International Journal of Advanced Research in Education and Society
e-ISSN: 2682-8138 | Vol. 8, No. 2, 237-252, 2026
https://asianscholarsnetwork.com/asnet-journals

Motivational Beliefs as Predictors of Self-regulated and Cognitive Learning Strategies in Engineering Students

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Received: 29 January 2026 | Accepted: 8 March 2026 | Published: 1 April 2026

DOI: https://doi.org/10.55057/ijares.2026.8.2.19

Abstract: *Motivation and self-regulation are widely recognised as key determinants of academic success, particularly in higher education. For learners to engage effectively in their studies, they must understand their learning goals and the motivational drivers behind their behaviours. Self-regulated learning (SRL) encompasses the metacognitive, motivational, and behavioural strategies that learners employ to control their learning processes. This study investigates the influence of motivational beliefs on the use of self-regulated learning strategies among undergraduate engineering students. A quantitative research design was employed, involving a sample of 110 students from 4 main engineering disciplines at Universiti Teknologi MARA (UiTM), Pasir Gudang Campus. Data were collected using a 44-item questionnaire adapted from Pintrich and De Groot (1990), encompassing three sections: demographic information, motivational beliefs, and SRL strategies, measured on a 5-point Likert scale. The findings revealed significant correlations between motivational constructs such as self-efficacy, intrinsic value, and test anxiety and students' application of cognitive and self-regulatory learning strategies. These results highlight the critical role of motivational factors in enhancing SRL practices, offering valuable insights for educators in designing pedagogical interventions that foster motivation and self-directed learning among engineering students.*

Keywords: Engineering Education, Self-Regulated Learning, Motivational Beliefs, Academic Performance, Learning Strategies, Higher Education

1. Introduction

Education is essential for individuals and societies to thrive in the modern world, contributing to economic growth, social progress, and personal fulfilment. Recent educational research emphasises the importance of motivation toward learning in pursuing educational objectives. Motivation refers to the forces prompt an individual to undertake a task or strive toward a goal. In terms of the school perspective, it pertains to the underlying reasons why a student exhibits persistent effort to achieve a favourable outcome (Wolters & Rosenthal, 2000). Pintrich and Schunk (1996) stated that motivation is a crucial factor influencing students' classroom learning and academic achievement. Highly motivated students typically exert more effort and persevere longer in their academic tasks than less motivated students.

Motivational beliefs are considered a key predictor of effective self-regulation consisting of several components such as goal orientation, self-efficacy, intrinsic and test anxiety. These beliefs interact with contextual, behavioural, and cognitive factors, contributing to the overall self-regulation learning process (Pintrich & De Groot, 1990; Omar et al. 2023). In the study of Abdala and Alemu (2023), motivational beliefs significantly influence students' academic performance directly and indirectly through the mediating role of cognitive and metacognitive learning strategies. Several researchers have documented different levels of self-regulation, highlighting differences in motivational processes between individuals with varying levels of self-regulation (Pintrich & De Groot, 1990; Pintrich et al., 1994).

Besides, self-regulated learning (SRL) is an important concept in learning psychology, particularly in the field of learning research, and is a conceptual framework for understanding the cognitive, motivational, and emotional aspects of learning. Researchers have analysed SRL from different perspectives. SRL refers to learners' ability to manage and control their own learning process (Marcou & Philippou, 2005). Zimmerman (1989) defined SRL as the degree to which students actively engage in their learning process through metacognitive, motivational, and behavioral engagement. In this work, SRL comprises of self-regulated learning strategies, self-efficacy perceptions of performance skills and commitment to academic goals. Additionally, cognitive strategy use, and self-regulation are components used to measure learners' self-regulated learning strategies.

According to Wolters and Rosenthal (2000), it is essential to consider both self-regulated learning and motivational beliefs to assess a learner's academic performance accurately. Many authors have been concerned with the factors affecting motivation and the strategies learners employ to regulate their learning. In the meantime, various empirical studies have explored the relationship between motivation and self-regulated learning. It is noteworthy that motivated learners are more likely to engage in self-regulated learning behaviors, such as setting goals, planning strategies and persevering through challenges (Marcou & Philippou, 2005; Amaruddin et al., 2023; Abdala & Alemu, 2023; Tareen et al., 2023).

Several research studies have been conducted in Malaysia to examine the correlation between motivation belief and self-regulated learning. The study by Nen et al., (2023) confirmed that there is a significant positive relationship between motivational beliefs and SRL. The outcomes show that learners have high motivational beliefs in learning which indicates their ability to gain new knowledge and complete the given tasks. Although SRL research has been extensive to date, most the studies investigating self-regulated learning have been well-documented in Western countries. In fact, findings related to motivational beliefs and self-regulated learning are often specific to the researchers' own countries. Therefore, there is a scarcity of literature related to the present study by Malaysian researchers. Due to that, there is a need to explore how these concepts apply in different cultural and educational contexts. The present study aims to address this gap by investigating the relationship between engineering learners' motivational beliefs and their use of regulation strategies intended to successfully achieve educational goals.

