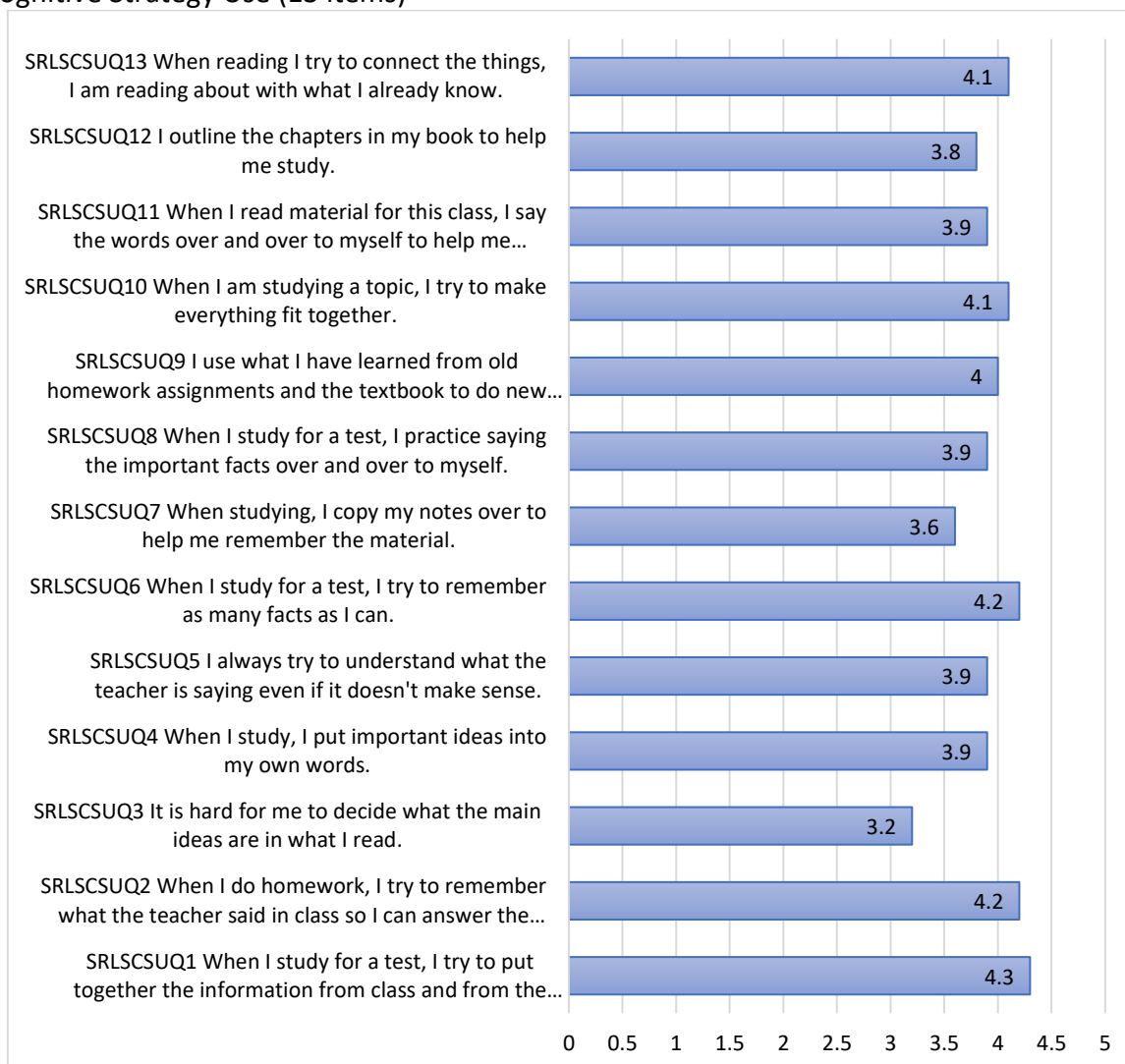
Cognitive Strategy Use (13 items)

