Impact of Teaching Cognitive and Metacognitive Learning Strategies on Academic Achievement among Nursing Students

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Background: Cognitive and metacognitive learning strategies are identified as important solutions for improving academic achievement. This study aimed toevaluate the effect of teaching cognitive and metacognitive learning strategies on academic achievement among nursing students.

Methods: This Study was an experimental with pretest and posttest and follow-updesign. The study population included all nursing students atIslamic Azad University of Pishva during 2013-14. Overall, 40 students were chosen byconvenience sampling technique and randomly divided into two groups (20 subjects in each group) of experimental and control. Students in the experimental group received 10 sessions of 70 minutes long (twice a week) training for cognitive and metacognitive strategies, while the control group received no training. All students completed a teacher-made academic achievement testat the pretest, posttest, and follow-up phases. Data were analyzed usingrepeated measures ANOVA technique.

Results: The mean value of the experimental group (16.67 ± 3.58) was higher than the control group (13.47 ± 2.37) at the posttest phase. Themean value of the experimental group (16.29 ± 3.74) was higher than the control group (12.93 ± 2.84) at the follow-up phase. In addition, there were significant differencesbetween mean valuesat the posttest and follow up phases and mean valueatthe pretest phase. However, there was no significant difference between the mean values of the posttest phase and the follow-up phase.

Conclusion: The results of this study indicate that teaching cognitive and metacognitive learning strategies improves academic achievement in students at posttest and follow-up phases. Thus, academic teachers may teach these useful strategies to the students to improve their academic achievement.

Keywords: Teaching, Cognitive and Metacognitive Strategies, Academic Achievement, Nursing Students

Introduction

Students' level of academic achievement is one of the criteria of measuring efficiency of any educational system. Educational systems seek ways to enhance their efficiency and quality of educational systems, and paying attention to academic achievement is crucially important in this regard. Academic achievement includes potential for proving success in acquisition of the educational goals (1). Thus,one of the most basic subjects of studies by educational systems is to determine the causes of academic progress and failure where cognitive and metacognitive strategies areconsidered as efficient strategies in increasing academic achievement. Therefore, this study aims to analyze the effect of cognitive and metacognitive strategies on academic achievement. Nowadays, educational systems in developed countries have established their main focus of education on the basis of cognitive and metacognitive learning strategies and less employment oftraditional methods such as lecture etc. (2). The learning strategies include a group of activities done by the learner for faster, easier, more joyful, efficient and more alienable learning (3). The cognitive strategies help us to combine new information with previous information and store them in our long-term memory. These strategies include mental repetition or rehearsal, semantic elaboration or extension and organization. The metacognitive strategies consist of strategies for monitoring, guiding and changing the cognitive strategies if necessary. These strategies include planning, monitoring and regulation (4). Studies on cognitive and metacognitive strategies have shown that applying these strategies increases learning in students (5). For example, Anderson (2002) investigated the role of metacognition in teaching and learning and found that teaching metacognitive strategies to teachers help them in teaching second languages (6). Schleifer et al. (2009) aimed to determine the role of cognitive strategies in educational performance and concluded that employing learning strategies might increase academic achievement and reported a positive correlation between utilizing learning strategies and obtaining higher academic achievement (7).Seif and Mesrabadi (2003) reported that utilizing cognitive and metacognitive strategies leads to improved perception and retention of textbooks (8). Saeed and Mehrabi (2013) concluded that teaching cognitive and metacognitive strategies leads to significant increase in self-directed learningand self-efficacy of students (9). Saeedi (2011)found that teaching learning strategies significantly affect educational performance and self-efficacy of students (10).

Many students get counseling on reasons for studying for long periodand not achieving satisfying results,or complain about how to read their textbooks to better memorize the information for longer periods. These complaints indicate that they are encountering problems in using the learning strategies (11). Application of cognitive and metacognitive learning strategies by students is crucially important and many students may not know how to use these strategies properly in educational and learning environments,which sometimes lead to educational under achievement and even dropouts. While several studies have been conducted about teaching cognitive and metacognitive strategies, none of these investigations analyzed academic achievement in nursing students. Therefore, the present study aimed to fill this researchgap as well. Given the importance of nurses' knowledge and sensitivity of future career of nursing students aimed to patient care bymaintaining and promoting health and the fact that more knowledge in these students increasetheir caring skills, improving academic achievement in these students is doubly important. Hence, the general objective of this study was to investigate the effect of cognitive and metacognitive learning strategies on academic achievement among nursing students. The present study tries to findwhether cognitive and metacognitive learning strategies are efficient in improvement of academic achievement among nursing students.