1.1 Objective of the Study and Research Questions

This study aims to explore learners' perceptions of their use of learning strategies. Specifically, this study seeks to answer the following questions.

- How do motivational beliefs influence learning?
- How does cognitive strategy influence learning?
- How does self-regulation influence learning?

- Is there a relationship between motivational beliefs and self-regulated strategies?

2. Literature Review

Over the past 20 years, the primary goal of higher education institutions has been to provide students with numerous opportunities to acquire knowledge and skills. Education in the modern era has evolved from its simple and basic beginnings to a complex and advanced system. There are increasing challenges that require learners to think critically and engage in self-regulated learning to make discoveries in today's world. Furthermore, Malaysia is embracing digital technologies such as the Internet of Things (IoT), big data, artificial intelligence, and other significant advancements. Research conducted by Liu et al., (2021) and Wang et al., (2022) revealed that the focus of educational institutions has shifted from simply educating students to achieving exceptionally high levels of academic success among them. In conjunction with this, researchers have been paying a great deal of attention to the factors that influence academic success for a long time. Most of the findings confirmed that motivation to learn in class plays a vital role in developing self-regulated learning strategies. The success in achieving learning goals motivates students and improves their self-regulation skills.

Research indicates that students who actively manage their own learning tend to achieve higher academic performance compared to those who do not engage in self-regulation. Ahmed (2017) investigates the relation of three aspects motivational variables (i.e., self-efficacy, intrinsic value and instrumental value) to SRL in a nationally representative sample of 15-year-old students. The findings showed that self-efficacy, intrinsic value and instrumental value each contribute significantly to SRL strategies. Meanwhile, the influence of the motivational variables differs from each other to some extent. Yusof et al. (2021) conducted a study on the significance of three psychological factors (self-efficacy, motivation, and learning strategy) and the impact of the demographic factor (age) on the academic achievement of undergraduate students. It is revealed that motivation and learning strategy show a significantly positive correlation with academic performance, while age shows a significantly negative correlation. This indicates that as students get older in university, their performance decreases. Research on how SRL strategies and motivational beliefs influence students' learning after the COVID-19 pandemic, particularly during the transition from online distance learning (ODL) to face-to-face classroom learning has been reviewed by Yew et al. (2023).

These authors found that students' self-efficacy, intrinsic value, and test anxiety influenced their motivational beliefs. This proved that students' motivational beliefs must be complemented using appropriate learning strategies to achieve good academic performance. Similarly, Lim and Yeo (2021) claimed that self-efficacy, intrinsic goal orientation, task value, and control of learning beliefs can predict SRL. Despite the widely recognized relationship between motivational belief and self-regulated learning, Nen et al. (2023) found that students commonly put off their learning. This could be possibly due to students' perspectives on learning, personal traits, and motivational beliefs. It is interesting to note that most of the published research has been concentrated on populations that have already been evaluated. In recent years, relatively few research has been established on the impact of motivating beliefs on self-regulated learning practices among engineering learners in public university environments.

2.1 Review Motivational Beliefs to Learn

Motivational belief to learn encompasses an individual's attitudes, perceptions, and confidence regarding their capability to engage in and succeed at learning tasks (Koca, 2016). It involves

the belief in one's ability to understand and be proficient in new concepts, the expectation of success in learning endeavours, and the value attributed to learning itself. Motivational beliefs to learn can be influenced by several factors such as past experiences, perceived competence, personal goals, and the learning environment such as the student-teacher relationship and class achievement goal structure and quality of the teacher (Koca, 2016). People with high levels of motivational belief are more likely to face obstacles with confidence and excitement, which usually results in higher engagement, persistence, and performance in learning activities. Reduced effort, avoiding learning tasks, and worse learning results can be the consequence of inadequate motivational belief. Building up motivated ideas that are favourable is therefore essential.

