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The Impact of Metacognitive Skills Educational Program on Metacognitive Awareness, Self- Efficacy, and Problem Solving Skills among Nursing Students

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Abstract **Background:** Cognitive skills play a vital role in all aspects of cognitive tasks, including verbal information exchange, greater understanding of reading, motivation, verbal understanding, writing, attention, solving problems and social cognition. **Aim of this study:** To examine the effectiveness of metacognitive skills educational program on metacognitive awareness, self-efficacy, and skillsofproblem solving among nursing students at the Faculty of Nursing ZagazigUniversity. **Subjects:** Asimple random sample (n= 70) of nursing students enrolled in fourthacademic year 2019-2020. **Tools of data collection:** A questionnaire sheet was used for collection of dataincluding four parts: 1) Personal characteristics of the nursing students, 2) Metacognitive Awareness of Reading Strategies Inventory (MARSI), 3) General Self-efficacy Scale, and 4) The problem solving skills inventory. **Results:** revealed that there were statistically significant strong correlations between students' metacognitive awareness, self-efficacy, and skills of problem solving after the educational program. **Conclusion:** Metacognitive skills educational program had positive influence in improving students' metacognitive awareness, self-efficacy, and skills of problem solving. **Recommendations:** Encourage nursing educators to develop the self-efficacy and skills of problemsolving of the students by placing clear strategies to enhance learning and embedding them in the different courses. Infuse training courses dealing with metacognitive thinking skills, with paying attention to the development of metacognitive thinking skills during all academic years.

Keywords: *metacognitive skills, metacognitive awareness, problem solving skills, self-efficacy*

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1. Introduction

The first objective of any educational institution is the learning of students, and learning requires the use of processes such as planning, knowledge application, monitoring, regulation and reflection that are obtained in the metacognition domain. The word "metacognition" applies to cognitive abilities; mechanisms and techniques used to regulate and correct individual learning; [1] and the ability to manage cognitive processes and self-realization [2].

Metacognitive awareness can be identified as people's self- understanding or knowledge of their metacognitive mechanism, it reflects people's awareness of their own capability examines. In addition, metacognitive awareness has two major components of metacognition as refers to knowledge about cognition and cognition regulation. People involved in cognitive tasks perform better, which believes interactions have an effect on self-efficacy, is an essential factor in improving the self-efficacy of individuals. Self-efficacy is the perception of the person about his or her abilities that influence individual performance in the learning environment [3].

Academic self-efficacy depends on the perception of learning by students, and is an important factor in student reasoning's success. Self-efficacy refers to beliefs in one's capacity to organize and execute the course of action necessary to manage future situations. Effectiveness values have an impact on how people think, feel, inspire and act. Self-efficacy of the individual plays a key role in inhibiting or stabilizing his conduct in different situations [4].

Using metacognition pushes people to try more and use learning strategies to profoundly process problems, leading to better performance, and improving self-efficacy. Metacognitive practices are used by those with a high degree of self-efficacy and motivation to learn and improve performance. In the problem-solving domain, metacognition is a central predictor of learning success [5].

According to Sternberg and Sternberg [6], Problem solving strategies include: problem definition, problem presentation, strategies formulation, information organization, resources allocation, and supervision and assessment. Researches were recording the role of metacognition in problem-solving. More complicated problems therefore require more metacognitive management, and teaching problem-solving and metacognition skills will give learners the right opportunities to handle their learning [7]. Promoting the academic performance of the students by metacognitive approaches is a concern verified by some studies [8].

Students who are metacognitively aware of what to do when they don't know what to do; that is, they have approaches to find out or figure out what they need to do. Metacognition is essential in one's learning. Using metacognitive strategies ignites one's thought and may lead to deeper learning and improved performance, particularly among struggling learners. You may build these metacognitive techniques inside yourself. Students who are aware of their own processes of cognition or thought will be more responsible for their own learning processes [9].

1.1. Significance of the Study:

Metacognitive teaching increases students ' ability to solve problems better, as metacognitive techniques improve their attempt to solve problems. Metacognitive education is done to help students coordinate their patterns of thinking, social behaviour, self-assessment, oral skills, self-learning, self-direction, self-consciousness and self-reinforcement.

