

Research Article

Determination of Metacognitive Learning Strategies and Academic Performance of Nursing Students: A Descriptive-correlational Study

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Abstract

Objective: The study was conducted to assess the correlation between approaches to metacognitive learning and the academic achievement of nursing students and identify variables that predict academic performance.

Methods: This study applied quantitative methods and employed correlational and descriptive approaches. The study was conducted during the 2023–2024 academic year and involved a sample of 215 nursing students. Statistical testing encompassed descriptive statistics, correlation analyses, and regression analysis of multiple variables.

Results: The level of metacognitive learning strategies was moderate. The correlation analysis revealed a positive and significant correlation between students' overall metacognitive learning strategies scale score and academic performance ($r(213) = 0.742, p < 0.001$). Multiple logistic regression analyses found metacognitive learning strategies, the number of classes, and age significant predictors of cumulative grade point averages.

Conclusion: This study underscores the need for focused interventions and support networks to increase nursing students' understanding and implementation of effective learning techniques. The findings can empower curriculum makers to explore integrating evidence-based teaching practices customized to students' learning preferences, thereby maximizing academic engagement and accomplishment. Clinical educators can also use these findings to incorporate active learning methodologies and scenarios to increase metacognitive awareness, enhancing nursing students' learning experience.

Keywords: metacognition, academic performance, nursing students, learning strategies, higher education

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1. Background

A college education should extend further, imparting information in a given discipline and preparing students across all fields with the essential skills to succeed in a dynamic societal and professional landscape [1]. Academic student behavior refers to the various cognitive, metacognitive, effective, and social processes students use to gain, understand, and use knowledge in educational settings. The Student Approach to Learning (SAL) is a theoretical framework for explaining learner behavior. The focus of SAL research has been to examine how students approach academic tasks by adopting a learning orientation to comprehend or reproduce the content of their courses to differentiate between deep, surface, and organized study methods to understand how students acquire new knowledge in academic environments [2]. Students who employ more profound techniques aim to cultivate a comprehensive understanding of the essential elements of the offered subject. They strive to establish connections between ideas and merge them into a cohesive entity [1, 2]. In contrast, students who adopt a surface approach prefer to concentrate on isolated bits of material that must be memorized to meet assessment requirements. A recent meta-analysis and systematic review by Takase and Yoshida indicated that deep and surface techniques are the two most thoroughly examined learning methodologies. The deep strategy to learning denotes a way in which students are driven to develop a personal understanding of a subject and utilize targeted strategies to fulfill their objectives. The surface strategy for learning is defined by students' external motivation to exert minimal effort to pass examinations. This type of reward encourages students to participate in lower-level cognitive processes, such as rote learning and memorizing study materials [3].

Metacognitive learning strategies are one of the approaches to learning. Flavell defined metacognition in the 1970s as "thinking about thinking" or an individual's "knowledge and cognition regarding cognitive phenomena." [4]. It encompasses the processes of organizing, tracking, and managing one's academic growth behavior, resulting in improved thinking, memorizing, and ability to solve problems [4, 5]. Metacognition denotes the knowledge and regulation related to educational strategies, including a student's understanding of these strategies, their functioning, and their appropriate application [6, 7]. These strategies refer to teachers' methods to help students understand how they learn, reflect on their learning process, and adjust as needed. These techniques empower students to regulate their cognitive involvement in learning activities actively [8]. In addition, the use of metacognitive methods enables students to adjust their cognitive resources in response to the demands of specific learning contexts, promoting a more adaptable and efficient way of acquiring knowledge [9, 10]. Consequently, embracing metacognitive learning strategies fosters students to navigate complex academic challenges effectively [11–13].

This metacognitive technique provides optimal task performance by activating prior knowledge, improving comprehension, and fine-tuning behavior [1, 10]. In this integrated study, students can leverage a

combination of the five domains of metacognitive learning approaches for a comprehensive learning approach and improve overall scholarly achievement, namely rehearsal, elaboration, organization, critical thinking, and self-regulation, as depicted in Figure 1, which involve simply repeating items from a list, effectively bring material into focus in working memory but not in helping it move to long-term memory [14]. While these tactics work well for more manageable tasks, these strategies cannot establish internal connections among information or integrate it with existing knowledge [15]. A study involving 135 students found that the deployment of summarization and concept mapping techniques appears more productive when students rehearse the material they have learned [16]. Elaboration approaches, on the other hand, excel in boosting the storage of information in long-term memory by establishing internal connections between objects [17]. Paraphrasing, summarizing, analogies, and generative notetaking contribute to seamlessly integrating new information with prior knowledge. A study by Pires et al. examined the learning approaches and cognitive strategies used by 263 medical students within an interactive educational framework utilizing team-based learning, showing that elaboration strategies are positively connected with student performance [18].

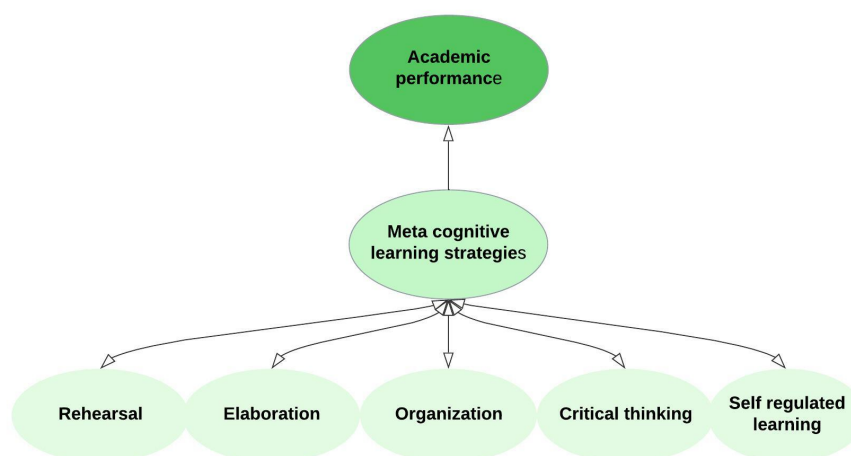


Figure 1: The metacognitive blueprint.