Methods

This Study was an experimental with pre-test, post-testdesign, and included follow-up

with a control group. The study population included all nursing students at Islamic Azad University, Iran in 2013-14. While the minimum sample size needed for execution of semi-experimental studies is 15 participants, each group in this study contained 20 subjects(12). Overall, 40 students were selected by convenience sampling and then randomly allocated in two groups (20 subjects in each group) of experimental and control. No individual was excluded from the study because of the study objectives, applied nature of trainings and accurate control. The inclusion criteria were as follows: being nursing student in second-fourth semesters and willingness to participate in the classes. The exclusion criteriaincluded severe psychological problems, mental illness, loss of first-degree relatives in the past three months, dealing with crisis and stress such as divorce and separation within the past three months. The experimental group received 10 sessions of 70 minutes long (twice a week) training for cognitive and metacognitive strategies, while the control group received no training. This training course was personally held by the researcher who hasa PhD degree in educational psychology (psychology of teaching and learning). Content of the 10 sessions was as follows: In the first session, after meeting and establishing a friendly relationship, students were motivated andobjectives and application of the strategies were explained. In the second session, mental repetition or rehearsal strategies were taught. These strategies includedretelling the content, repeated reading, repeated writing, underlining and highlighting key points and scripting of difficult issues. During the third and fourth sessions, semantic extension or elaboration strategy was taught. This strategy includedconnecting new content to already learned materials, subjective imagination, use of headwords, note-taking, comparison, teaching learned materials to others, description, interpretation, and analysis of relationships between the contents. Organization strategy was taught in the fifth session. This strategy included categorization or classification of new data in a new form, conversion of lesson text into map or diagram, using tree-chart to summarize main themes of a subject and producing conceptual map or diagram to determine relationships between key concepts of lesson. Planning strategies were taught in the sixth session. This strategy included determination of study objective, prediction of the required time for study, identifying speed of study and selection of one cognitive strategy for the study. Control and monitoring strategy was taught in the seventh session. This strategy included evaluation of study progress, monitoring their own attention and learning, self-questioning during study and learning, controlling study time and speed and prediction of examination questions. The regulatory strategies were taught in the eighth session. These included adjusting study speed and study time and modifying or alteringcognitive strategies for study. In the ninth session, all the cognitive strategies were extensively reviewedand practiced for one time and the existing problems were solved (13). At the end of each session, an assignment was given to the learners based on the trained strategies and the assignments were reviewed in the beginning of the next session. Groups were evaluated in terms of academic achievement before and after the intervention andtwo months after the intervention. The required data was gathered without writing full names of the learners using academic achievement test:

- Academic achievement test: Three teacher-made tests of academic achievement in pediatric nursing(pretest, posttest, and follow-up) were used to measure the level of academic achievement. The testswere prepared according to textbook of pediatric nursingby three experienced academic teachers at Islamic Azad University, Pishva Branch in three Forms of A,B and C. Each form included 50 multiple-choice questions comprising of one correct choice and three distractors, where the correct choice was given score 1 and the distractors were scoredzero. After confirming content validity of the test by other academic teachers in this field, reliability of the forms A,B and C was obtained by Kuder- Richardson Formula as 0.75, 0.77, and 0.72, respectively. Moreover, Item Difficulty of questions in this test ranged from 0.34 to 0.76.

For data analysis, descriptive statistical methods were used such as parameters of central tendency and dispersion to describe distribution of variables and repeated measures ANOVAwas utilized for hypothesis testing. The presuppositions of analysis were assessed before execution of data analysis by repeated measures ANOVA. SPSS software (Version19) was used for data analysis at significance level of 0.05. After selection of subjects, they were ensured that their personal information will remain confidential and written consent letter was taken from all study subjects. Although it was tried to reduce bias due to confounding variablesby random assignment of subjects into experimental and control groups, the main limitation of this study was the use of convenience sampling technique and employing only one teaching method. Anotherlimitation was restriction of samples to nursing students at Islamic Azad University, Pishva Branch. Therefore, it is suggested to employ random sampling technique in future studies and to compare efficiency of this technique with other educational methods. It is also suggested to implement this study among students in other academic fields and universities in order to generalize the results and effect of teaching cognitive and metacognitive strategies more accurately and confidently. Considering the significant results in the follow-up phase, it is better to perform follow-ups with longer intervals in order to evaluate the effectiveness of the results more accurately in long-term.