Figure 6- Mean for Cognitive Strategy

When respondents were asked how they perceived the use of cognitive strategy in learning (figure 6), most respondents, with a mean score of 4.3, revealed that when they studied for a test, they tried to put together the information from class and from the book and tried to remember as many facts as they could (mean score of 4.2). Besides, when they did homework, they tried to remember what the teacher said in class so they could answer the questions correctly. This is closely followed by respondents who stated that when they studied a topic, they tried to make everything fit together and when they read, they tried to connect what they were reading with what they already knew (mean score of 4.1). Four other cognitive strategies with a mean value of 3.9 each were putting important ideas into their own words and practising saying the important facts over and over to themselves while studying (SRLSCSUQ4 and SRLSCSUQ8), always trying to understand what the teacher was saying even if it doesn't make sense (SRLSCSUQ5), and when reading, they said the words

over and over to themselves to help them remember (SRLSCSUQ11). The least frequent response with a mean score of 3.2 was that it was hard for them to decide what the main ideas were in what they read.

Findings for Self-efficacy

This section presents data to answer research question 3- How does self-efficacy influence learning?
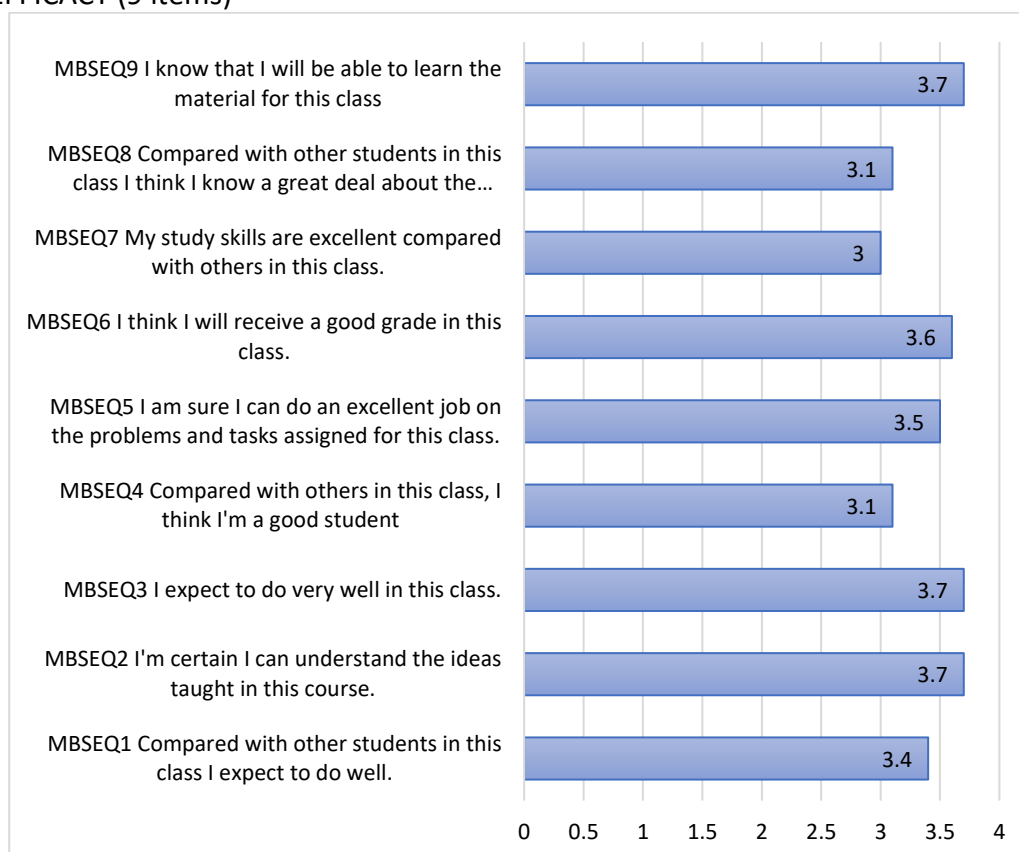
SELF-EFFICACY (9 items)

Figure 7- Mean for Self-Efficacy

Self-efficacy is having a belief to be able to complete given tasks and achieve a particular goal. Figure 7 summarised the means of self-efficacy items. None of the respondents were found to have negative self-efficacy but some neutral opinions were recorded for MBSEQ1, MBSEQ4, MBSEQ7, and MBSEQ8. All the items are used in finding out the respondents' opinions on doing well, being a better student, having better study skills, as well as knowing the subject better than their peers. It can be implied that they perceive themselves as having similar academic levels and abilities to their peers. For other items, most responded positively. It can be implied from the data that the respondents felt confident that they know the ideas taught in class, can solve problems and complete the tasks given, and were able to learn the materials for the class. Also, they have positive mindsets on doing well in the subject and getting good grades out of it.