Building on this, an organization's learning strategy, as a domain of metacognitive learning strategies, encompasses the deliberate organizing, tracking, and assessment of learning processes in a collective framework. Techniques involve regulating cognitive processes, such as clustering and outlining, to enhance learning effectiveness and active participation. A study by Almarzouki et al. highlighted the importance of organizing information as a metacognitive approach, demonstrating its beneficial effects on comprehension and memory retention [19]. Researchers revealed that students who participated in activities such as summarizing exhibited more significant levels of comprehension and retention by actively organizing the information they received [19]. Similarly, Bobek and Tversky highlighted the cognitive advantages of generating visual explanations, asserting that visual organization yields more

benefits than verbal ones [20]. Therefore, incorporating organization subscale skills is consistent with the findings of studies that support their effectiveness in fostering meaningful learning experiences and academic achievement.

Critical thinking, a separate cognitive process, entails applying existing information to novel situations, allowing for problem-solving, decision-making, and critical evaluation against preset standards. Bangun and Praghlapati asserted that instructing nursing students in advanced cognitive abilities, particularly critical thinking, can enhance their performance in diverse situations [21]. These essential cognitive abilities are appropriate for preparing students in tertiary education before they enter into various professional environments [21]. Moreover, self-regulated learning is described by Zimmerman as a self-directed process wherein educators convert their cognitive capacities into academic competencies [22]. Self-regulated students typically characterize themselves as proactive people capable of employing learning methods and effectively managing their learning through self-observation [23]. A research investigation was conducted to analyze the self-regulated learning process of nursing students during clinical practice and the factors that impact this process. A survey of 614 nursing students indicated that self-regulated learning is crucial for adapting to ever-evolving health technologies, adjusting to advancing science knowledge, and thriving professionally. Therefore, identifying the factors that influence academic performance and provide support to students is advisable [24].

Achieving academic excellence and securing high grades are crucial objectives across all educational levels, offering positive outcomes for both students and educational systems [25, 26]. Scholars have dedicated considerable attention to comprehending the fundamental purpose of learning strategies in students' academic endeavors and overall performance. In contemporary education, a significant focus has been on metacognitive learning strategies, particularly academic performance. This area of research has garnered considerable attention, with numerous studies now being performed [3]. In a study by Moghadari-Koosha et al., the researchers aimed to evaluate the factors that impact academic achievement in paramedical students. The findings revealed that self-regulated learning emerged as the most reliable indicator of academic success. Self-regulated learning promotes students' confidence in their abilities and enhances their self-directed learning in both classroom and practical contexts [27]. Research conducted by Matric, for instance, demonstrated that students who actively engage in autonomous processes, including establishing objectives and tracking their progress, exhibit more extraordinary academic achievement [28]. Additionally, studies by Chin et al. have highlighted the positive correlation between the use of effective learning strategies and improved problem-solving and critical-thinking skills [29]. This research highlights the deep connection between learning techniques and academic proficiency, emphasizing the importance of customized approaches considering personal variations in learning styles and preferences. As researchers further investigate these interactions, the results consistently emphasize the crucial impact of learning strategies on students' educational experiences and achievements [30–32].

Currently, there is a prevailing belief that students who employ a more significant number of metacognitive learning techniques can develop more successful study plans, engage in more efficient tracking and assessment of their learning progress and comprehension of the materials, demonstrate greater responsibility, exhibit problem-solving skills, and have a heightened commitment to deep learning [3, 33]. Students who possess proficiency in employing these tactics have greater success than their counterparts lacking similar skills [34, 35]. These theories and studies have demonstrated the importance of metacognitive learning techniques in attaining academic success. Numerous studies have shown that metacognitive learning strategies serve as a significant predictor of students' academic achievement [36, 37]. However, based on the available literature, there is a lack of rigorous studies investigating the elements of metacognitive skills that enhance the academic performance of nursing students. Hence, most related studies have been conducted in Western countries, and their findings have been generalized in different contexts. Therefore, this study assesses the relationship between metacognitive learning strategies and academic performance among nursing students and identified variables that predict academic performance.

2. Research Questions and Hypotheses

2.1. Research Questions

- Does the academic performance of nursing students correlate with their use of metacognitive learning strategies?
- What variables are predictive of academic performance among nursing students?

2.2. Research Hypotheses

- The academic performance of nursing students is unrelated to their use of metacognitive learning techniques.
- The academic performance of nursing students is significantly positively correlated with their use of metacognitive learning strategies.

3. Methods

3.1. Study Design

The study approach was cross-sectional and quantitative, incorporating correlational and descriptive methods.

3.2. Sample and Setting

During the academic year 2023–2024, this study was carried out in the nursing department at [removed for blinded review] in the United Arab Emirates. The college enrolment comprises exclusively of female students. The participants included nursing students' levels 2 to 4 years. The sample size calculation for nursing student participants was performed using Epi-Info 7 software. The sample size was determined by considering a 5% variation, a 95% confidence level, and a power of 0.80 at a significance level of 0.05. Additionally, a 5% nonresponse rate was considered in the calculation. The final sample consisted of 215 nursing students who were accessible and willing to take part at the designated time.