2.2 Self-Regulated Learning Strategies

Self-regulated learning (SRL) skills play an important role in enhancing educational outcomes and preparing students for lifelong learning. Generally, teaching quality significantly influences student performance. SRL encompasses learners' ability to set realistic goals, regulate emotions, monitor progress, and adapt strategies for meaningful comprehension and assimilation of learning materials (García-Pérez, et.al, 2021). Recent research underscores the importance of promoting SRL skills among teachers during initial teacher education at higher education institutions. Rodriguez-Gomez et.al (2024) were emphasised the need to equip pre-service teachers with the ability to identify necessary academic resources, maintain engagement, and seek help when needed. Additionally, García-Pérez, Fraile, and Panadero (2021) highlight the adaptability of learning strategies to different learning situations and their association with self-regulated learning and academic performance. Furthermore, instructional practices that support learners' SRL and self-determined motivation are crucial for sustainable professional development in education (Brenner, 2022). As we navigate the changing educational landscape, understanding and promoting effective SRL strategies remain essential for fostering critical thinking, problem-solving, and resource efficiency among students.

2.3 Past Studies on Motivational Beliefs

Many studies have been reviewed to investigate the influence of motivational beliefs on self-regulated learning strategies. Research on the influence of motivational beliefs on self-regulated learning strategies consistently shows that these beliefs play a critical role in how students manage their learning. One study by El-Adl and Alkharusi (2020) demonstrated that students with strong self-efficacy were more likely to employ effective learning strategies, such as elaboration and metacognitive self-regulation, leading to higher academic achievement in mathematics. Another study by Lim and Yeo (2021) found that intrinsic motivation and task value beliefs significantly enhance the use of self-regulated learning strategies among students, further emphasizing the importance of fostering motivational beliefs to improve educational outcomes.

Koca (2016) research focuses on the importance of learning motivation in early children and how the calibre of the teacher-student connection affects this motivation. Infants and early children are among the study participants, though the published material is unclear on the precise number. The main tool used in the research to investigate the theoretical foundations of expectancy-value and self-determination theories connected to achievement motivation is a literature review. Positive relationships between teachers and students have been found to increase students' enthusiasm to learn, which in turn promotes their social and academic competencies. On the other hand, contentious partnerships are linked to poorer self-esteem and achievement. The results of this study imply that developing solid, constructive relationships between educators and students is essential for advancing students' motivation and helping

them acclimate to school in general, which will improve their academic performance and mental health.

The study titled "Relationships between self-regulated learning strategies, learning motivation and mathematics achievement" by El-Adl and Alkharusi (2020) examines the connections between self-regulated learning strategies and students' motivation and academic performance in mathematics. The research involved 238 ninth-grade students from Oman. The Motivated Strategies for Learning Questionnaire (MSLQ) assessed self-regulated learning strategies and motivation. The findings revealed positive relationships between self-regulated learning strategies, intrinsic and extrinsic motivation, task value, control of learning beliefs, self-efficacy, and academic achievement, while test anxiety showed a negative relationship. These results highlight the importance of motivational beliefs in enhancing self-regulated learning and academic success.

2.4 Past Studies on Self-Regulated Learning Strategies

Panadero et al (2021), investigate how students regulate their learning strategies in more realistic learning situations. The study developed a questionnaire called the Deep Learning Strategies questionnaire. This questionnaire investigates how students use different learning strategies in authentic learning scenarios. The sample consists of 601 higher education students and these students participated in the validation process of the newly developed questionnaire. The questionnaire is validated through structural modelling. The findings identify four scales related to deep learning strategies: basic learning self-regulation, visual elaboration and summarizing deep information processing, and social learning self-regulation. In addition, the study also explores the relationship between the use of deep learning strategies and personal factors, such as learning goal orientation, self-efficacy, and effort. It is discovered that academic performance is positively related to effort but negatively related to the use of deep learning strategies. Overall, the article contributes to understanding how students regulate their learning strategies in authentic educational contexts, emphasizing the importance of self-regulated learning for academic success.

Anthonysamy et.al, (2020) conducted a study that focuses on self-regulated learning strategies (SRLS) in the context of higher education by exploring SRL's impact on non-academic outcomes in blended learning environments. This study adopted the systematic review methodology following PRISMA guidelines and different sources were searched using predefined search items to explore the current literature. The sample includes peer-reviewed articles published in social science and educational journals. The study identifies a list of self-regulated learning strategies and non-academic outcomes used in blended learning environments within higher education institutions. Most of the reviewed papers investigated metacognitive knowledge, resource management, and motivational belief strategies toward learning performance. Generally, SRLS positively correlates with non-academic outcomes**.**

3. Methodology

3.1 Conceptual Framework

This study explores the influence of motivational beliefs on cognitive strategy use and self-regulation as depicted in Figure 1. Learners are motivated to learn if the environment supports their learning needs (Rahmat et al., 2021). According to Pintrich & De Groot (1990), learners' motivation beliefs are self-efficacy, intrinsic value, and test anxiety. In addition to that, they listed self-regulated learning strategies as cognitive strategies use and self-regulation.

