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Self-Regulation Strategies among UMK Students in Online learning Environment

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ABSTRACT

The rapid expansion of online education has necessitated a closer examination of self-regulated learning (SRL) strategies among university students. Understanding SRL strategies can help enhance educational outcomes and student engagement in online learning environments. This study investigates the SRL strategies employed by students at Universiti Malaysia Kelantan (UMK) in their online learning activities. Data were collected using the Self-Regulated Online Learning Questionnaire (SOL-Q) from 100 UMK students across various faculties and year levels. The analysis included descriptive statistics, t-tests, ANOVA, chi-square tests, correlation analyses, and regression analysis to explore the influence of demographic factors on SRL scores. The results indicated no statistically significant differences in SRL scores based on faculty, year of study, gender, or primary device used. Additionally, a multiple regression analysis revealed that these demographic factors collectively explained only a small portion of the variance in SRL scores. Individual learner characteristics, rather than demographic factors, play a more critical role in influencing SRL strategies. This study emphasizes the need for broad and inclusive interventions to enhance SRL skills among university students in online learning environments. Future research should explore additional factors such as psychological traits, learning environments, and instructional methods to better understand and support SRL in diverse educational settings.

1. Introduction

The rapid expansion of online education has transformed the landscape of higher learning, making education accessible to a broader audience. With advancements in technology and the increasing availability of internet access, online learning platforms have become an integral part of modern education [1], [2]. This shift has been further accelerated by the COVID-19 pandemic, which forced educational institutions worldwide to transition to remote learning [3], [4], [5]. However, this shift also presents significant challenges, particularly in student self-regulation. Self-regulated learning (SRL) refers to the process whereby learners set goals, monitor their progress, and reflect

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on their learning outcomes [6]. Effective SRL is crucial for success in online learning environments, where students must manage their time, stay motivated, and seek help independently.

Online courses, especially those in the form of Massive Open Online Courses (MOOCs), provide students with a high degree of autonomy and flexibility. These courses are open to all, and do not require prior knowledge, making them accessible to a diverse range of learners [7], [8]. While this autonomy can be empowering, it also requires students to engage more actively in SRL strategies compared to traditional face-to-face education [9], [10]. In traditional classroom settings, instructors often guide students through the learning process, providing structure and support. In contrast, online learners must take on greater responsibility for their own learning, which can be challenging for those who lack effective SRL [11], [12].

Self-regulated learners are described as active participants in their learning process, employing strategies to plan, monitor, and evaluate their learning [9], [13]. According to Panadero's [14], SRL encompasses cognitive, metacognitive, and motivational components. Cognitive strategies involve the use of specific techniques to enhance learning, such as summarization and elaboration. Metacognitive strategies include planning, monitoring, and regulating one's cognitive activities, while motivational strategies involve maintaining effort and persistence in the face of challenges. These strategies are essential for successful learning in online environments, where students must navigate the complexities of self-directed learning [15].

Despite the growing research on SRL, there is a lack of studies focusing specifically on Malaysian university students and their experiences with SRL in online learning environments. Most existing research has been conducted in Western contexts, and it is unclear whether the findings can be generalized to students in other cultural settings [16], [17]. Additionally, there is a need for validated instruments to measure SRL in online learning environments. The Self-Regulated Online Learning Questionnaire (SOL-Q) developed by Jansen et al. is a comprehensive tool designed to assess SRL strategies specifically in online contexts. This questionnaire has been validated in various studies and has shown to be a reliable measure of SRL in online learning [10].

Studies have shown that cultural differences can significantly influence students' learning behaviours and their use of SRL strategies [18] For instance, Asian students might exhibit different patterns of self-regulation compared to their Western counterparts due to differences in educational systems and cultural values [19]. Understanding these differences is crucial for developing effective educational interventions that cater to the specific needs of students from diverse backgrounds.

Figure 1 shows the conceptual framework used in the present study.