In this research, metacognitive learning strategies are the independent variable, and academic performance (CGPA) is the dependent variable.

3.3. Data Collection Tools

Age, educational attainment, number of classes taken during the data-collecting semester and previous semesters, and cumulative grade point average (CGPA) were among the demographic information. Pintrich et al. developed the Motivated Learning Strategies Questionnaire (MLSQ) in 1993 [38], which consists of six motivational and nine learning strategies subscales. The Cognitive and Metacognitive Strategies subscale is one of the nine learning strategies subscales of the MLSQ [39, 40]. This scale contains 31 items organized into five dimensions: rehearsal (4 elements; $\alpha = 0.912$), elaboration (6 elements; $\alpha = 0.952$), organization (4 elements; $\alpha = 0.926$), critical thinking (5 elements; $\alpha = 0.941$), and metacognitive self-regulation (12 elements; $\alpha = 0.877$).

The variables on the rehearsal subscale included self-subject repetition, extensive note review, keyword memorization, and conceptual lists. The elaboration list included source integration, cross-course connections, material relatability, summarizing, conceptual connections, and applying reading elsewhere. Items on the organization subscale included outline readings, identifying key ideas, creating visual imagery, and noting outlines. The items featured in critical thinking include questioning information, assessing supporting evidence, developing one's ideas, exploring personal ideas, and considering alternatives. Finally, metacognitive self-regulation included indicators of distraction in class, the ability to create reading questions, resolve reading confusion, adapt to difficulty, preview before study, self-question understanding, adjust study methods, lack reading comprehension, reflect on learning, identify weaknesses, set study goals, and clarify note confusion.

The respondents evaluated each item using a seven-point scale, with 1 representing "not at all" and 7 depicting "to a very great extent". Students were told to ascertain the number between 1 and 7 that most accurately described their characteristics. Items 20 and 27 were evaluated using a reverse scale, where a rating of 7 indicated "not at all" and a rating of 1 indicated "to a very great extent." The study authors calculated the mean score for every element and the overall scale score ($\alpha = 0.936$), the average of the

five categories. Elevated scores signified an enhanced degree of cognitive and metacognitive abilities. The overall score, which spans from 31 to 217 points, can be categorized into three levels: low learning strategies (31–54 points), moderate learning strategies (55–163 points), or high learning strategies (164–217 points). The statistical scoring methods for the cognitive and metacognitive learning strategies were defined as follows: a score above 75% was classified as high, a score between 25% and 75% was classified as moderate, and a score below 25% was classified as low. Students' academic performance is evaluated based on their grade point average (GPA). A CGPA is categorized as acceptable (≤ 2.5), good ($> 2.5-3$), or very good (> 3).

3.4. Validity and Reliability

A Cronbach's alpha coefficient analysis was performed to determine the trustworthiness of the research tool. The Cognitive and Metacognitive Strategies instrument demonstrated a statistically significant degree of reliability at a P value of less than 0.05, with a coefficient of 0.973. A total of 21 participants, constituting 10% of the sample, were involved in the pilot study. This pilot aimed to assess the effectiveness and practicality of the tools used, uncover any challenges encountered throughout gathering data, and establish the time needed to complete the tools. Individuals who participated in the pilot study were excluded from the sample for the study. Since the items evaluated by the MLSQ are considered universal across many cultural and educational contexts, the instrument was kept exactly as is. Research suggests that these study-measured characteristics are broadly applicable in various educational contexts. The original wording works well in our context; thus, no further translation or linguistic changes are needed. In several published studies, MLSQ was used in its original form and yielded valid and dependable results under similar conditions [27, 38, 40].

3.5. Data Collection

The survey was distributed to students of the FCHS via email, utilizing the platform's capacity to reach all students' email accounts. An attachment to the email included a statement of information outlining the goals, benefits, and participant rights of the study. Furthermore, it was explicitly indicated that students could choose to participate or abstain from the research. The survey requires an estimated duration of 10–13 minutes to complete. The data was gathered over 2 months. No missing data were observed in the dataset, as the data collection concluded after the predetermined threshold of 215 was achieved. The researcher's contact details were given. All of the participants' questions were thoroughly handled and answered.

3.6. Data Analysis

Statistical Package for the Social Sciences (SPSS) 20.0 was used to examine the data. Demographic variables were quantified using descriptive statistics, which include frequency, means, standard deviations, and percentages. The study used Pearson's coefficient correlation to determine the relationship between the variables. The predictors of "higher than 3.0 CGPA" were investigated using multiple logistic regression.

4. Results

The study included 215 nursing students in total. The participants' average age was 19.77 ± 1.93 years, and the students ranged from 17 to 25 years. Most students were enrolled in 4–5 classes per semester ($n = 124$, 57.7%). A high proportion of those surveyed ($n = 107$, 49.8%) reported that their CGPA was more than 3.0 (Table 1).

Table 1: Demographic profile participants ($n = 215$).

