

The Effectiveness of Metacognitive Skills Training on Increasing Academic Achievement

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Abstract

Purpose: This paper aims at studying the effectiveness of training metacognitive skills on academic achievement among the first grade female high school students. **Materials & Methods:** The population consists of the first grade female high school students in Shirvan in the academic years of 2014-2015. The sample includes 40 students and divided into two groups of 20 who were randomly grouped in experimental and control groups. The students' means in two semesters was used as the tools of this paper. The methodology used in this paper is quasi-experimental, in which both groups took a pre-test, and then, the samples in test group were taught the metacognitive skills in 16 sessions, and finally, there was a post-test for both. **Findings:** The results show that training metacognitive skills can result in increasing the students' academic achievement. **Discussion:** In this context, it can lead to more interest in education and learning as well as acquiring appropriate skills and experiences and finally, academic achievement.

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1. Introduction

One of the main variables determined in many studies on its effectiveness on students through training metacognitive skills is academic achievement. Academic achievement is of great importance in education system. The educational and psychological researchers tried to identify the influential factors on the learners' performance, and introduced the following factors as influential: intelligence, family environment, parents' education, the relationship between parents, the stimuli of personality variables such as introversion and extroversion, neurosis and psychosis, self-perception, and adjustment. Academic achievement is one of the important factors in evaluating the Education, and all attempt in this system in order to accomplish such an important task.

2. Research Background

The society, in general, and the Education, in particular, is concerned with the children's future, development, successes, and their position in the community, and expects the students to progress and find excellence in all aspects, including cognitive dimensions, acquiring skills and abilities as well as emotional and personality dimensions, as much as they are able to by reference¹. On the other hand, learning how to learn, i.e. developing and creating a set of thinking processes that can be used for problem-solving, is one of the main objectives of Education in the present century. Now, people are faced with situation and challenges that are not solvable through their previously learned responses. Here, the metacognitive behavior comes into the scene, and help the person to solve the problem.

The metacognitive awareness is required in cases where cannot use the previously learned responses to find an answer. Therefore, directing students in recognizing, understanding, and applying the metacognitive strategies can help them to successfully solve some of their problems by reference³. He believes that metacognitive refers to the knowledge one has about his thinking processes, and since metacognitive prepares one to control his cognitive skills, it is considered as an essential component in fine learning. Metacognitive is the learner's ability to recognize the cognitive abilities and use them in learning. Practicing through using the strategies allows the learners to assess their progress and adjust their learning approach. The metacognitive strategies include techniques that are used by the students to model learning, monitor learning activities, and evaluating the outcomes of leaning activities. These strategies provide good tools for self-management, and self-adjustment in order to achieve the desired learning outcomes. The metacognitive strategies are involved with the methods dealing directly with the learning topics and are inclined to increase interpretation, understanding, and gaining information. The cognitive processes cause an increase in thinking process through using various learning strategies, and contribute to achieving cognitive goals, such as reading comprehension, and memorizing.

3. Methodology

The methodology used in this paper is quasi-experimental and its research project is of pre-test, post-test ones with control group. The population consists of all first grade female high school students (second high school) in Shirvan, 2014-2015; totally 862 students. First, referring to the Department of Education and calling for inquiry, we understood that 10 high schools and schools of art in this city have first grade students; totally in 30 classrooms, 862 students were studying in these high schools and schools of art, with minimum 1 classroom and maximum 4 classrooms. At first, we selected 1 school of art and 3 high schools, among which 4 classrooms were selected. Then we selected 40 students with grade point averages to low, and randomly, divided them to test and control groups in order to use the results to help the low-skilled students.

The data gathered in this paper was analyzed using SPSS18. Analyzing data, we used the topics of descriptive statistics, including minimum and maximum score, average, and standard deviation. Also,

we used the topics of inferential statistics, including, t-test, variance analysis, and one-variable covariance analysis in order to determine the effectiveness of training metacognitive skills on academic achievement.