Findings for Intrinsic Value
This section presents data to answer research question 4- How does intrinsic value influence learning?
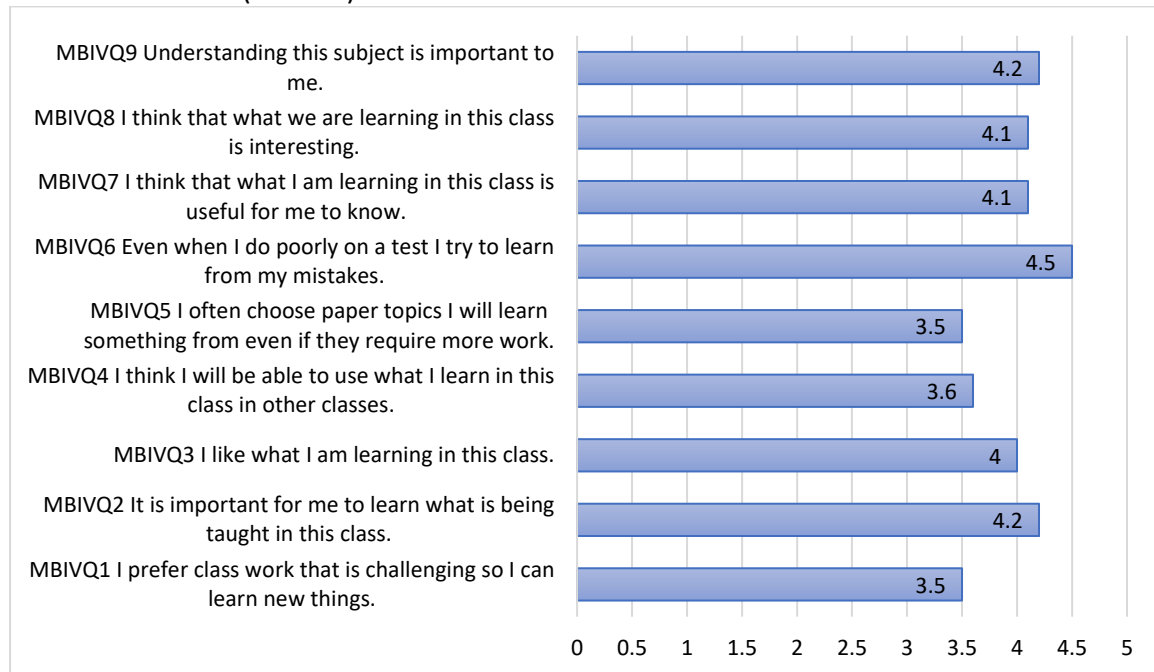
INTRINSIC VALUE (9 items)

Figure 8- Mean for Intrinsic Value

Intrinsic value refers to enjoyment experienced by students while involved in academic tasks or activities. Data in figure 8 shows that respondents reflect on their mistakes even when they did poorly on a test with a mean value of 4.5. This is closely followed by items MBIVQ2 and MBIVQ9 in which the respondents are aware of the importance of what was taught in class and its understanding with a mean of 4.2 each. Both items MBIVQ7 and MBIVQ8 have a means of 4.1 where the respondents think that what they are learning in the class is useful and interesting. Also, the respondents like what they are learning in class with a mean of 4.0. The least mean of 3.5 was responded for items MBIVQ1 and MBVIQ5 where the respondents prefer challenges in acquiring new knowledge and often choose paper topics where they will learn something from even if it is difficult.