Sociodemographic variables	No.	%
Age (years)		
< 20	99	46.0
20-22	95	44.2
≥ 23	21	9.8
Min. – Max.	17.0 – 25.0	
Mean $\pm$ SD.	19.77 ± 1.93	
Median	20.0	
Student level		
Level 1	52	24.2
Level 2	60	27.9
Level 3	54	25.1
Level 4	49	22.8
How many classes are you taking each term?		
1-3	15	7.0
4-5	124	57.7
≥ 6	76	35.3
Min. – Max.	1.0 – 9.0	
Mean $\pm$ SD.	5.06 ± 1.03	
Median	5.0	
CGPA	No.	%
≤ 2.5	58	27.0
$> 2.5 - 3$	50	23.3
> 3	107	49.8

As shown in Table 2, the overall level of information about learning strategies was moderate (57.2%), with a mean percentage of $62.23 \pm 22.43\%$. They obtained the highest mean score in the elaboration subscale (64.65 ± 26.39), followed by organization (63.39 ± 27.08). In contrast, the critical thinking and metacognitive self-regulation subscales had the lowest mean scores of 60.73 ± 26.44 and 60.99 ± 20.21 , respectively.

Table 2: Descriptive analysis of the students studied according to mean percent score of Metacognitive Learning Strategies subscales (n = 215).

Study variables	Mean% $\pm$ SD.	Low (<25%)		Moderate (25-75%)		High (>75%)	
		No.	%	No.	%	No.	%
Metacognitive Learning Strategies							
Rehearsal	62.98 $\pm$ 27.30	23	10.7	112	52.1	80	37.2
Elaboration	64.65 $\pm$ 26.39	19	8.8	99	46.0	97	45.1
Organization	63.39 $\pm$ 27.08	20	9.3	113	52.6	82	38.1
Critical thinking	60.73 $\pm$ 26.44	26	12.1	115	53.5	74	34.4
Metacognitive self-regulation	60.99 $\pm$ 20.21	6	2.8	147	68.4	62	28.8
Overall Metacognitive Learning Strategies	62.23 $\pm$ 22.43	20	9.3	123	57.2	72	33.5

SD: Standard deviation

Correlation analysis used the Pearson test to figure out the interrelationship between learning approaches and academic performance (Table 3). A moderate, significant, and positive correlation between students' overall learning strategies scale score and academic performance $r(213) = 0.742$, $p < 0.001$. The previous-mentioned correlations were detected for all the subscales of learning styles and academic performance, which were rehearsal $r(213) = 0.528$, $p = 0.001$; elaboration $r(213) = 0.603$, $p = 0.003$; organization $r(213) = 0.684$, $p = 0.007$; critical thinking $r(213) = 0.717$, $p = 0.001$; and metacognitive self-regulation $r(213) = 0.658$, $p < 0.001$.

Table 3: Matrix Correlation for information about learning strategies (n = 215).

		Learning strategies						Academic performance
		Rehearsal	Elaboration	Organization	Critical thinking	Metacognitive self-regulation	Overall	
Rehearsal								
	r	1.000	0.890*	0.850*	0.831*	0.750*	0.912*	0.528*
	p		< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	0.001*
Elaboration								
	r		1.000	0.899*	0.892*	0.792*	0.953*	0.603*
	p			< 0.001*	< 0.001*	< 0.001*	< 0.001*	0.003*

Table 3: Continued.

		Learning strategies						Academic performance
		Rehearsal	Elaboration	Organization	Critical thinking	Metacognitive self-regulation	Overall	
Organization								
	r			1.000	0.876*	0.776*	0.931*	0.684*
	p				< 0.001*	<0.001*	<0.001*	0.007*
Critical thinking								
	r				1.000	0.767*	0.928*	0.717*
	p					<0.001*	<0.001*	0.001*
Metacognitive self-regulation								
	r					1.000	0.913*	0.658*
	p						<0.001*	<0.001*
Overall learning strategies								
	r						1.000	0.742*
	p							<0.001*
Academic performance								
	r							1.000
	p							

r: Pearson correlation coefficient

*: Statistically significant at $p \leq 0.05$

The findings of multiple logistic regression analysis for assessing the predictors of academic achievement are shown in Table 4, in which the dependent variable is whether a student has a CGPA of >3 (recorded as 1) or ≤ 3 (recorded as 0). The independent variables in the model are metacognitive learning strategies, the number of classes, and age. Results indicated that age ($B = -0.555$, $SE = 0.100$, $p = <0.001$, $OR = 0.574$), number of classes taken each term ($B = 0.461$, $SE = 0.176$, $p = 0.009$, $OR = 1.586$), and metacognitive learning strategies ($B = 0.010$, $SE = 0.004$, $p = 0.018$, $OR = 1.010$) were significant predictors of the CGPA.

Table 4: Multivariate logistic regression analysis for academic performance.

	B	SE	Sig.	OR	95% CI	
					LL	UL
Age (years)	-0.555	0.100	<0.001*	0.574	0.472	0.698
How many classes are you taking each term?	0.461	0.176	0.009*	1.586	1.123	2.240
Metacognitive Learning Strategies	0.010	0.004*	0.018*	1.010	1.002	1.018

B: Unstandardized coefficients

SE: Estimates standard error

OR: Odds ratio

*: Statistically significant at $p \leq 0.05$ Note: The dependent variable in this analysis is CGPA 1 = >3 ($n = 107$) vs. 0 = ≤ 3 ($n = 108$).

5. Discussion

The study examined the correlation between metacognitive learning strategies and the academic performance of nursing students, as well as determined the attributes that can predict academic performance. The primary results emphasize the moderate degree of knowledge regarding metacognitive learning techniques among nursing students, with the elaboration and organization of information being the most frequently employed metacognitive strategies. The correlation analysis proved a moderate, positive, and statistically significant link between the scale score of students' total metacognitive learning strategies and their academic performance. Furthermore, the multiple logistic regression analysis results indicated that metacognitive learning strategies, the number of classes, and age were significant predictors for CGPA.