Metacognitive training can also assist students in controlling their perception and integrating their learning and problem solving processes. As well, knowledge of when and how to use metacognitive approaches plays a key role in students' performance during the process of problem-solving.While nursing students face many critical problems throughout their career, it is essential to train students to deal with these problems and to use metacognitive skills to make suitable decisions based on process organization.

1.2. Aim of the Study:

To explore the impact of metacognitive skills educational program on metacognitive awareness, self-efficacy, and skills of problem solving among nursing students at theFaculty of Nursing Zagazig University.

1.3. Research Hypotheses:

1. There is a difference in students' metacognitive awareness regarding metacognitive skills educational program before and after program.
2. There is a difference in students' self-efficacy regarding metacognitive skills educational program before and after implementation of the program.
3. There is a difference in students' problem solving skills regarding metacognitive skills educational program before and after implementation of the educational program.

2. Subjects and Methods

2.1. Research Design:

A quasi - experimental design was used.

2.2. Study Setting:

The study was carried out at the Faculty of Nursing, Zagazig University, Egypt, which includs seven scientific departments namely; Nursing Administration, Psychiatric and Mental Health Nursing, Pediatric Nursing, Community Health Nursing, Maternal and New Born Health Nursing, Medical Surgical Nursing, Community Health Nursing and Geriatric Nursing.

2.3. Subjects:

The subjects of the study included fourth year nursing students who enrolled in nursing administration course in the academic year 2019-2020.

2.4. Sample Size:

The sample was taken through a proportionate random sampling technique by using a simplified formula n= N/1+N (e) 2, provided by Yamane [10]. A 95% confidence level and P =0.05 are assumed for Equation. The ideal sample size was 70 students.

Tools of data collection:

Aquestionnaire sheet including 4 parts:

Part (1): Personal characteristics of nursing students developed by the researchers: Age, gender, marital status, previous working, and previous training about metacognition skills.

Part (2): Metacognitive Reading Strategy Inventory (MARSI): developed by Mokhtari and Richard [11] to measure students' metacognitive awareness of 3-scale reading strategies; general reading strategies (13 items), problem-solving strategies (8 items); and study support strategies (9 items). All the answers are based on a Likert scale of 5 points. The Coefficient of reliabilitywas 0.995.

2.5. Scoring System:

The scores were categorized into satisfactory level (students who scored ≥ 75% on metacognitive awareness based questions) and unsatisfactory level (students who scored <75% on metacognitive awareness based questions).

Part 3: General Self-efficacy Scale: It was developed by Crandall et al. [12] and composed of10 items rated on a scale of 1 (not at all true) to 4 (exactlytrue) [5]. Sample items include: "I canmanage to solve difficult problems if Itry hard enough" and "If I am in trouble,I can usually think of a solution". This inventory's internal reliability was measured using the alpha coefficient of Cronbach and it was 0.994.

2.6. Scoring System:

The scores were categorized into satisfactory level (students who scored ≥ 75% on self-efficacy based

questions) and unsatisfactory level (students who scored <75% on self-efficacy based questions).

Part 4: Skills of The Problem SolvingInventory: It was developed by Soliman [13], to measure nursing student's perceptions of their problem-solving abilities composed of 28 self-report items assessed on a 5-point Likert scale that are designed. Responses to the items range from 1 (strongly disagree) to 5 (strongly agree), and the total score ranges from 28 to 140. The internal reliability of this inventory was measured using the alpha coefficient of Cronbach, and was 0.994.

2.7. Scoring System:

The scores were categorized into satisfactory level (students who scored ≥ 75% on problem solving skills based questions) and unsatisfactory level (students who scored <75% on problem solving skills based questions).

2.8. Content Validity and Reliability:

A self-administered questionnaire was used, after the translation of instrument to Arabic. The content and face validity were established by a jury of experts (5 professors & 4 assistant professors) from academic nursing staff, Zagazig and Cairo Universities.

2.9. Pilot Study:

To test the questionnaire accuracy and feasibility before using, a pilot study was conducted on 10 percent of the research sample (n=7). Those students who were included in the pilot study were removed from the sample analysis. Informed consent has been received from the entire study group for participation in the study, and they have been told that participation in the research is voluntary. And that every student can decide to stop completing the study and withdraw without consequences at any point.