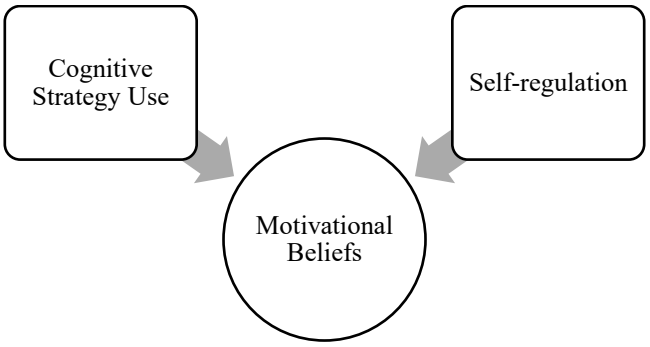

Figure 1: Conceptual framework of the study

3.2 Research Methodology

This quantitative study was conducted to examine the motivational factors influencing self-regulated learning among undergraduate students from four engineering disciplines at Universiti Teknologi MARA (UiTM) Pasir Gudang Campus. A purposive sample of 110 participants voluntarily responded to the survey. The instrument employed was a 5-point Likert scale questionnaire, adapted from Pintrich and DeGroot (1990), designed to measure key constructs related to motivation and self-regulated learning, as outlined in Table 1.

The questionnaire consisted of three sections. The first section collected respondents' demographic information, including age, gender, and academic background. Although this section did not contain specific scales, it served as a foundational element for contextualizing the analysis. The second section measured motivational beliefs, covering three subscales: self-efficacy (belief in one's capability to succeed in learning tasks), intrinsic value (the personal interest or importance attributed to the task), and test anxiety (the emotional tension experienced during assessments).

The final section assessed self-regulated learning strategies, specifically focusing on cognitive strategy use and self-regulation behaviours. This section comprised 22 items related to goal setting, progress monitoring, and time management which is the core elements of effective learning regulation. In total, the questionnaire included 44 items across all sections. The instrument demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of 0.938. Data analysis was conducted using SPSS to examine relationships among the study variables and to address the formulated research questions.

Table 1: Distribution of items in the survey

Part	Strategy		Scale	No of items	Total items	Reliability scale
One	Demographic Profile					
Two	Motivational Beliefs	A	Self-Efficacy	9	22	0.893
		B	Intrinsic Value	9		
		C	Test Anxiety	4		
Three	Self-Regulated Learning Strategies	D	Cognitive Strategy Use	13	22	0.900
		E	Self-Regulation	9	9	0.754
			Total No of Items		44	0.938

4. Results and Discussion

4.1 Students' Demographic Information

Figure 2 illustrates the gender distribution of the respondents, revealing that female students comprised the majority at 54%, while male students accounted for 46%, indicating a notable 8% difference. This highlights a higher participation rate among female students in engineering education, reflecting a shift toward greater gender balance in traditionally male-dominated fields.

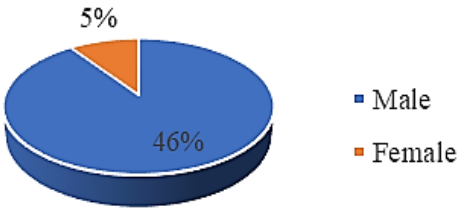

Figure 2: Percentage for gender

Figure 3 illustrates the distribution of respondents across four engineering disciplines: Civil, Mechanical, Electrical, and Chemical Engineering. The majority of participants were from the Faculty of Civil Engineering, comprising 72% of the total sample, indicating a dominant representation in the study. In contrast, the remaining schools contributed significantly smaller proportions: Electrical Engineering (12%), Mechanical Engineering (9%), and Chemical Engineering (7%). These demographic insights provide important context for interpreting the learners' motivational and self-regulated learning behaviours, as differences in gender and disciplinary background may contribute to varying academic experiences and strategies.