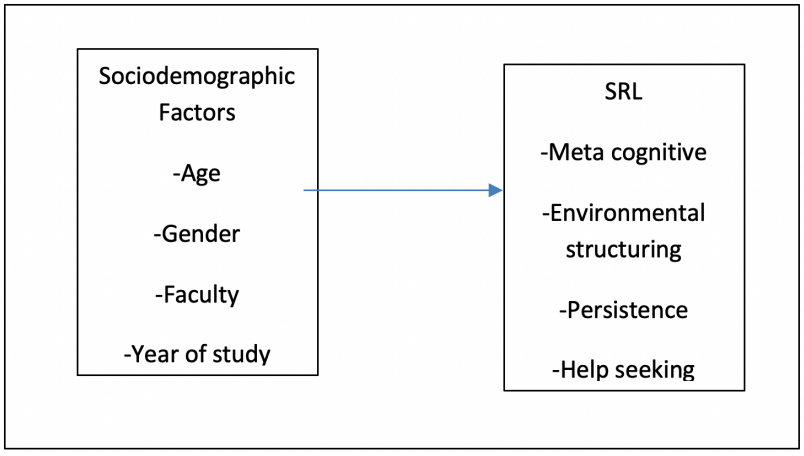

Fig. 1. Conceptual framework

This study aims to explore the self-regulation strategies employed by students at Universiti Malaysia Kelantan (UMK) in their online learning activities. By understanding the SRL strategies used by UMK students, educators can better support their learning processes and improve online education outcomes. The specific objectives of this study are to investigate the level of self-regulated learning among UMK students in online courses and examine the relationship between demographic factors (e.g., gender, age, faculty, year of study, primary device used) and SRL strategies.

1.2 Research Question

Our research aims to study the difficulties of online learning during the coronavirus pandemic. As well as using past articles to identify solutions. Hence, our main research question is:

"What are the associated factors affecting self-regulation strategies for online learning among university students?"

1.3 Research Objectives

The goal of this research is to identify the factors affecting self-regulation learning among university students.

1.3.1 Specific objectives

i. To identify the level of self-regulated strategies score.
ii. To explore the relationship between related factors affecting self-regulated strategies.
iii. To analyze the association of related factors towards self-regulated strategies score among student.

2. Methodology

A cross-sectional study design was employed to investigate the self-regulation strategies among UMK students in online learning environments. Ethical approval for the study was obtained from the relevant committee at Universiti Malaysia Kelantan. All participants provided informed consent prior to participating in the study.

The study involved 100 students from Universiti Malaysia Kelantan (UMK) across various faculties and year levels. The participants were equally distributed in terms of gender. The participants were distributed across various faculties, including the Faculty of Architecture and Ekistics (FAE), the Faculty of Bioengineering and Technology (FBKT), the Faculty of Language Studies and Human Development (FBI), the Faculty of Hospitality, Tourism and Wellness (FHPK), the Faculty of Agro-Based Industry (FIAT), the Faculty of Entrepreneurship and Business (FKP), the Faculty of Veterinary Medicine (FPV), the Faculty of Earth Science (FSB), the Faculty of Data Science and Computing (FSDK), and the Faculty of Creative Technology and Heritage (FTKW). Their year of study ranged from first-year undergraduate to postgraduate levels. The primary devices used for online courses included laptops/computers, tablets, smartphones, and other electronic devices.

The Self-Regulated Online Learning Questionnaire (SOL-Q) was used to measure the self-regulation strategies of UMK students in online learning environments. The questionnaire consisted of 36 items across five scales: metacognitive skills, time management, environmental structuring, persistence, and help-seeking. Each item was rated on a 5-point Likert scale, ranging from 1 (Never)

to 5 (Always). The questionnaire was adapted from the validated SOL-Q to include demographic questions specific to UMK students. For the present study, the reliability of 0.747 was recorded based on Cronbach alpha, α.

Data were collected using a Google Form over a period of one month. Participants were invited to complete the questionnaire via social media channels. Before participating, students provided informed consent, ensuring they understood the purpose of the study and their rights as participants. The survey took approximately 10-15 minutes to complete.

The collected data were analyzed using SPSS 27 software through a series of statistical procedures. Descriptive statistics were computed to summarize demographic information and overall SRL scores, including means, standard deviations, frequencies, and percentages for variables such as gender, age, faculty, year of study, and primary device used for online courses. Independent samples t-tests were conducted to compare SRL scores between male and female students, identifying any significant differences in SRL strategies based on gender.

To examine variations in SRL total scores across different faculties, years of study, and primary devices used for online courses, one-way ANOVA tests were performed, followed by post-hoc tests to determine specific group differences when significant results were found. Additionally, chi-square tests were used to assess associations between categorical demographic variables (e.g., gender, faculty, year of study) and categorical SRL variables (e.g., high vs. low metacognitive skills).