The reported overall level of information about learning strategies was moderate at 57.2%, with a mean percentage of $62.23 \pm 22.43\%$. This indicates moderate awareness and understanding among the study participants regarding learning strategies. Research on learning strategy awareness among nursing students has revealed varying degrees of knowledge across different populations and educational levels. Some studies have reported higher levels of awareness, indicating a more widespread understanding of effective learning strategies, while others have shown a moderate level of awareness. For example, a study on e-learning during the COVID-19 pandemic in Iran found that the majority of nursing students generally used two different strategies, namely, self-centered learning strategies and evidence-based methods of learning [41]. Additionally, a study on active learning strategies among first-year nursing students showed that this engaged learning strategy and setting can support undergraduate nursing students' development of metacognitive awareness [42]. Additionally, a focus group study demonstrated that undergraduate nursing students agreed that using active learning techniques aids in gaining fundamental knowledge [43]. These results emphasize the significance of understanding and promoting effective metacognitive learning strategies among nursing students, as these strategies can significantly impact their academic engagement and achievement. Developing and implementing teaching strategies tailored to students' learning strategies can optimize and facilitate learning in both academic and clinical settings [41, 44]. Therefore, nursing educators should explicitly instruct and exemplify metacognitive strategies throughout the curriculum. For instance, create a workshop or online workshop that addresses metacognitive skills such as critical thinking, goal planning, and self-regulation motivate students to apply these approaches across many learning environments (e.g., clinical practice, exam preparation, group discussions).

The study showed that nursing students possess a better understanding of how to elaborate on information and organize it in the context of learning, as evidenced by the relatively higher mean scores on the elaboration and organization subscales (64.65 ± 26.39 and 63.39 ± 27.08 , respectively) than on the overall level of information. This implies that nursing students have a good grasp of effective learning strategies, which can be attributed to the development and implementation of teaching strategies tailored

to students' learning strategies [41, 43, 45]. For instance, a study on active learning strategies among first-year nursing students showed that undergraduate nursing students' development of metacognitive awareness may be promoted by an active learning environment and methodology [42]. Moreover, a quantitative study investigated the effectiveness of study strategies among nursing students, providing insights into effective study techniques for nursing education [46]. The findings suggest that nursing students can enhance their learning and academic performance by implementing recommended strategies, such as increasing their study hours, engaging in study groups, and practicing quizzes [46]. Other studies, such as that of Langdon et al., showed that participants applied metacognitive strategies at a high frequency, with evaluating strategies being the most frequently used, followed by monitoring and planning strategies [37]. Consequently, promoting self-regulation and reflection among nursing students will enhance their capacity for monitoring. At the same time, problem-based learning and case studies can serve as valuable strategies for increasing metacognitive engagement in nursing students.

The results of the present investigation showed a strong and significant connection between students' overall metacognitive learning strategies scale score and academic performance ($p < 0.001$). Furthermore, there was a substantial link between CGPA and information about learning strategies ($p = 0.001$). These results are in line with earlier studies that demonstrated a favorable relationship between learning strategies and academic performance [47–50]. Specifically, a study of primary medical science students revealed a favorable relationship between academic performance and all learning strategies, with the strongest relationship found between academic performance and metacognitive self-regulation ($r = 0.723$) [51]. A study comparing the learning techniques and academic performance of APELs and ordinary entry undergraduates found that effort regulation, time and study environment management, and metacognitive self-regulation showed the most vital link with academic achievement [50].

This conclusion could be explained by the fact that pupils who employ efficient metacognitive strategies might have higher engagement and achievement levels [36]. Overall, this study's findings highlight the importance of learning strategies, particularly metacognitive self-regulation, in academic performance. The results suggest that interventions aimed at improving learning strategies could enhance the educational performance of nursing students. These interventions include teaching students effective learning strategies, providing feedback on their learning strategies, and encouraging them to reflect on their learning processes.

Identifying metacognitive learning strategies, the number of classes, and age as factors influencing CGPA represent critical insights into the multifaceted nature of academic performance among nursing students. This finding aligns with contemporary research emphasizing the intricate interplay between educational achievement and various contextual factors. Recent scientific publications corroborate the significance of the learning strategies in shaping CGPA. A study by Ganji et al. revealed that learning patterns have been utilized to differentiate between students' scholastic achievement regarding self-directed learning hours and CGPA scores [52]. The authors argued that students with better academic

performance tend to exhibit a heightened awareness of their learning processes and are more likely to employ metacognitive strategies, such as rehearsal and critical thinking [52]. This finding aligns with the present study's finding that students with a CGPA higher than 3 reported more effective learning strategies. Another study from 2019 showed that students who employ self-regulating and motivating learning techniques had more exceptional academic performance and that cognitive and metacognitive learning strategies are predictors of academic achievement [53]. Additionally, a 2021 study compared students' academic performance and types of learning strategies. It revealed a relationship between learning approaches and CGPA, with deep learning approaches showing a positive association with CGPA [50]. Likewise, 400 paramedical students participated in the study, which found that self-regulated learning was superior to academic achievement [27]. These findings corroborate the claim that students with higher CGPA tend to exhibit a heightened awareness of their learning processes and are more likely to employ metacognitive strategies, aligning with the importance of CGPA in shaping learning strategies. The study suggests incorporating these tactics into course design may directly affect student outcomes. For example, assisting students in establishing academic objectives at the beginning of each course and using metacognitive methods to monitor their progress. Deploy drills, including peer review, through interaction and feedback to improve academic and metacognitive skills and learning.