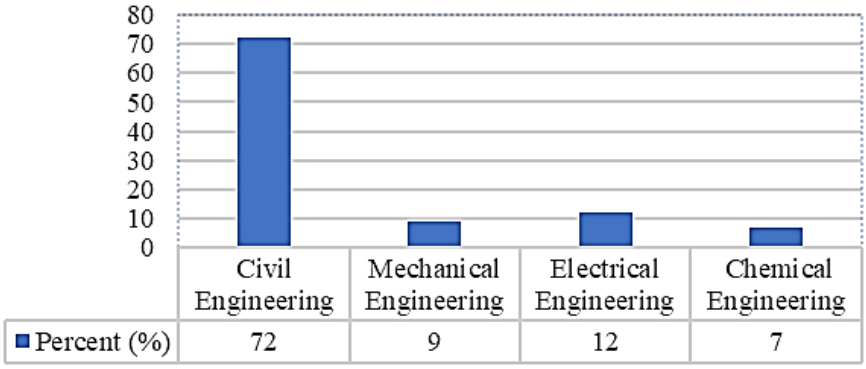

Figure 3: Percentage for school of engineering

4.2 Motivational Beliefs

This section presents the findings related to Research Question 1, which explores the extent to which motivational beliefs shape students' learning behaviours. In this context, motivational beliefs are operationalised through three key dimensions: self-efficacy, intrinsic value, and test anxiety where each playing a critical role in influencing learners' engagement and strategic approach to learning. The mean scores presented in Table 2 illustrate how learners perceive their academic abilities and level of confidence within a classroom setting. High mean values for items such as MBSEQ2, MBSEQ3, MBSEQ5, and MBSEQ9 (ranging from 3.6 to 3.7) indicate that students generally possess strong beliefs in their capacity to understand course content, perform well, and successfully complete assigned tasks. Similarly, MBSEQ1 and MBSEQ6, with mean scores of 3.3, reflect a positive, though slightly more moderate, perception of academic self-efficacy. Notably, the item MBSEQ7 recorded the lowest mean

score (2.9), suggesting that students are more modest in evaluating their study skills compared to their peers. This subtle distinction points to a degree of self-awareness regarding areas that may require further improvement. Overall, the results reflect a balanced combination of confidence and reflective self-assessment. Learners tend to anticipate success and show optimism in their academic abilities, while also acknowledging the need for continued development in specific skill areas. These findings underscore the critical role of self-efficacy in influencing learners' motivation and their strategic approach to academic tasks.

Table 2: Mean for self-efficacy (9 items)

Item	Statement	Mean
MBSEQ1	Compared with other students in this class I expect to do well.	3.3
MBSEQ2	I'm certain I can understand the ideas taught in this course.	3.7
MBSEQ 3	I expect to do very well in this class.	3.6
MBSEQ 4	Compared with others in this class, I think I'm a good student	3.0
MBSEQ5	I am sure I can do an excellent job on the problems and tasks assigned for this class.	3.6
MBSEQ6	1 think I will receive a good grade in this class.	3.3
MBSEQ 7	My study skills are excellent compared with others in this class.	2.9
MBSEQ8	Compared with other students in this class I think I know a great deal about the subject.	3.1
MBSEQ9	I know that I will be able to learn the material for this class	3.6

Understanding learners' intrinsic value is essential in examining how internal motivation influences engagement and learning outcomes. Table 3 presents the mean scores for nine items measuring intrinsic value, with results ranging from 3.5 to 4.3. These scores reflect varying levels of agreement among respondents, suggesting a spectrum of internal motivation from moderate to high. High mean values (above 4.0) were observed for items MBIVQ2, MBIVQ6, MBIVQ7, MBIVQ8, and MBIVQ9, indicating that learners generally recognize the usefulness, relevance, and importance of the course content. These responses demonstrate strong intrinsic interest and perceived value in their academic experiences. Meanwhile, moderate scores (ranging from 3.5 to 3.8) for MBIVQ1, MBIVQ3, MBIVQ4, and MBIVQ5 suggest a balanced perspective, where learners value learning while also acknowledging the challenges involved. Overall, the findings suggest that students are intrinsically motivated and find meaning in their learning experiences. This insight is critical for educators aiming to design instructional strategies that nurture internal motivation and promote deep, sustained engagement.

Table 3: Mean for intrinsic value (9 items)

Item	Statement	Mean
MBIVQ1	I prefer class work that is challenging so I can learn new things.	3.6
MBIVQ2	It is important for me to learn what is being taught in this class.	4.1
MBIVQ3	I like what I am learning in this class.	3.8
MBIVQ4	I think I will be able to use what I learn in this class in other classes.	3.8
MBIVQ5	I often choose paper topics I will learn something from even if they require more work.	3.5
MBIVQ6	Even when I do poorly on a test I try to learn from my mistakes.	4.1
MBIVQ7	I think that what I am learning in this class is useful for me to know.	4.1
MBIVQ8	I think that what we are learning in this class is interesting.	4.1
MBIVQ9	Understanding this subject is important to me.	4.3

Table 4 displays the mean scores for four items assessing learners' levels of test anxiety. The mean scores range from 3.2 to 3.5, indicating a moderate level of test-related anxiety among respondents. Items such as MBTAQ3 and MBTAQ4 recorded the highest mean scores (3.5), reflecting students' tendencies to worry about test performance and outcomes. Meanwhile, MBTAQ2 reflects lower mean scores (3.2) but still notable levels of emotional discomfort before assessments. The results suggest that while learners generally manage their anxiety, many still experience apprehension related to testing situations, which may influence their academic performance. These findings highlight the importance of addressing emotional and psychological aspects of learning. Educators should consider integrating anxiety-reducing strategies or test-preparation techniques to support students' academic confidence and well-being.