Further, Spearman correlation analyses explored associations between different SRL scales, such as metacognitive skills, time management, environmental structuring, persistence, and help-seeking, in relation to age. Finally, multiple regression analysis using backward stepwise method was conducted to predict overall SRL scores based on demographic factors, including gender, age, faculty, year of study, and primary device used for online courses when adjusted for cofounding factors. The regression model incorporated these demographic factors as predictors to determine their contribution to SRL strategies. For confirmation, Phyton language in was used to re-run the analysis using the model.

3. Results and Discussion

In this study, the majority of the participants were female (53%), while the remaining participants were male (47%). The participants' mean age was 22.18 years old (SD = 1.009). The distribution of participants across various faculties was as follows: FAE (0%), FBI (2%), FBKT (6%), FHPK (19%), FIAT (2%), FKP (15%), FPV (3%), FSB (1%), FSDK (51%), and FTKW (1%).Most of the participants were in their second year of study (58%), followed by third year (27%), first year (10%), fourth year (5%), and no postgraduate students participated in this study. Regarding the primary device used for online courses, most of the participants used a laptop or computer (77%), while others used smartphones (12%) and tablets (11%).

The mean SRL scores ranged from the lowest for Time Management (Mean = 3.4800, SD = 0.66552) to the highest for Environmental Structuring (Mean = 3.8660, SD = 0.63440). The other SRL scores were as follows: Metacognitive Skills (Mean = 3.6528, SD = 0.68071), Persistence (Mean = 3.7200, SD =0.66424), and Help-Seeking (Mean = 3.7820, SD = 0.71186). The descriptive statistics for the demographic variables and SRL scales are listed in Table 1.

Table 1
Participants' demographic data and SRL scores

Variable	Mean (SD)	Frequency (%)
Gender		
Male		47 (47)
Female		53 (53)
Age	22.18 (1.009)	
Faculty		
FAE		0 (0)
FBI		2 (2)
FBKT		6 (6)
FHPK		19 (19)
FIAT		2 (2)
FKP		15 (15)
FPV		3 (3)
FSB		1 (1)
FSDK		51 (51)
FTKW		1 (1)
Year of study		
First year		10 (10)
Second year		58 (58)
Third year		27 (27)
Fourth year		5 (5)
Postgraduate		0 (0)
Primary use device for online courses		
Laptop/Computer		77 (77)
Smartphone		12 (12)
Tablet		11 (11)
Self-Regulation Learning		
Metacognitive Skills	3.6528 (.68071)	
Time Management	3.4800 (.66552)	
Environmental Structuring	3.8660 (.63440)	
Persistence	3.7200 (.66424)	
Help Seeking	3.7820 (.71186)	
Total score	132.92(18.91)	

The findings from this study provide valuable insights into the SRL strategies among students at UMK in online learning environments. Self-regulated learning is essential for success in online education, as it requires students to manage their own learning processes effectively. The current study aimed to examine the SRL strategies employed by UMK students and to explore the influence of demographic factors such as faculty, year of study, gender, and primary device used for online courses on SRL scores.

Inferential Statistics

The one way ANOVA test was conducted to compare the overall SRL scores across different categories: faculties, years of study, and primary devices used for online courses at UMK. The analysis aimed to determine whether there were significant differences in SRL scores based on these categories. The descriptive statistics revealed the mean SRL scores for each faculty were highest by participants from FPV (Mean = 148.00, SD = 12.17), and the lowest found from FSB (Mean = 125.00, SD = 0.00). Between year of study, first year (Mean = 140.20, SD = 16.09), score the lowest and fourth year (Mean = 150.40, SD = 13.05) scored the highest. The comparison of mean SRL scores between different primary device used for online courses showed similar average score between groups. The ANOVA results in Table 2 indicated that there were no statistically significant differences in the overall SRL scores among the different faculties, $F (8, 91) = 0.627$, $p = 0.753$, based on the year of study, $F (3, 96) = 2.261$, $p = 0.086$ and primary device used for online courses, $F (2, 97) = 0.013$, $p = 0.987$.

An independent samples t-test was conducted to compare the SRL scores between male and female students. The results indicated that the mean SRL score for male students (M = 133.64, SD = 22.06) was slightly higher than that for female students (M = 132.49, SD = 15.66). However, this difference was not statistically significant, $t (98) = 0.303$, $p = 0.763$, indicating no significant difference in SRL scores between genders. Levene's test for equality of variances was not significant ($F = 3.696$, $p = 0.057$), suggesting that the assumption of equal variances was met. The effect sizes were also calculated, with Cohen's d = 0.061, Hedges' correction = 0.060, and Glass's delta = 0.073. These values suggest a very small effect size, indicating that gender had a negligible impact on SRL scores. The 95% confidence interval for the difference in means ranged from -6.38 to 8.68, further supporting the conclusion that the difference in SRL scores between male and female students is not significant.