Findings for Test Anxiety
This section presents data to answer research question 5- How does test anxiety influence learning?
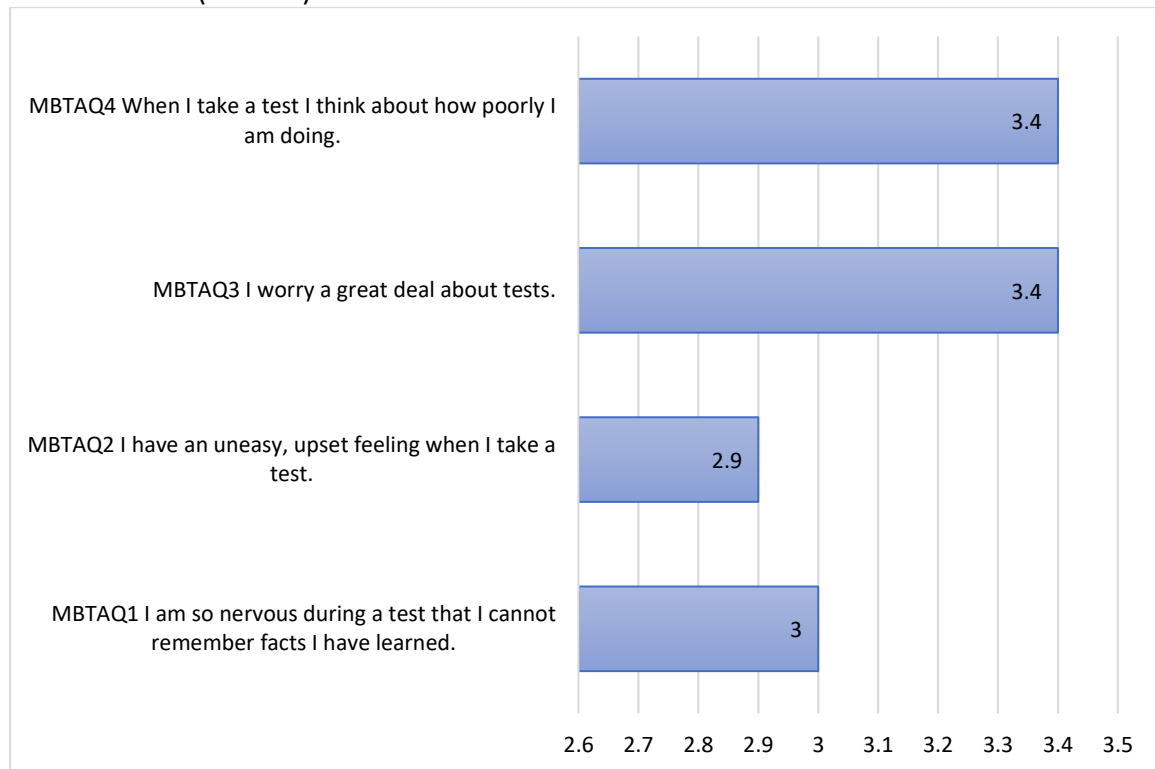
TEST ANXIETY (4 items)

Figure 9- Mean for Test Anxiety

As shown in figure 9, respondents worried a great deal about tests and when they take a test, they always think about how poorly they were doing (both with a mean score of 3.4). The respondents also reported that they felt so nervous during a test that they forgot facts they have learned, with a mean score of 3. Finally, under this research question 5 for test anxiety, the respondents revealed that they had an uneasy, upset feeling when they take a test (mean score of 2.9). It can be inferred from the data that the respondents felt anxiety when taking a test.

Findings for Relationship between

This section presents data to answer research question 6- Is there a relationship between self-regulation with cognitive strategy, self-efficacy, value and test anxiety? To determine if there is a significant association in the mean scores between self-regulation, cognitive strategy, self-efficacy, intrinsic value and test anxiety, data is analysed using SPSS for correlations. Results are presented separately in Tables 3, 4, 5 and 6 below.

Table 3
Correlation between Self-Regulation and Cognitive Strategy

Correlations

		SELFREGULATION	COGNITIVE
SELFREGULATION	Pearson Correlation	1	.537**
	Sig. (2-tailed)		.000
	N	115	115
COGNITIVE	Pearson Correlation	.537**	1
	Sig. (2-tailed)	.000	
	N	115	115

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows there is an association between self-regulation and cognitive strategy. Correlation analysis shows that there is a highly significant association between self-regulation and cognitive strategy (r=.537**) and (p=.000). According to Jackson (2015), the coefficient is significant at the .05 level and a positive correlation is measured on a 0.1 to 1.0 scale. A weak positive correlation would be in the range of 0.1 to 0.3, a moderate positive correlation from 0.3 to 0.5, and a strong positive correlation from 0.5 to 1.0. This means that there is also a strong positive relationship between self-regulation and cognitive strategy.