2.10. Field Work:

The study was carried out for three months from the beginning of May to the end of July 2019, as the following:

Preparatory phase:

It started with reviewing national and international resource of theoretical and empirical literature on the topic of the study using textbooks, articles, magazines, research, and internet search to get a clear image of all parts of the study. The pre-test questionnaire sheet has been provided to students to determine their metacognitive skills training needs. The estimated time each student needed to complete each sheet varied between 25-30 minutes. The students ' learning needs were identified based on pre-test results. Accordingly, the educational program's objectives were set out and the content was designed.

Implementation phase:

The educational program planned for this study was implemented across 10 sessions from which 4 theory and 6 practical sessions were performed. These sessions lasted 16 hours; the theory lasted 4 hours (one hour per theoretical session); and practical 12 hours (two hours per practical session); It was hard to take the entire number of students at the same time, so the students were distributed intofive groups; every group comprised approximately 14 students. All sessions were repeated to the five main groups until the 70 students finished all 16 hours of instruction.

The theoretical part of the educational program consists of 4sessions covering;defining the terms ofmetacognitive strategies, metacognitive principles, its role and significance in learning-teaching process, teaching major metacognitive strategies (planning,controlling, monitoring,and regulation strategies), association of metacognition with problem solving and self-efficacyand teaching problem solving approaches and how to solve the problem by using the metacognitive approach.The practical part of the educational program consists of 6 sessions covering;metacognitive problem solving exercises and solving these problemsby using planning strategies,control and monitoring strategies, and self-regulation strategies by students along with the teacher's guidance to enhance student's self-efficacy. Guided metacognitive problem solving exercises in small groups and individual metacognitive problem solving exercises along with review by the instructor and error correction. Continuation of activities, summarization, posttest administration, termination and donation of rewards.

The investigator used various teaching methods to attract students' attention and motivate them to participate such as lectures, group discussions and brainstorming. The teaching media included: power point, white blackboard and a copy of the program which covered theoretical and practical information about metacognitive skills.

Evaluation phase: -

During this phase, the effect of educational program was evaluated; it was carried out immediately after the program implementation by using the same formats of the tools used before the program implementation.

Administrative and ethicalconsiderations:

The Ethics Committee and Dean of the Faculty of Nursing, University of Zagazigwere informed. Students included in the study sample were given verbal and written explanations of the aim and nature of the study. Confidentiality was assumed as student's names were not written. The researchers told students that their involvement in the study was completely voluntary and that they can withdraw at any stage without any consequences.

2.11. Statistical Design:

Entering data and using statistical evaluation (SPSS), version 21.0. And checked to ensure no information was lost or inadequate. ANOVA F test and t-test were used to identify the relationship between the variables and the analysis of the association between total scores.

3. Result

Table 1: Shows that, 51.4% of students aged less than 21 years. As well, the highest percentages of them are female, not working and didn't take any training about metacognitive skills (77.1%, 75.7%, 100% respectively).

Figure 1: Illustrates that, there were highly statistically significant improvements in levels of metacognitive awareness, self-efficacy, and problem solving skills

among nursing students, where 71.4% of them had satisfactory levels in the three skills immediately post educationalprogram (p<0.001). Compared to the preprogram scores, the highest percentage of students had unsatisfactory levels of metacognitive awareness, self-efficacy, and problem solving skills (85.7%, 91.4%, & 85.7% respectively).

Table 1. Personal Characteristics of Nursing Students (n = 70).

Variables	No	%
Age		
• <21	36	51.4
• ≥21	34	48.6
Sex		
• Male	16	22.9
• Female	54	77.1
Marital status		
• Single	61	87.1
• Married	9	12.9
Previous working		
• No work	53	75.7
• Working	17	24.3
Training		
• Training about metacognitive	0	0.0
• No training about metacognitive	70	100

Table 2. Reveals that there were highly statistically significant differences in metacognitive knowledge and aspects of metacognitive awareness among nursing students (global reading strategy, problem solving strategy, and supporting reading strategy) following the introduction of the educational program. In addition, the average mean scores of the global reading system, problem-solving strategy, and support reading strategy immediately post educationalprogram (50.93±10, 32±6.64, & 37.1±8.12 respectively), compared to the total mean scores at the preprogram phase(35.96±11.1, 22.1±6.8, and 24.87±7.69 respectively). The highest mean score was related to global reading strategy (50.93±10), while the lowest mean was related to problem solving strategy (32±6.64).