Table 2
Participants' demographic data and comparison of SRL scores by category

Variables	Mean (SD)	F-statistics (df)/ t-statistics (df)	pvalue
Faculty		0.627 (8,91)	0.753
FBI	128.00(4.24)		
FBKT	138.00(6.57)		
FHPK	131.00(25.31)		
FIAT	143.50(9.19)		
FKP	137.07(9.68)		
FPV	148.00(12.17)		
FSB	125.00(0.00)		
FSDK	130.86(19.35)		
FTKW	144.00(0.00)		
Year of study	140.20(16.09)	2.26(3,96)	0.086
First	131.28(15.11)		
Second	130.93(25.43)		
Third	150.40(13.05)		
Primary device used		0.013(2,97)	>0.950
Laptop/computer	132.90(18.78)		
Tablet	133.09(16.83)		
Smartphone	133.83(22.42)		
Gender		0.303(98)	0.753*
Male	133.64(22.06)		
Female	132.49(15.66)		

*t-statics for Independent t-test analysis and F-statistics for One Way ANOVA analysis result.

The analysis revealed no statistically significant differences in SRL scores among students from different faculties. This suggests that the faculty to which a student belongs does not significantly influence their self-regulation strategies. This finding aligns with previous research, indicating that SRL strategies are more likely to be influenced by individual learner characteristics rather than the academic discipline [20], [21]. Efforts to enhance SRL should therefore focus on individual students rather than tailoring interventions to specific faculties.

Similarly, no significant differences were found in SRL scores based on the year of study. This indicates that students' progression through their academic years does not significantly impact their SRL strategies. This finding contrasts with some previous studies that suggest older students or those further along in their studies might develop better SRL strategies due to increased experience and maturity [22], [23]. The lack of significant differences in this study could be attributed to the relatively homogeneous nature of the sample or the specific context of UMK [24], [25].

The independent samples t-test comparing SRL scores between male and female students showed no significant difference, suggesting that gender does not play a significant role in SRL strategies among UMK students. This finding is consistent with other studies that have found minimal gender differences in SRL [18], [26]. Both male and female students in this study demonstrated similar levels of self- regulation, indicating that interventions to improve SRL should be gender neutral.

Chi-Square Analysis

Gender and Metacognitive Skills

The relationship between gender and metacognitive skills was assessed using a chi-square test. The results indicated no significant association between gender and metacognitive skills, χ^2 (2, N = 100) = 1.59, p = .452 and χ^2 (2, N = 100) = 61.90, p = 0.796. The majority of students in both gender groups fell into the 'High' category of metacognitive skills.