Table 4: Mean for intrinsic value (9 items)

Item	Statement	Mean
MBTAQ1	I am so nervous during a test that I cannot remember facts I have learned.	3.4
MBTAQ2	I have an uneasy, upset feeling when I take a test.	3.2
MBTAQ3	I worry a great deal about tests.	3.5
MBTAQ4	When I take a test I think about how poorly I am doing.	3.5

4.3 Cognitive Strategy Use

This section presents the data addressing Research Question 2. Cognitive strategies are fundamental to the learning process as they equip learners with structured methods for processing, organizing, storing, and retrieving information. These strategies enable students to actively engage with content, fostering deeper understanding and long-term retention. By employing such techniques, learners not only enhance their academic performance but also develop critical thinking skills and the capacity for independent learning. Ultimately, cognitive strategies serve as a catalyst for meaningful knowledge construction, promoting greater autonomy and effectiveness in learners' academic pursuits.

Table 5 presents the mean scores for each item measuring cognitive strategy use among learners. The analysis includes 13 statements designed to assess students' cognitive engagement and learning approaches, with mean scores ranging from 3.3 to 4.0. The highest mean scores (4.0) were recorded for SRLSCSUQ1, SRLSCSUQ2, and SRLSCSUQ6, suggesting that students actively attempt to integrate classroom and textbook content, recall teacher instructions, and retain factual information for exams. These responses indicate strong tendencies toward memory-based strategies and rehearsal techniques. Conversely, the lowest mean score (3.3) was recorded for SRLSCSUQ3, indicating that some students struggle with identifying main ideas in reading materials which is an important component of deeper-level comprehension. Moderate scores (ranging from 3.6 to 3.9) across other items such as paraphrasing, organizing, and connecting information reflect students' efforts to use elaboration and organizational strategies to enhance learning. Overall, the findings demonstrate that learners are actively engaging with study materials through a combination of surface-level and higher-order cognitive strategies. While most students show strength in memorization and repetition, the slightly lower score on identifying main ideas highlights an area where additional instructional support could enhance students' analytical reading skills. These insights can guide educators in refining instructional approaches to better support learners' cognitive development and academic success.

Table 5: Mean for cognitive strategy use (13 items)

Item	Statement	Mean
SRLSCSUQ1	When I study for a test, I try to put together the information from class and from the book.	4.0
SRLSCSUQ2	When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly.	4.0
SRLSCSUQ3	It is hard for me to decide what the main ideas are in what I read.	3.3
SRLSCSUQ4	When I study, I put important ideas into my own words.	3.9
SRLSCSUQ5	I always try to understand what the teacher is saying even if it doesn't make sense.	3.8
SRLSCSUQ6	When I study for a test, I try to remember as many facts as I can.	4.0
SRLSCSUQ7	When studying, I copy my notes over to help me remember material.	3.9
SRLSCSUQ8	When I study for a test, I practice saying the important facts over and over to myself.	3.9
SRLSCSUQ9	I use what I have learned from old homework assignments and the textbook to do new assignments.	3.9
SRLSCSUQ10	When I am studying a topic; I try to make everything fit together.	3.9
SRLSCSUQ11	When I read material for this class, I say the words over and over to myself to help me remember.	3.9
SRLSCSUQ12	I outline the chapters in my book to help me study.	3.6
SRLSCSUQ13	When reading I try to connect the things; I am reading about with what I already know.	3.8

4.4 Self-Regulation

This section presents the data addressing Research Question 3: How does self-regulation influence learning? Table 6 reports the mean scores for nine items measuring learners' self-regulated learning behaviours, with values ranging from 3.0 to 3.8. These results suggest that respondents demonstrate a generally positive orientation toward self-regulation, particularly in areas related to persistence, self-motivation, and active engagement with learning tasks.

The highest mean score (3.8) was recorded for SRLSSRQ9 indicating that students are highly motivated to achieve good grades even when they have little interest in the subject. Similarly, SRLSSRQ1 and SRLSSRQ4 share means scores (3.7) reflect learners' ability to self-question and persist through uninteresting materials. These responses reveal a strong commitment to academic goals and sustained effort, which are essential elements of effective self-regulated learning. Moderate mean scores for items such as SRLSSRQ5, SRLSSRQ8 (3.6), and SRLSSRQ3 (3.4) suggest that students engage in some degree of planning, reflection, and practice, though inconsistently. SRLSSRQ7 recorded a comparatively lower mean score (3.0), highlighting a potential area of concern. The findings indicate that students experience difficulty maintaining attention during lessons, suggesting challenges in sustaining cognitive focus in the presence of distractions. Overall, the findings point to a generally strong foundation in self-regulatory practices, but also reveal opportunities for improvement, particularly in attention control and comprehension. These insights suggest the need for targeted instructional interventions to support learners in enhancing resilience, metacognitive regulation, and attentiveness during instructional activities.