Comparing the average of the first semester, i.e. before training metacognitive skills (pre-test), and the average of the second semester, i.e. training metacognitive skills (post-test), we studied on Literature, Mathematics, Physics, Chemistry, and English to determine the academic achievement.

Metacognitive training box include 90-minute sixteen training metacognitive skills sessions were held based on the behavioral approach, focusing on referential method, for the test group. The contents of these sessions are summarized as follows.

Session 1) Introduction, explaining the rules, a brief explanation about the number of sessions and the process in each session, and emphasis on cooperation. Session 2) discussing about adolescence, talking about the necessities of learning life skills with an emphasis on metacognitive skill, including 1. Person, 2. Assignments, and 3. Learning strategies. Problem-solving: first step: defining and formulating the problem; second step: making, creating, and finding various and different solutions; third step: evaluating different solutions; fourth step: using the selected solution, session 3) training the metacognitive strategies; after defining various definitions of metacognition, we provide main metacognitive strategies in general, including 1. Planning strategies, 2. Controlling and monitoring strategies, 3. Regulating strategies by reference, session 4). Training metacognitive strategies such as planning: the planning strategies include determining the objectives of learning and studying, predicting the required time for studying, determining the proper speed of studying, analyzing the ways to dealing with the learning topic, and selecting helpful learning strategies. Controlling and monitoring: monitoring the concentration while reading a text, asking questions while studying, watching the time and speed of studying, among others.

Regulation: adjusting the speed of studying and learning, and modifying or changing the learning strategies by reference. Session 5) we expresses the stages of metacognition procedures in general, including 1. Diagnostic evaluation and awareness about prior knowledge, 2. Planning, 3. Self-regulation, 4. Ongoing monitoring and reviews reference⁴. Session 6) preparation: in this stage, the teacher tries to encourage the student to do 3 types of activities: 1. deciding about the goal; 2. Predicting the problem-solving method and choosing a solution; and 3. Examining the required prior knowledge. Session 7) regulation: the stage of displaying the mental evaluative activities, both intellectually and scientifically. The intellectual activities are concerned with finding the solutions and selecting the method and forming a special point of view towards the topic and examining the prerequisites. Evaluating: the teacher makes the students to judge about what they have learned and asks them to assess their performance of reference². Session 8) training one of academic skills while studying, including concentration that includes 12 items: 1. setting the goal, 2. Preparation for studying, 3. Asking questions, 4. Speed reading, 5. Enthusiasm and diligence in studying, 6.

Highlighting and underlining the important notes, 7. Finding a good place to study, 8. Leaving aside the negative thoughts and focusing on positive ones, 9. Choosing the right time for studying, 10. Taking notes and summary, 11. Writing down the distractions, 12. Using a finger or an indicator while studying of reference. Session 9) reciprocal teaching method: in order to improve the reading process and reading comprehension. In this method, four strategies of asking questions, summarizing, explaining, and clarifying the complex issues and predicting the following events to improve training of reference. Session 10) training reciprocal questioning method: includes expressing the goal of training by the trainer. Session 11) training practical problem-solving approach: the stages in this approach are: 1. Problem statement, 2. defining the problem, 3. proposing hypotheses, 4. testing the hypotheses, 5. choosing the best hypothesis Session 12) training problem-solving approach (problem-solving through intuition): we stated the problem through intuition which includes: 1. Understanding problem, 2. the incubation period, 3. Intuition, 4. memorizing the intuition-based solutions, 5. generalizing the intuition-based solutions of reference^{9,10}. Session 13) training the metacognitive skills, which include self-

referential and other-referential. Session 14) training metacognitive including referring to the conditions and situations. Session 15) training the metacognitive skills, including early conclusion of reference¹⁵. Session 16) reviewing what had been explained during 15 previous sessions by doing different practices in order to remembering, acknowledging, and appreciating the members of the group.