Moreover, the impact of the number of classes on CGPA is well supported by research in education psychology. Tan et al. explored the connection between academic workload and learning approaches [50]. They revealed that students in more classes tended to employ organizational and time-management strategies to cope with increased cognitive demands [50]. This finding concurs with the current study's observation that a significant proportion of students at level 2, taking 4–5 classes per semester, exhibited high academic performance scores. However, no recent publications have specifically explored the relationship between the number of classes and CGPA. Furthermore, the interaction between CGPA, number of classes, and learning strategies is a complex dynamic that needs further exploration to determine the role of workload in shaping students' cognitive and metacognitive processes. A balanced workload, as indicated by a moderate number of classes, could have contributed to optimal learning strategy utilization and higher CGPA among the participants in the present study. Recognizing these factors as influential elements in academic performance can inform targeted interventions and personalized educational strategies to optimize learning outcomes in nursing education. Lastly, research conducted among undergraduate medical students has shown strong evidence supporting the influence of students' age on their CGPA [54]. It was found that participant age is a significant predictor of self-reported academic achievement [54]. This result aligns with the present research, which showed that age was a predictor of academic achievement. As age increases, educational attainment decreases correspondingly. Nevertheless, it is difficult to definitively claim that younger students surpass older ones, as being older may be influenced by other variables such as family circumstances, medical problems, or even delays in enrolment.

Future research could delve deeper into the nuanced relationships between workload, academic achievement, and specific learning strategies, promoting a more thorough comprehension of the complex dynamics in the classroom. The research results may have restricted applicability due to the limited sample population. Research conducted at a single university, concentrating exclusively on undergraduate students from a given program, limits the diversity necessary for broader generalizations. Subsequent research should strive to incorporate a more diverse demographic, spanning various institutions and academic disciplines, to improve the validity and applicability of the findings across different situations.

5.1. Limitations

The paper has limitations despite offering fresh insights into theory and future investigations. The study included an online poll of nursing undergraduates, which could limit the application of the findings in other contexts. A significant limitation is the participants' subjective reporting of all the data. Self-reports were deployed in this study to assess knowledge regarding learning patterns and CGPAs. Furthermore, the study was performed at a single university with only undergraduate students from one program, limiting the generalizability of the findings.

5.2. Implications

This study's findings hold significance for nursing colleges in the UAE. This indicates a paramount necessity for educational programs to augment this understanding, especially in developing information elaboration and organization skills. For instance, instructors can combine exercises in concept mapping, peer debates, and summarizing. Given the favorable relationship between metacognitive techniques and academic achievement, incorporating metacognitive training into the curriculum through workshops centered on goal setting, self-reflection, and self-monitoring of learning progress could significantly improve student performance and academic proficiency. Identifying predictors, such as age, class attendance, and metacognitive strategies, suggests that tailored interventions and support, like flexible learning resources for students with lower attendance or mentoring for older students, could be developed to meet the diverse needs of nursing students. Ultimately, these methods might lead to better academic achievement and better skills preparation for future healthcare jobs. This resulted in enhanced academic performance and improved preparation skills for future employment in healthcare.

6. Conclusion

There is a moderate overall level of information about learning strategies and a significant correlation between CGPA and metacognitive learning strategies. Curriculum makers should consider incorporating

evidence-based teaching strategies tailored to students' learning preferences to optimize academic engagement and achievement. In addition, the study underscores the importance of nursing educators implementing teaching strategies aligned with students' learning strategies. A higher mean score for elaboration and organization suggested a solid understanding of these strategies among nursing students.

Clinical educators can integrate active learning approaches and environments to further promote metacognitive awareness. Building on the literature, future studies can investigate the impact of interventions to improve learning strategies, especially metacognitive self-regulation, on nursing students' academic performance.

Acknowledgment

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Statement of Ethics

The study was planned, conducted, and reported by the World Medical Association (WMA) Declaration of Helsinki.

Ethical Approval

The study protocol, research instrument, and consent documents were submitted to and approved by the Research Ethics Committee at Fatima College of Health Sciences [Ethical Approval Number: FCEC-04-06-2023-NUR-01]. The participants willingly participated in the study after receiving detailed information regarding the measures implemented to protect their data confidentiality. The data collected from the participants were entirely anonymous, with no identifiable personal information recorded. The research's aim and objectives were successfully conveyed to the nursing students involved in the study via the distribution of informational materials and consent forms.

Informed Consent Statement

Written informed consent was obtained from all participants in the study.

Conflict of Interest

The authors declare that there is no conflict of interest.

Artificial Intelligence (AI) Disclosure Statement

AI-unassisted work.

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Author Contribution

Rasha Kadri Ibrahim is the principal investigator, writing the original draft, methodology, results preparation and writing, completing the ethical approval process, reviewing the manuscript, and being the corresponding author. Atika Khalaf contributed to the data collection, interpretation of the results, manuscript drafting, and frequent critical review of the whole manuscript. The authors read and approved the final manuscript.

Data Sharing Statement

The data supporting this study's findings are available from the corresponding author upon reasonable request.