Table 3: shows that, there were highly statistically significant differences in students' self- efficacy skills and all self- efficacy skills' items except with the first item (I can manage to solve difficult problems if I try hard enough) after the implementation of the program (p<0.001). Moreover, there was improvement in total mean scores of self- efficacy skills immediately post the educational program (36.4±6.1), compared to the total mean scores at the preprogram phase(26.14±4.9).

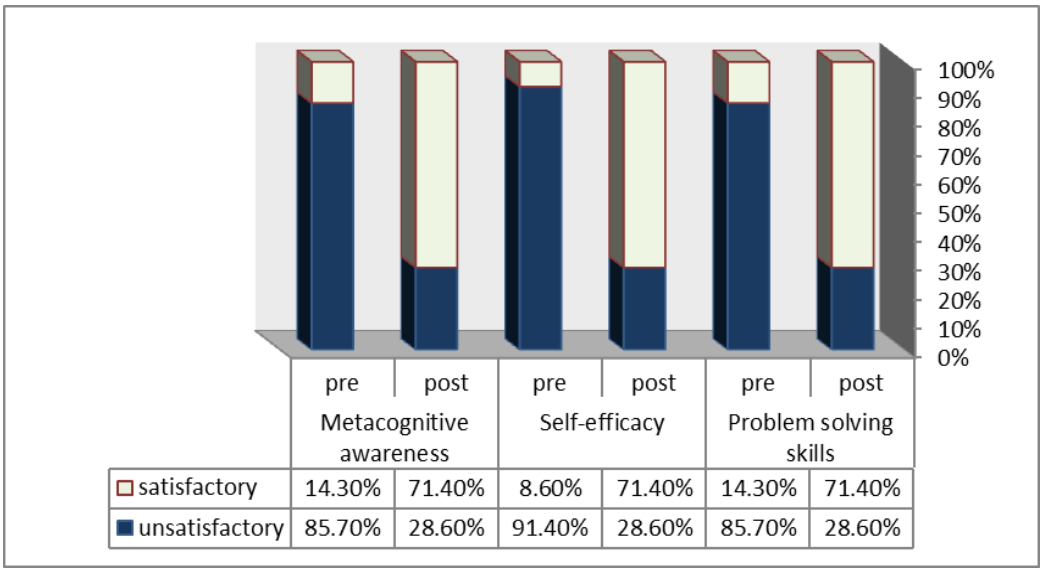

Figure 1.

Table 2. Comparison Between Metacognitive Awareness Dimensions as Reported by Studied Nursing Students Pre and Post Educational Program (n=70)

Dimensions of Metacognitive awareness	Program		Paired t - test	
	Pre educational program	post educationalprogram		p-value
Global reading strategy **Mean ±SD** **Range**	35.96±11.1 13-52	50.93±10 26-57	7.72**	<0.001
Problem solving strategy **Mean ±SD** **Range**	22.1±6.8 8-32	32±6.64 16-36	8.04**	<0.001
Support reading strategy **Mean ±SD** **Range**	24.87±7.69 9-36	37.1±8.12 18-42	8.4**	<0.001
Metacognitive awareness **Total Mean ±SD** **Range**	82.9±25.6 30-120	120±24.9 60-135	8.03**	<0.001

Paired t significant test ** highly significant =p<0.001

Table 3. Comparison Between Self- Efficacy Skills Items as Reported by Studied Nursing Students Pre and Post Educational Program (n=70).