Table 4
Correlation between Self-Regulation and Self-Efficacy

Correlations

		SELFREGULATION	SELFEFFICACY
SELFREGULATION	Pearson Correlation	1	.311**
	Sig. (2-tailed)		.001
	N	115	115
SELFEFFICACY	Pearson Correlation	.311**	1
	Sig. (2-tailed)	.001	
	N	115	115

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4 shows there is an association between self-regulation and self-efficacy. Correlation analysis shows that there is a moderately significant association between self-regulation and self-efficacy (r=.311**) and (p=.000). According to Jackson (2015), the coefficient is significant at the .05 level and a positive correlation is measured on a 0.1 to 1.0 scale. A weak positive correlation would be in the range of 0.1 to 0.3, a moderate positive correlation from 0.3 to 0.5, and a strong positive correlation from 0.5 to 1.0. This means that there is also a moderate positive relationship between self-regulation and self-efficacy.

Table 5
Correlation between Self-Regulation and Intrinsic Value

Correlations

		SELFREGULA TION	INTRINSICVA LUE
SELFREGULATION	Pearson Correlation	1	.490**
	Sig. (2-tailed)		.000
	N	115	115
INTRINSICVALUE	Pearson Correlation	.490**	1
	Sig. (2-tailed)	.000	
	N	115	115

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5 shows there is an association between self-regulation and intrinsic value. Correlation analysis shows that there is a moderately significant association between self-regulation and intrinsic value (r=.490**) and (p=.000). According to Jackson (2015), the coefficient is significant at the .05 level and a positive correlation is measured on a 0.1 to 1.0 scale. A weak positive correlation would be in the range of 0.1 to 0.3, a moderate positive correlation from 0.3 to 0.5, and a strong positive correlation from 0.5 to 1.0. This means that there is also a moderate positive relationship between self-regulation and intrinsic value.

Table 6
Correlation between Self-Regulation and Test Anxiety

Correlations

		SELFREGULA TION	TESTANXIET Y
SELFREGULATION	Pearson Correlation	1	.200*
	Sig. (2-tailed)		.032
	N	115	115
TESTANXIETY	Pearson Correlation	.200*	1
	Sig. (2-tailed)	.032	
	N	115	115

*. Correlation is significant at the 0.05 level (2-tailed).

Table 6 shows there is an association between self-regulation and test anxiety Correlation analysis shows that there is a low significant association between self-regulation and test anxiety (r=.200*) and (p=.000). According to Jackson (2015), the coefficient is significant at the .05 level and a positive correlation is measured on a 0.1 to 1.0 scale. A weak positive correlation would be in the range of 0.1 to 0.3, a moderate positive correlation from 0.3 to 0.5, and a strong positive correlation from 0.5 to 1.0. This means that there is a low positive relationship between self-regulation and test anxiety.

Conclusion

Summary of Findings and Discussions

This research study has found some important information and opinions from the pre-university students who responded. Overall, more female students and science students responded to the survey questions. Most of the students are from Pusat Asasi UiTM, Kampus Dengkil and this means that most opinions came from the pre-university students from PI than INTEC. The next part of this section is to summarize the research findings based on the research questions created for the study.