Results

The mean age of students was 21.37 years. The results of Kolmogorov- Smirnov test were not significant for variable of academic achievement at pretest, posttest, and follow-up phases, which indicates normality of data. The results of Leven's test for variable of academic achievement were not significant at the pretest (F=0.69, P=0.55), posttest (F=1.37, P=0.24), and follow-up (F=1.93, P=0.29) phases.These suggest that presupposition of equality of covariance is confirmed. Considering the satisfying assumption of normality, homogeneity of variances and equality of covariance, repeated measures ANOVA was used (14). Mean and standard deviation (SD) of variables at pretest, posttest and follow-up phases is shown in Table 1.

Table 1: Mean and SD of academic achievement at test phases

Groups	Number of subjects	Academic achievement		
		Pre-test	Post-test	Follow-up
		Mean±SD	Mean±SD	Mean±SD
Experimental	20	12.93±2.78	16.67±3.58	16.29±3.74
Control	20	13.06±2.64	13.47±2.37	12.93±2.84

Mean value of the experimental group (16.67±3.58) washigher than the control group (13.47±2.37) at the posttest phase. Mean value of the experimental group (16.29±3.74) was higher than the control group (12.93±2.84) (Table 1). Repeated measures ANOVA was used to specify whether teaching cognitive and metacognitive strategies were effective in academic achievement (Table 2).

Table 2: The results of Repeated measures ANOVA to determine effect of teaching method on academic achievement

Source of variance	Sum of squares	Degree of freedom	Mean of squares	F-statistic	Significance	Eta-squared
Method	7056.96	2	3528.48	70.07	0.0005	0.724
Error	1862.99	37	50.35			

The results indicated that the effect of independent variable was significant on dependent variable (F=82.33, P=0.0005). With respect to eta-squared value, one can determine that independent variable interprets about 72.4% of total variance (Table 2). Therefore, it may be implied that method of teaching cognitive and metacognitive strategies had an impact on the improvement of academic achievement. Pairwise comparison was done to evaluate significant differences among the means at different phases. The findings showed that a significant difference between the mean value of pretest and posttest and the mean value of pretest and follow-up phases. In other words, posttest and follow-up scores significantly increased in the experimental group compared to the pretest scores. Moreover, there is was no significant difference between the mean valuesof the posttest and follow-up phases (Table 3).

Table 3: Pairwise comparison of academic achievement among groups at posttest and follow-up phases

Factor (i)	Factor (j)	Difference of means	SD	Significance
Posttest	Pretest	3.74	0.684	0.017*
	Follow-up	0.38	0.244	0.709
Follow-up	Pretest	3.36	0.651	0.019*
	Posttest	-0.38	0.244	0.709

Discussion

The results of this studyon academic achievement were consistent with the findings of Schleifer et al. (2009), Saeed and Mehrabi (2013), Saeedi (2011), Zarei et al. (2012), Faye Marsha (2006) and Lee (2008) (7, 9, 10, 15, 16, 17). Schleifer et al. (2009) examined learning strategies in academic achievement and concluded that using learning strategies may improve educational performance and using more learning strategies results in higher academic achievement (8). Saeedi (2011) reported that teaching learning strategies significantly affects educational performance and self-efficacy of students (10). In a study on teaching cognitive and metacognitive strategies for reducing anxiety and improving academic achievement in female students, Zarei et al. (2012) concluded that teaching cognitive and metacognitive strategies significantly reduces anxiety and significantly increases educational performanceat posttest and follow-up phases (15). In a study on effect of teaching self-regulating strategies (cognitive and metacognitive) on academic achievement, Faye Marsha (2006) demonstrated that teaching self-regulating strategies at posttest and follow-up phases significantly increases academic achievementin mathematics among children (16). Lee (2008) also concluded that learning self-regulating strategies increases satisfaction with learning performance and learning (17).

To interpret the effect of cognitive and metacognitive strategies on improvement of academic achievement at posttest and follow-up phases, it can be mentioned that teaching these strategies makes individuals utilize appropriate strategies and solutions for studying and learning to do assignments and enhance their motivation for learning. Therefore, those individuals who have these skillsare usually diligent, hardworking and persistent, which ultimately leads to their improved academic achievement. The cognitive and metacognitive strategies are derived from theory of self-regulation that is based on constructivism approach itself.This approach emphasizes on active role of learners in studying and learning. Such activity and having right of choice and freedom are factors that improve academic achievement.

Conclusion

The results of this study indicated that teaching cognitive and metacognitive strategies at posttest and follow-up phases significantly improves academic achievement among nursing students. Thus,teaching these strategies can be used as an efficient technique in improvement of academic achievementin educational centers. In order to avoidrote teaching and learning,

institutionalization of learningand nurturing thoughtful learning, the educational and training system should seek strategies such as teaching cognitive and metacognitive learning strategiesto teach learners to improve their level of academic achievement.

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