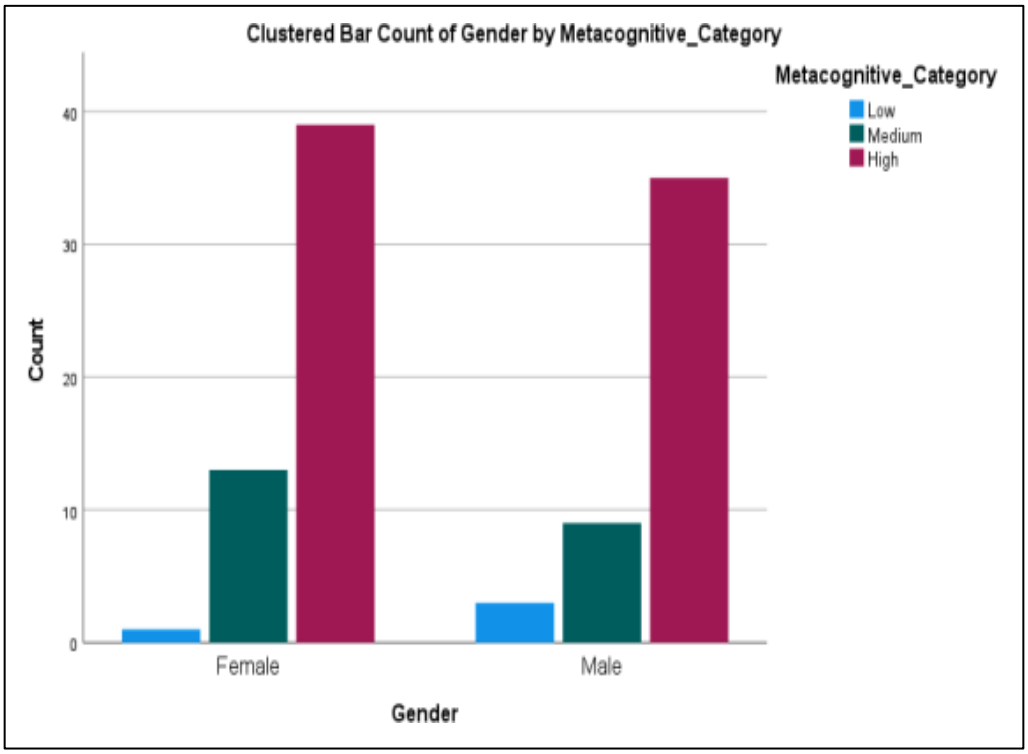

Fig. 2. Bar graph of metacognitive skill level between gender

Faculty and Time Management

The relationship between faculty and time management skills was assessed using a chi-square test. The results indicated no significant association between gender and metacognitive skills, χ^2 (2, N = 100) = 61.90, p = 0.796. Most students in FSDK groups gather more in the category of medium score for time management.

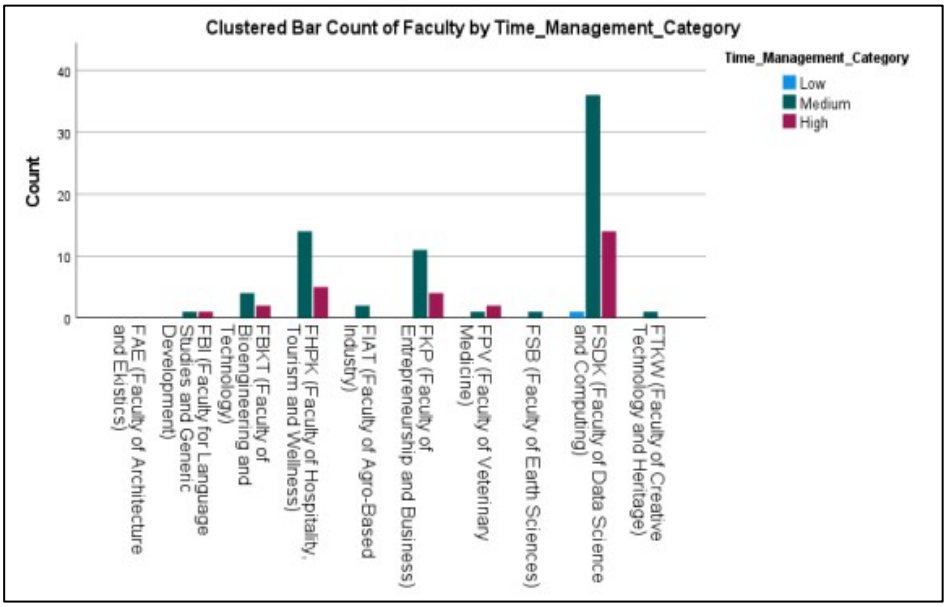

Fig. 3. Bar graph of time management score level between faculty

Overall, the chi-square analyses did not reveal significant associations between the categorical variables of gender, faculty, and year of study with the SRL components of metacognitive skills, time management, and environmental structuring. These findings suggest that self-regulation strategies among UMK students in online learning environments do not significantly differ based on these demographic factors.

The type of device used for online learning (laptop/computer, tablet, or smartphone) also did not significantly affect the SRL scores of the students. This finding suggests that regardless of the device used, students can effectively engage in self-regulated learning if they possess the necessary skills and motivation. This aligns with the increasing emphasis on the flexibility and accessibility of online learning platforms [2], [27].

Correlation Analysis

A correlation analysis was conducted to examine the relationship between age and the total self-regulated learning (SRL) scores among the participants and as the scatterplot suggested non-bivariate normality, Spearman correlation was chosen. The Spearman's rho correlation coefficient also indicated a very weak positive correlation, ρ (100) = 0.077, p=0.444, further supporting the conclusion that there is no significant relationship between age and SRL scores.