Table 6: Mean for self-regulation (9 items)

Item	Statement	Mean
SRLSSRQ1	I ask myself questions to make sure I know the material I have been studying.	3.7
SRLSSRQ2	When work is hard I either give up or study only the easy parts.	3.1
SRLSSRQ3	I work on practice exercises and answer end of chapter questions even when I don't have to.	3.4

SRLSSRQ4	Even when study materials are dull and uninteresting, I keep working until I finish.	3.7
SRLSSRQ5	Before I begin studying, I think about the things I will need to do to learn.	3.6
SRLSSRQ6	I often find that I have been reading for class but don't know what it is all about.	3.2
SRLSSRQ7	I find that when the teacher is talking, I think of other things and don't really listen to what is being said.	3.0
SRLSSRQ8	When I'm reading, I stop occasionally and go over what I have read.	3.6
SRLSSRQ9	I work hard to get a good grade even when I don't like a class.	3.8

4.5 Relationship between motivational beliefs and self-regulated strategies

This section presents findings related to Research Question 4: Is there a relationship between motivational beliefs and self-regulated strategies? To explore this, correlation analyses were conducted to examine the association between motivational beliefs and two key learning strategies: cognitive strategy use and self-regulated learning. The results are summarised in Tables 7 and 8.

Table 7 present the Pearson correlation between motivational beliefs and cognitive strategy use. The analysis reveals a strong positive and statistically significant correlation ($r = .703$, $p < .01$). According to Jackson (2015), correlation coefficients ranging from 0.5 to 1.0 indicate a strong positive relationship. This suggests that students with stronger motivational beliefs are more likely to engage in effective cognitive strategies, such as organizing, elaborating, and rehearsing information. This finding highlights the importance of fostering motivational constructs such as self-efficacy, intrinsic value, and reduced test anxiety as a means of enhancing students' active engagement with learning materials

Table 7: Pearson correlation between motivational beliefs and cognitive strategies use

	Motivational Beliefs	Cognitive Strategies
Motivational Beliefs	1.000	0.703**
Sig. (2-tailed)	–	0.000
N	110	110
Cognitive Strategies	.703**	1.000
Sig. (2-tailed)	0.000	–
N	110	110

Note: Correlation is significant at the 0.01 level (2-tailed)

Table 8 presents the correlation between motivational beliefs and self-regulated learning behaviours. A moderate positive correlation was observed ($r = .571$, $p < .01$), which is also statistically significant. As defined by Jackson (2015), a correlation between 0.3 to 0.5 is considered moderate, and values above 0.5 indicate stronger associations. This result suggests that students with higher motivational beliefs are moderately more likely to demonstrate persistence, goal setting, planning, and reflection key aspects of self-regulated learning.

Table 8: Pearson correlation between motivational beliefs and self-regulated learning

	Motivational Beliefs	Self-Regulated Learning
Motivational Beliefs	1.000	0.571**
Sig. (2-tailed)	–	.000
N	110	110
Self-Regulated Learning	.571**	1.000
Sig. (2-tailed)	0.000	–
N	110	110

Note: 0.571 correlation is significant at the 0.01 level (2-tailed)

These findings reinforce the theoretical link between motivation and regulation of learning, where motivation acts as a driver for students to initiate and sustain effective learning behaviours. Together, the results from Tables 9 and 10 confirm that motivational beliefs play a crucial role in shaping both cognitive and self-regulated learning strategies. While the association with cognitive strategy use is stronger, the moderate relationship with self-regulation also underscores the need for educators to promote motivational factors to cultivate both deep learning approaches and independent learning habits among students.

5. Conclusions and Recommendations

5.1 Conclusions

The findings of this study demonstrate that motivational beliefs are positively associated with self-regulated learning strategies, particularly in relation to both cognitive strategy use and self-regulation behaviors. These beliefs significantly shape learners' engagement, persistence, and use of effective learning strategies, thereby influencing academic outcomes. Addressing Research Question 1, the analysis identified intrinsic value, self-efficacy, and test anxiety as key components of motivational beliefs. Among them, intrinsic value emerged as the most influential factor, affirming its strong connection to motivation and learning performance, as supported by prior studies (Ryan & Deci, 2000; El-Adl & Alkharusi, 2020; Jalil et al., 2023; Omar et al., 2023). Conversely, while test anxiety also impacted motivation, it presented a more complex and often negative effect on academic performance (Cassady & Johnson, 2002).