items	time		Paired t-test	
	Pre educational program	post educational program		p-value
I can manage to solve difficult problems if I try hard enough	3.64±0.7	3.64±0.615	.000	1.000
If someone opposes me, I can find the means and ways to get what I want	2.96±0.46	3.64±0.615	7.3**	<0.001
It is easy for me to stick to my aims and accomplish my goals	2.27±0.61	3.64±0.615	15.4**	<0.001
I am confident that I could deal efficiently with unexpected events	1.59±0.98	3.64±0.615	17.9**	<0.001
Thanks to my resourcefulness, I know how to handle unforeseen situations	2.96±0.46	3.64±0.615	7.26**	<0.001
I can solve most problems if I invest the necessary effort	2.27±0.61	3.64±0.615	15.4**	<0.001
I can remain calm when facing difficulties because I can rely on my coping abilities	2.27±0.61	3.64±0.615	15.4**	<0.001
When I am confronted with a problem, I can usually find several solutions	2.96±0.46	3.64±0.615	7.3**	<0.001
If I am in trouble, I can usually think of a solution	2.96±0.46	3.64±0.615	7.3**	<0.001
I can usually handle whatever comes my way	2.27±0.61	3.64±0.615	15.4**	<0.001
Self-efficacy Mean ±SD Range	26.14±4.9 20-40	36.4±6.1 20-40	11.8**	<0. 001

Paired t significant test **highly significant =p<0.001

Table 4. Comparison BetweenProblem Solving Skills Dimensions as Reported by Studied Nursing Students Pre and Post EducationalProgram (n=70)

Dimensions of Problem solving skills	Program		Paired t- test	
	Pre educational program	post educationalprogram		p-value
Problem solving confidence skill Mean ±SD Range	33.7±9.2 30-56	51±8.6 28-56	13.2**	<0.001
Approach avoidance skill Mean ±SD Range	15±5.3 13-28	25.5±4.3 14-28	14.5**	<0.001
Personal control Mean ±SD Range	15±5.3 13-28	25.5±4.3 14-28	14.5**	<0.001
Problem solving skills Total Mean ±SD Range	64±19.7 56-112	102±17.2 56-112	13.89**	<0.001

Paired t significant test **highly significant =p<0.001

Table 5. Correlation Matrix between of Nursing Students' Metacognitive Awareness Score, Self-Efficacy Score and Problem Solving Skills Score at Post Educational Program Phase (n=70).

parameters	post metacognitive awareness score		Post self-efficacy score	
	(r)	p	(r)	p
Post self-efficacy score	.0.995**	0.0001		
Post problem solving skills score	0.995**	0.006	1**	0.0001

(r) Correlation coefficient

Table 4: shows that, there were highly statistically significant differences in students' problem solving skills and problem solving skills dimensions (problem solving confidence, approach avoidance, &personal control) after the implementation of the program (p<0.001). Moreover, there were improvements in total mean scores of problem solving confidence, approach avoidance, and personal control immediately post the educationalprogram (51±8.6, 25.5±4.3, & 25.5±4.3 respectively), compared to the total mean scores at the preprogram phase(33.7±9.2, 15±5.3, & 15±5.3 respectively). The highest mean score wasrelated to problem solving confidence (51±8.6), while the lowest mean wasequally related to both approach avoidance, and personal control (25.5±4.3).

Table 5: shows that there is statistically significant correlations between metacognitive awareness score and self-efficacy score and problem solving skills score at post program phase p=0.0001. As well, there was a statistically significant correlation between self-efficacy score and problem solving skills score at post educational programphase p<0.0001.

Table 6: reveals that that there were no statistically significant relationships between nursing students' metacognitive awareness, self- efficacy skills, problem solving skills and all demographic variables,wherep - value > 0.05.

Table 6. Relationship between Personal Characteristics of Nursing Students and Different Study Variables during The post-educational phase (n=70)

Variables	Metacognitive awareness				Self-efficacy skills				Problem solving skills			
	Unsatisfactory		Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory		Satisfactory	
	No	%	No	%	No	%	No	%	No	%	No	%
Age												
• <21	13	36.11	23	63.89	15	41.67	21	58.33	9	25	27	75
• ≥21	7	20.59	27	79.41	5	14.71	29	85.29	11	32.35	23	67.65
Independent t-test---P-value	2.1 ---- 0.15		6.23 ----- 0.13		0.46 - 0.496							
Sex												
• Male	4	25	12	75	5	31.25	11	68.75	2	12.5	14	87.5
• Female	16	29.63	38	70.37	15	27.78	39	72.22	18	33.33	36	66.67
Independent t-test---P-value	0.13------- 0.72		.07-------- 0.79		.07 ------- 0.79							
Marital status												
• Single	18	29.51	43	70.49	18	29.51	43	70.49	16	26.23	45	73.7
• Married	2	22.22	7	77.78	2	22.22	7	77.78	4	44.44	5	55.5
Independent t-test---P-value	0.2 ----- 0.65		.204 -------- 0.65		1.28 ----- 0.26							
Previous Working												
• No work	17	32.08	36	67.92	17	32.08	36	67.92	15	28.3	38	71.7
• Working	3	17.65	14	82.35	3	17.65	14	82.35	5	29.41	12	70.5
Independent t-test---P-value	1.3 --------- 0.25		1.3 ------- 0.25		.008 ------ 0.93							