The first research question was how self-regulation influences learning? Most students reported that they applied some form of self-regulated learning skills and behaviours to achieve their academic goals. The highest mean came from the item on working hard to get good grades despite disliking the class. This echoes Zimmerman (2002) that explained that self-regulated learners are being autonomous in learning strategies to achieve good grades in the subject they are learning. Students thrive through the difficulties in understanding a particular topic and self-reflect on the topic contents they are learning to find out their strengths and weaknesses related to the particular topic. Also, they do exercises to understand better understand the topic and plan what to study from the topic content. The second research question was how do learners perceive the use of cognitive strategy in learning? Most students agreed that they have applied some form of cognitive strategies during learning. They have used active revision strategies like recalling what was taught in class and putting the ideas together with the book chapters, talking to themselves, recalling facts, referring to past homework to try the new ones, and reconnecting contents learned from the past to the ones learned in present. In 2018, Adesola & Li found that students who reported having good self-regulation were also students who applied high cognitive thinking. While the third research question was how does self-efficacy influence learning? For this question, most students reported that they are confident that they could excel and they are as competent as the other members of the class. Having positive emotions in academic achievement is a way to boost a person's motivation to work hard. Jackson (2002) discovered that self-efficacy can improve if students are aware of their rewards at the end of their learning activities. Students accepted into PI and INTEC are selected based on good SPM results. The students have motivated themselves to get good academic results to further their studies in tertiary education. Kyndt et. al (2019) discovered that motivated secondary school students have high values of self-efficacy and can become more self-efficient. Next, the fourth question was how does intrinsic value influence learning? From the data collected it was found that intrinsic value positively influences learning. Students reported they enjoyed doing activities related to learning. Umemoto & Ito (2016) has also reported that intrinsic value played a strong role in influencing 'emotional engagement' in learning. These findings strengthen the positive effect of intrinsic value. The fifth question to be answered for this study was How does test anxiety influence learning? It was found from the means that the students reported that having test anxiety has a negative influence on learning. The students felt a little upset and uneasy when taking tests and sometimes forgot facts learned for the tests. According to Cassady (2004), high test anxiety could lead to students disliking assessments and they need to be assisted to gain more self-efficacy in learning. This particular effect of high test anxiety has to be avoided and students who strongly felt that way have to be assisted. The final research question for this study was, is there a relationship between self-regulation and cognitive strategy, self-efficacy, intrinsic value and test anxiety? As found, there was a positive relationship between self-regulation and cognitive strategy. Whereas

there was a moderate positive relationship between self-regulation towards self-efficacy and intrinsic value. However, self-regulation and test anxiety were found to have a low positive relationship. The results show that self-regulation has more influence on cognitive strategy than self-efficacy and intrinsic value but less influence on test anxiety. Pintrich & De Groot (1990) has also found similar result on the relationship between self-regulation with cognitive strategy and self-efficacy. A study done by Peng (2012) found that examination results are closely related to cognitive strategy, self-efficacy and intrinsic value but not to test anxiety. Having test anxiety is less helpful in academic performance.

(Pedagogical) Implications and Suggestions for Future Research

Self-regulation is a personal development that can be learned. Academics can learn how to teach students to self-regulate and students can also seek help with study skills in general on university campuses. Some universities have developed websites for lecturers on how to deliver their course content in attractive ways. The University of Connecticut, for example, has a website that guides academics on strategies to increase intrinsic value in students (Vahidi, 2015). Peel (2020) described that four teaching approaches can be applied during class which are 'connect the learning', 'facilitate the learning', 'diversify the learning', and 'socialise the learning'. Also, Peel (2020) suggested twelve ways under the four approaches that can be utilised to assist students to develop self-regulation abilities and created 'A Decision-making Tool for Self-Regulated Learning' useful for teachers. Monash University, Australia has developed a study skills website for students on the best methods for studying and enhancing thinking abilities, among other guides (Home, n.d.). Research done by May Chin Yong & Kee Thai Yeo in 2012 discovered that form four students who underwent a self-regulation intervention programme for nine months developed improvement in their motivational level and learning strategies. Pre-university learning institutions could develop support systems for both lecturers and students to help enhance students' self-regulation approaches that would benefit the students in the long run. Academic advisors for pre-university students should have a good understanding of the university application process and consistently remind students of the importance of getting good results to secure desirable majors.

This study has covered the effects of self-regulation on learning, cognitive strategy, self-efficacy, intrinsic value, and test anxiety in post-COVID pre-university students. Further research could look into ways to help both lecturers and students understand and apply self-regulation strategies. Researchers could also find out about the influence of other self-regulation strategies on post-COVID pre-university students that were not covered in this study. Further research could also be done on similarities and differences in self-regulated learning between science and engineering pre-university students or male and female students.

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