In response to Research Question 2, learners reported employing a variety of cognitive strategies such as summarizing, organizing, paraphrasing, and rehearsal. These strategies enhance their ability to process and retain information during class preparation and assessments. This aligns with Zimmerman (2000), who emphasized the role of active engagement in enhancing comprehension, as well as with findings from Wang et al. (2021) and Idris et al. (2022), which linked cognitive strategies with improved academic outcomes. For Research Question 3, the results indicate that learners engage with multiple dimensions of self-regulated learning, including persistence, task planning, and reflective monitoring. Notably, students reported working diligently even in less preferred subjects, highlighting their commitment to academic goals. However, challenges remain in sustaining attention during instruction, which may hinder self-regulatory effectiveness. These findings are consistent with previous studies (Bakar et al., 2017; Kosnin, 2007; Yu, 2023), which found that high-achieving students tend to apply SRL strategies more effectively and that self-regulation is closely tied to performance, even in online learning contexts.

Addressing Research Question 4, correlation analyses confirmed a significant and positive relationship between motivational beliefs and self-regulated learning strategies. Motivated students were more likely to invest time and effort in applying SRL skills, as also reported by Zimmerman (2000) and Omar et al. (2023). Supporting evidence from Muwonge et al. (2019) further demonstrated that motivational beliefs especially self-efficacy and task value positively influence academic performance via cognitive strategy use, suggesting a mediating effect. In conclusion, this study reinforces the interdependence between motivation and self-regulation in academic success. Promoting both aspects in instructional design can enhance learners' capacity to engage deeply with content, persist through challenges, and take ownership of their learning journey.

5.2 Recommendations

Although motivational beliefs and self-regulated learning strategies have been widely recognised for their positive impact on academic performance (Koca, 2016; El-Adl & Alkharusi, 2020; Lim & Yeo, 2021; Abdala & Alemu, 2023; Omar et al., 2023; Tareen et al., 2023; Nen et al., 2023), many learners continue to struggle in effectively regulating their own learning. This apparent inconsistency suggests that the presence of motivational constructs alone may not guarantee successful self-regulation. Such difficulties are often associated with individual variations in self-efficacy, intrinsic motivation, and anxiety, which are influenced by diverse personal, cultural, and educational backgrounds. Furthermore, limited awareness and insufficient mastery of effective learning strategies may further constrain learners' capacity for autonomous regulation.

Consistent with these findings, several pedagogical implications emerge. Educators should implement instructional interventions that simultaneously foster motivation and strengthen self-regulatory competencies. For instance, designing tasks that are both achievable and appropriately challenging may enhance students' self-efficacy, while incorporating autonomy-supportive practices, such as offering choices in learning activities, can cultivate intrinsic motivation. Additionally, explicit instruction in self-regulated learning strategies including goal setting, self-monitoring, and time management combined with structured opportunities for guided practice, can empower learners to assume greater control over their learning processes. Such approaches not only improve academic performance but also promote essential competencies for lifelong learning.

Future research should further examine the dynamic interplay between motivational beliefs and self-regulated learning across different educational contexts and stages. Longitudinal investigations may provide deeper insight into how these constructs develop and interact over time. Moreover, evaluating targeted intervention programs and exploring contextual influences such as instructional design, classroom climate, and non-academic factors would contribute to a more comprehensive understanding of how sustained motivation and self-directed learning can be effectively supported.

Acknowledgements

The authors would like to express their sincere gratitude to the Academic Affairs Office, Universiti Teknologi MARA (UiTM), Johor, Malaysia, for providing access to the data used in this study. Special thanks are also extended to the Faculty of Civil Engineering, Universiti Teknologi MARA (UiTM), Johor, for their continuous support and facilitation throughout the research process.

Conflict of Interest Statement

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

Authors' Contributions

Siti Shahidah Sharipudin was responsible for data collection, data analysis, and preparation of the initial manuscript draft. Herda Balqis Ismail conceptualized the study, supervised the research work, reviewed and revised the manuscript critically for important intellectual content, and acted as the corresponding author. Asmawati Che Hasan contributed to the research methodology, data analysis, interpretation of results and provided technical input. Nor Mayuze Mohamad assisted in data collection and analysis and contributed to manuscript revision.

Adrina Rosseira A. Talip contributed to the research methodology and provided technical input and assisted in manuscript review and editing. All authors have read and approved the final version of the manuscript.

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