References

- [1] Chen JH, Björkman A, Zou JH, Engström M. Self-regulated learning ability, metacognitive ability, and general self-efficacy in a sample of nursing students: A cross-sectional and correlational study. *Nurse Educ Pract.* 2019;37:15–21.
- [2] Díaz EV, Hilliger I, Gonzalez C, Celis S, Pérez-Sanagustín M, Broisin J. The mediating role of learning analytics: Insights into student approaches to learning and academic achievement in Latin America. *J Learn Anal.* 2024;11(1):6–20.
- [3] Takase M, Yoshida I. The relationships between the types of learning approaches used by undergraduate nursing students and their academic achievement: A systematic review and meta-analysis. *J Prof Nurs.* 2021;37(5):836–845.
- [4] Jaušovec N. Metacognition. In: Runco MA, Pritzker SR, editors. *Encyclopedia of Creativity* (Second Edition) [Internet]. San Diego: Academic Press; 2011 [cited 2025 May 3]. p. 107–12. Available from: <https://www.sciencedirect.com/science/article/pii/B9780123750389001461>
- [5] Varga A. Metacognitive perspectives on the development of reading comprehension: A classroom study of literary text-talks. *Literacy.* 2017;51(1):19–25.

- [6] Siqueira MA, Gonçalves JP, Mendonça VS, Kobayasi R, Arantes-Costa FM, Tempiski PZ, et al. Relationship between metacognitive awareness and motivation to learn in medical students. *BMC Med Educ.* 2020;20(1):393.
- [7] Ford JK, Smith EM, Weissbein DA, Gully SM, Salas E. Relationships of goal orientation, metacognitive activity, and practice strategies with learning outcomes and transfer. *J Appl Psychol.* 1998;83(2):218–233.
- [8] Marantika JE. Metacognitive ability and autonomous learning strategy in improving learning outcomes. *J Educ Learn.* 2021;15(1):88–96.
- [9] Jain D, Tiwari G, Awasthi I. Impact of metacognitive awareness on academic adjustment and academic outcome of the students. *Int J Indian Psychol.* 2017;5(1):123–138.
- [10] Vermunt JD, Vermetten YJ. Patterns in student learning: Relationships between learning strategies, conceptions of learning, and learning orientations. *Educ Psychol Rev.* 2004;16(4):359–384.
- [11] Husain W, Ashkanani F, Al Dwairji MA. Nutrition knowledge among college of basic education students in Kuwait: A cross-sectional study. *J Nutr Metab.* 2021;2021:5560714.
- [12] Truman E, Lane D, Elliott C. Defining food literacy: A scoping review. *Appetite.* 2017;116:365–371.
- [13] Sukrajh V, Adefolalu AO. Understanding learning and the components of the learning process in medical education: A review of the literature. *EJEDU [Internet].* 2021;2(1):69–72.
- [14] Drigas A, Mitsea E. The 8 pillars of metacognition. *Int J Emerg Technol Learn.* 2020;15(21):162–178.
- [15] Wang Z, Zhang Z, Ebrahimi S, Sun R, Zhang H, Lee CY, et al. DualPrompt: Complementary prompting for rehearsal-free continual learning. *Computer Vision – ECCV.* 2022;631–648.
- [16] Biyıklı C, Doğan N. The effect of learning strategies used for rehearsal on the academic success. *TED EĞİTİM VE BİLİM.* 2015;40(181):311–327.
- [17] Drigas A, Mitsea E, Skianis C. Metamemory: Metacognitive strategies for improved memory operations and the role of VR and mobiles. *Behav Sci (Basel).* 2022;12(11):450.
- [18] Pires EM, Daniel-Filho DA, de Nooijer J, Dolmans DH. Collaborative learning: Elements encouraging and hindering deep approach to learning and use of elaboration strategies. *Med Teach.* 2020;42(11):1261–1269.
- [19] Almarzouki HS, Khan MA, Al-mansour M, Al-jifree HM, Abuznadah W, Althubaiti A. Effectiveness of cognitive strategies on short-term information retention: An experimental study. *Health Prof Educ.* 2023;9(3):128–132.
- [20] Bobek E, Tversky B. Creating visual explanations improves learning. *Cogn Res Princ Implic.* 2016;1(1):27.
- [21] Bangun AV, Pragholapati A. Enhancing critical thinking skills in nursing higher education in preparation for the industrial revolution 4.0. *KLS.* 2021;6(1):793–804.
- [22] Ngah N, Safian N, Aini N, Hussain A, Hussain S, Aini Yaacob M, et al. A study of the factors that influence learners' drive to be self-regulated. *Int J Acad Res Bus Soc Sci.* 2023;13(9):1375–1392.