Table 3
Correlation between age and SRL score

Variables	Spearman correlation coefficient, r_ρ	pvalue
Age	0.077	0.444

The correlation analysis between age and SRL scores revealed a very weak, non-significant positive correlation. This indicates that age is not a significant predictor of SRL strategies among UMK students. This finding contrasts with some previous research suggesting that older students may exhibit better self- regulation due to greater maturity and experience [28]. However, the specific context of online learning at UMK may mitigate the impact of age on SRL.

Regression Analysis

A multiple regression analysis was conducted to examine the predictive relationship between the independent variables (Age, Gender, Faculty, Year of Study, and Primary Device Used for Online Courses) and the dependent variable (Self-Regulated Learning (SRL) total score). The correlation matrix shows the Pearson correlation coefficients between the SRL total score and the independent variables. None of the correlations are significant, suggesting weak linear relationships between the variables. The model summary shows that the predictors collectively explained only 0.5% of the variance in SRL scores ($R^2 = 0.005$), with an adjusted R^2 of -0.048. This model was not statistically significant ($F(5, 94) = 0.089$, $p = 0.994$). The ANOVA table indicates that the regression model did not significantly predict SRL scores ($F(5, 94) = 0.089$, $p = 0.994$).

Scatter plot visualize the relationship between each independent variable and the SRL total score, scatter plots were generated. Each plot showed no clear trend or relationship, further supporting the non- significant findings of the regression analysis. In conclusion, the regression analysis indicated that Age, Gender, Faculty, Year of Study, and Primary Device Used for Online Courses do not significantly predict SRL scores among students. This suggests that other factors not included in this model may better explain the variability in SRL scores.

Based on linear regression analysis using phyton, the model shows arbitrary results that confirmed the prediction model is not fit and needed improvement for future research.

Table 4
Performance evaluation of the prediction model

Parameters	Value
Mean Squared Error (MSE)	327.75
Mean Absolute Error (MAE)	12.78
Root Mean Squared Error (RMSE)	18.10
Relative MSE	1.39
Covariance	-24.39
R square	-0.388

The present regression equation of SLR score=99.19 +1.75*Gender -3.43*Age +1.43*Faculty +-5.79**Year of study + 2.96*Device used need improvement for better fit and prediction of self-regulated learning.

The multiple regression analysis indicated that demographic factors such as age, gender, faculty, year of study, and primary device used collectively explained only a small portion of the variance in SRL scores, and the model was not statistically significant. This suggests that other unexamined factors, potentially including psychological traits, learning environments, and instructional methods, may better predict SRL scores. The scatter plot corroborated these findings, showing no evident

relationship between age and SRL scores [25], [29]. Therefore, for future studies more cofounding factors should be added on to better understand and predict self-regulation learning strategies.

The findings of this study have important implications for educators and administrators at UMK. Given that demographic factors do not significantly influence SRL, interventions to enhance self-regulation should be broad and inclusive, addressing a wide range of potential influences. Educators should focus on developing students' individual SRL skills through targeted training and support, regardless of their faculty, year of study, gender, or device used.

This study has several limitations that should be considered when interpreting the findings. The small sample size from a single university limits the generalizability, and larger sample size across multiple universities would provide more robust and generalizable results [30]. For future, it was suggested that more samples were collected. The reliance on self-reported data may introduce response biases such as social desirability bias, where participants may respond in a manner they perceive as favourable or acceptable rather than truthfully [31]. However, the participants were encouraged to be honest to the questions as much as possible.

The cross-sectional design does not capture changes in SRL over time, and the study's scope did not encompass all SRL dimensions or qualitative insights. This can be improved through the usage of longitudinal study design in the future. Longitudinal studies would be needed to assess how SRL strategies evolve throughout the academic journey of students [32], [33]. Additionally, cultural factors and rapid technological changes were not accounted for, which may influence SRL strategies.

4. Conclusion

In summary, this study contributes to understanding SRL among Malaysian university students in online learning contexts. While demographic factors did not significantly impact SRL scores, further research is needed to explore other potential influences. Future research should address these limitations by expanding sample diversity, incorporating longitudinal designs, and integrating qualitative methods for deeper insights. Investigating psychological traits, different learning environments, and instructional methods like flipped classrooms can provide a more comprehensive understanding of SRL. Additionally, exploring interventions for enhancing SRL, particularly in online education, can offer practical strategies to improve student learning experiences. By addressing these gaps, educators can develop more effective strategies to support students' self-regulation, ultimately enhancing their academic success.

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