4. Discussion

Metacognition is persuasive evidence encouraging the use of metacognition in the process of learning and teaching. It has better performance for people involved in cognitive activities. The concept of meta-cognition is knowledge of one's cognitive processes, as well as the ability to develop a plan to achieve a goal and assess the success of one's achievement of that objective. It is widely accepted that meta-cognition is important for high quality learning and problem solving [14].

The findings of this study show that there was an increase in the overall mean scores of metacognitive awareness of students relative to the overall mean scores in the pre-intervention process, as well as highly statistically significant differences in the metacognitive knowledge and metacognitive awareness dimensions of students (global reading strategy, problem-solving strategy, and helpandsupport reading strategy) after the implementation of program. This might be due to that students who are aware of their own cognitions or thoughts processes will be more responsible of their own learning processes. Also, Meta-cognition skills help students to understand their own knowledge, organize and plan, use problem-solving strategies and self-assessment and self-correction capabilities. In the same line, Goli et al. [14] who Study conducted to assess the effectiveness of metacognitive skills training in university education on metacognitive comprehension, self-efficacy and academic achievement, and noted that there was a significant difference in metacognition awareness between the pretest score and the intervention group's posttest score. In agreement with the previous results, Saeid and Mehrabi [15] have shown that teaching cognitive strategies and metacognitive approaches has been effective in developing strategies and increasing the number of problem solving and self-efficacy skills.

The current research findings presented that, there was an increase in the overall mean scores of students' self-efficacy skills immediately after the intervention of the program compared to that in the pre-intervention process.In addition, the self-efficacy abilities of students had extremely statistically significant differences. This may be due to that students who are aware of their own cognitions or thinking processes are more responsible for their own learning processes, as well as have information and knowledge about themselves and the ability to organize how, when and why they can use this information andknowledge in problem solving that could positively affect their self-efficacy skills during the learning process.In agreement with the previous resultsGoli et al**. [14]** who reported that there was a significant difference in self-efficacy between the score of the pretest and the posttest score of the intervention group. As well, Saeid and Mehrabi [15] have demonstrated that cognitive strategies and metacognitive strategies were effective in strengthening strategies, increasing the scores of self-directed learning and self-efficacy, and improving them. In the same direction, Yusef-Zadeh et al. [16] concluded that students had information and knowledge about themselves, and that they were able to organize how, when and why this information and knowledge could be used to solve the problem they were facing during the learning process. Self-efficacy in students who have acquired metacognitive skills is also more significant than in students who have not obtained the training.

This research finding showed that, differences in problem solving skills and problem solving dimensions (problem solving confidence, approach avoidance, and personal control) were highly statistically significant after the program was implemented. In addition, there have been improvements in total mean scores of confidence-solving problems, avoidance of approaches and personal control immediately after the implementation of the program. This might be due to thatstudents who know their own cognitions or processes of thought will be more responsible for their own learning processes. Metacognitive teaching approach also regulates the

learning process and problem solving of the students, and enhances the ability of the learners to solve problems by strengthening their efforts to solve the problem. In agreement study findingswith Safari andMeskini[9] who conducted a study, in Iran, to Investigate the impact of metacognitive instruction on students ' problem-solving skills and find that metacognitive instruction had a significant effect on problem-solving skills development, including all three problem-solving components (problem-solving trust, personal control, and orientation-avoidance style coping). In addition, Kramaski et al. [17] carried out a study to determine the impact of metacognitive training (one-dimensional and multi-dimensional metacognition training) on comprehension and math problem solving. The results showed that students trained in multidimensional metacognition were considerably better able to solve and understand mathematical problems than those trained in one-dimensional metacognition.