- [23] Cho KK, Marjadi B, Langendyk V, Hu W. Medical student changes in self-regulated learning during the transition to the clinical environment. *BMC Med Educ.* 2017;17(1):59.
- [24] Kurt E, Eskimez Z. Examining self-regulated learning of nursing students in clinical practice: A descriptive and cross-sectional study. *Nurse Educ Today.* 2022;109:105242.
- [25] Hayat AA, Shateri K, Amini M, Shokrpour N. Relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students: A structural equation model. *BMC Med Educ.* 2020;20(1):76.
- [26] Bulfone G, Mazzotta R, Cocco M, Maurici M, Anastasia M, Macale L, et al. Variables predicting academic success of nursing students: A longitudinal study in a nursing Bachelor's degree program. *Ann Ig.* 2022;34(4):384–397.
- [27] Moghadari-Koosha M, Moghadasi-Amiri M, Cheraghi F, Mozafari H, Imani B, Zandieh M. Self-efficacy, self-regulated learning, and motivation as factors influencing academic achievement among paramedical students: A correlation study. *J Allied Health.* 2020;49(3):e145–e152.
- [28] Matric M. Self-regulatory systems: Self-regulation and learning. *JPMNT.* 2018;6(4):79–84.
- [29] Chin DB, Blair KP, Wolf RC, Conlin LD, Cutumisu M, Pfaffman J, et al. Educating and measuring choice: A test of the transfer of design thinking in problem solving and learning. *J Learn Sci.* 2019;28(3):337–380.
- [30] Kogei KF. Academic motivation and self-efficacy as predictors of academic performance among form three students in Kitui County, Kenya. *IJSRM.* 2021;9(06):1732–1755.
- [31] Vettori G, Vezzani C, Bigozzi L, Pinto G. The mediating role of conceptions of learning in the relationship between metacognitive skills/strategies and academic outcomes among middle-school students. *Front Psychol.* 2018;9:1985.
- [32] Kassim A, Puteh F, Chandran SD, Katamba A, Magobe M, Rahmat NH, et al. Exploring relationship between learning approaches among postgraduate students. *Int J Acad Res Bus Soc Sci.* 2023;13(6):1391–1412.
- [33] Callan GL, Marchant GJ, Finch WH, German RL. Metacognition, strategies, achievement, and demographics: Relationships across countries. *Educ Sci Theory Pract.* 2016;16(5):1485–1502.
- [34] Poorman SG, Mastorovich ML. Using metacognitive wrappers to help students enhance their prioritization and test-taking skills. *Nurse Educ.* 2016;41(6):282–285.
- [35] Lyons K, McLaughlin JE, Khanova J, Roth MT. Cognitive apprenticeship in health sciences education: A qualitative review. *Adv Health Sci Educ Theory Pract.* 2017;22(3):723–739.
- [36] Amien MS, Hidayatullah A. Assessing students' metacognitive strategies in e-learning and their role in academic performance. *Jurnal Inovasi Teknologi Pendidikan.* 2023;10(2):158–166.
- [37] Langdon J, Botnaru DT, Wittenberg M, Riggs AJ, Mutchler J, Syno M, et al. Examining the effects of different teaching strategies on metacognition and academic performance. *Adv Physiol Educ.* 2019;43(3):414–422.

- [38] Ibrahim RK, Aldawsari AN. Relationship between digital capabilities and academic performance: The mediating effect of self-efficacy. *BMC Nurs.* 2023;22(1):434.
- [39] Pintrich PR, Smith DA, Garcia T, McKeachie WJ. A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ). Ann Arbor (MI): National Center for Research to Improve Postsecondary Teaching and Learning; 1991.
- [40] Ibrahim RK, Al Sabbah S, Al-Jarrah M, Senior J, Almomani JA, Darwish A, et al. The mediating effect of digital literacy and self-regulation on the relationship between emotional intelligence and academic stress among university students: A cross-sectional study. *BMC Med Educ.* 2024;24(1):1309.
- [41] Cheraghbeigi N, Molavynejad S, Rokhafroz D, Elahi N, Rezaei E. Nursing students' learning strategies for e-learning during the Covid-19 pandemic in Iran: A qualitative study. *BMC Med Educ.* 2023;23(1):321.
- [42] Chan CW, Tang FW, Chow KM, Wong CL. Enhancing generic capabilities and metacognitive awareness of first-year nursing students using active learning strategy. *BMC Nurs.* 2021;20(1):81.
- [43] Kalu F, Wolsey C, Enghiad P. Undergraduate nursing students' perceptions of active learning strategies: A focus group study. *Nurse Educ Today.* 2023;131:105986.
- [44] Ghasemi MR, Moonaghi HK, Heydari A. Strategies for sustaining and enhancing nursing students' engagement in academic and clinical settings: A narrative review. *Korean J Med Educ.* 2020;32(2):103–117.
- [45] Mayfield LR. Nursing students' awareness and intentional maximization of their learning styles. *TLAR.* 2012;17(1):27–44.
- [46] Sulaiman MH, Jasim MS, Ahmed AA, Ahmed AA, Ibrahim RH, Al-Mashhadany OI. A winning formula for nursing education: Effective study strategies and techniques. *Teach Learn Nurs.* 2023;18(4):e142–e145.
- [47] Mohammadi I, Thaghinejad H, Suhrabi Z, Tavan H. The correlation of learning and study strategies with academic achievement of nursing students. *JBRMS.* 2017;4(3):8–13.
- [48] Jin M, Ji C. The correlation of metacognitive ability, self-directed learning ability and critical thinking in nursing students: A cross-sectional study. *Nurs Open.* 2021;8(2):936–945.
- [49] Cale AS, Hoffman LA, McNulty MA. Promoting metacognition in an allied health anatomy course. *Anat Sci Educ.* 2023;16(3):473–485.
- [50] Tan SF, Din Eak A, Ooi LH, Abdullah AC. Relationship between learning strategies and academic performance: A comparison between accreditation of prior experiential learning (APEL) and regular entry undergraduates. *Asian Association of Open Universities Journal.* 2021;16(2):226–238.
- [51] Khan HM. Correlation of learning strategies with academic performance in students of Basic Medical Sciences. *Rawal Med J.* 2020;45(3):720–724.
- [52] Ganji KK, Alam MK, Gudipaneni RK, Algarni H, Munisekhar MS, Hamza MO, et al. Do learning style preferences influence the cumulative gross point average and self directed learning hours in dental students: A preliminary study. *BMC Med Educ.* 2022;22(1):493.

- [53] Nabizadeh S, Hajian S, Sheikhan Z, Rafiei F. Prediction of academic achievement based on learning strategies and outcome expectations among medical students. *BMC Med Educ.* 2019;19(1):99.
- [54] Gedefaw A, Tilahun B, Asefa A. Predictors of self-reported academic performance among undergraduate medical students of Hawassa University, Ethiopia. *Adv Med Educ Pract.* 2015;6:305–315.