In the present study, with regard to the relationship between metacognition and problem-solving skills, the association between metacognitive knowledge, self-efficacy and problem-solving skill scores at post-program intervention is statistically significant. This could be attributed to the metacognitive training strengthens the ability of the students to manage and arrange their cognitive processes, increases or enables critical thinking, judgments or decisions to solve problems that might affect their conditional knowledge and comprehension monitoring scores during the learning process.

In the same way, several researchers found a positive association between metacognitive competencies and cognitive processes such as problem solving and self-efficacy. In this respect, Anandaraj, and Ramesh, [18] Özçakır-Sümen and Çalışıcı [19], and Tavakolizadeh et al. [20] all their findings are in the same line with the results of the study conducted by Anandaraj and Ramesh [18] which reported that there was a significant correlation between metacognition and problem solving ability. As well, Aurah et al [21] who carried out a study in Kenya, to investigate the impact of metacognition on problem solving among students, and concluded that when one has a high metacognitive capacity and knows how to apply it, it is more likely that problem solving will be effective. Additionally, Jalili et al., [22] who conducted a study to evaluate the relationship between metacognition and academic performance with the mediation roleof problem solving and found that metacognition has a significant relationship with problem solving.

In agreement with the current study findings, Hermita and Thamrin [23] who carried out a study in Indonesia examining the awareness of metacognition and its correlation with and contribution to academic self-efficacy they concluded that, a positive relationship exists between metacognition awareness and academic self-efficacy. There is also a correlation of significance between metacognitive consciousness and academic self-efficacy. Moreover, Ghonsooly et al. [24] using path analysis, the self-efficacy and metacognition were found to be positively and significantly interrelated,which is consistent with a research conducted in the same year by AkturkandSahin. [25] The relationship between metacognition and self-efficacy was also found positive. As well, Memduhoğlu and Keleş [26] concluded that, problem-solving skills contribute to critical thinking dispositions and found that metacognition and self-efficacy greatly clarified the ability to solve problems. In this respect, Aurah et al. [27] stated that metacognitive competencies, problem solving skills and perceptions of academic self-efficacy are interconnected concepts.

With regard to the relationship between metacognitive awareness, self-efficacy, problem-solving skills and personal characteristics of students. The present research findings revealed that there were no statistically significant difference between metacognitive awareness, self-efficacy, problem-solving skills, and all personal characteristics (age, sex, marital status, previous work and training). This may be explained that there are certain factors affect students' self-efficacy, problem-solving and metacognitive skills rather than personal characteristics such as academic level of students, previous self-efficacy education, problem-solving and metacognitive skills, and teaching methods and learning approaches commonly used in their schools and universities using new advanced methods as a problem-based approach, self-directed learning, critical and reflective thinking skills. These findings were in agreement with those of Safari and Meskini**, [9]** who concluded that there was no significant difference between the average score of problem-solving and gender among students. These results are congruent with those of the research conducted by Kamid [28] by explaining that there was no differential in the ability of male and female students to metacognise while performing a task. As well, there were also several studies as those done by Parameswari and Shamala, [29] Lau et al. [30], and Tian et al. [31] showing no sex difference in self-efficacy. However, the previous results are incongruent with those of the research conducted by Ogus and Ataseven [32] and those of a prior research result of Joët et al. [33] andLee and Kim [34] which mentioned that metacognitive and self-efficacy skills differed significantly between male and female students.

5. Conclusion

The results of this study concluded that there was an increase in metacognitive awareness, self-efficacy,and highly statistically significant and problem-solving skills of students after the metacognitive education program was introduced.

6. Recommendations

- Encourage nursing educators to develop the self-efficacy and problem-solving skills of students by implementing unique approaches to improve learning and integrate them into the different courses.
- Infuse courses on metacognitive thinking skills, in all academic years, pay attention to the growth of metacognitive thinking skills.
- Academic courses should be structured to enhance metacognitive approaches and thus develop student problem-solving skills.
- Metacognitive workshops for nursing educators are

suggested to improve their understanding of this important learning aspect-the teaching process.

7. Further Studies

Can be conducted to examine the effect of metacognitive skills, problem solving skills, academic self-efficacy on critical thinking and academic achievement among students at various academic levels.

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