4. Findings

The results show that the mean of academic achievement skills in pre-test and post-test increased from 14.68 to 15.02 in samples. Mathematics had the least impact and Persian Literature had the highest impact on academic achievement. In other words, there could be found a significant change in the students' scores, indicating effectiveness of training. Covariance analysis test was used to make questions of the test used in this research. The results show that there is a significant difference between the means of academic achievement in test and control groups, revealing the effectiveness of training metacognitive skills on the studied variable in students.

According to Table 1, training the metacognitive skills was effective. Considering the ITA square coefficient, the impact of training the metacognitive skills on academic achievement is measured as 60%. It should be noted that we used the Kolmogorov-Smirnov test to examine the normality of distribution of errors, and the results show that the distribution of academic achievement is normal as half of the achieved significance level is greater than 0.25 ($P=0.40 > 0.25$). Moreover, the Z of Kolmogorov-Smirnov ($Z=0.63$) is between -1.96 and +1.96.

Table 1. Covariance analysis of the impact of training metacognitive skills on academic achievement

The source of impacts	Total Squares	Freedom level	The means of squares	F	Significance	Impact (ETA square)
Pre-test of academic achievement	351.50	1	351.50	4.02	0.06	0.55
Intervention group	371.89	1	371.89	4.02	0.000	0.60
Error	3.22	37	0.08			

According to the results, since the significance level in pre-test (0.06) is higher than 0.05, there is no significant difference in academic achievement between samples in test and control groups. But, as the significance level in intervention group (0.000) is less than 0.05, it indicates that training the metacognitive skills increases academic achievement in the students. Therefore, the research hypothesis (training the metacognitive skills can increase academic achievement) is approved with 95% confidence.

5. Discussion

The results of correlation show that there is a significant relation between academic achievement (average) and its subscales (scores); in this context, the results of covariance analysis of the hypothesis, based on this fact that "training the metacognitive skills can increase academic achievement" is approved by 95% confidence. Therefore, it can be concluded that the metacognitive package of increasing scores does not refer to the overall academic achievement. That is, training the metacognitive skills is influential on the students' academic achievement.

The results of this paper conforms to some done before. Seif et al (2007) studied the impacts of training learning strategies and metacognitive studying on the achievement motivation and academic achievement among the female high school students in Tehran, 2007-2008. Providing 10 sessions training the metacognitive strategies to the test group, the results of post-test of the achievement motivation showed that there is a significant relation between these two groups, and the score in the test group was higher than that of the control group of reference¹⁹. Mason (2000), in a research entitles as "The Impact of Training the Metacognitive Strategies on the Students' Academic Achievement),

showed that training the metacognitive strategies is significantly influential on academic achievement and successful completion of assignments of reference. Athero et al (1992), in a study on high school students, concluded that there is a positive and significant, but average, relation between metacognitive monitoring on reading comprehension and the total average and the average scores of Science (including Mathematics, Biology, Geology, Physics, and Chemistry) and Humanities (including Language, Geography, History, Literature, and Philosophy). Explaining the results, we could say that: nowadays, the students' academic achievement is of great concern as an important factor to assess the educational systems. Furthermore, academic achievement has always been of great importance to teachers, students, theorists, and educational researchers.

For instance, the learners' academic achievement is considered as one of the most important evaluation factors of teachers' performance. The students' average represents their scientific capabilities to enter the world of work and employment and continue their studying. Perhaps, it is due to this importance that the educational theorists focused their researches on influential factors of academic achievement. For years, educational researchers and scholars and social psychologists have conducted many studies on influential factors of the students' academic achievement. Achievement is the topic of many researches all over the world. Every year, a large amount of the countries' funds are spent on the children's education and many researches are conducted to study different factors that can affect academic achievement, including family, environment, school, and educational programs.

In the end, it is important to note some restrictions and suggestions of the present paper; first: the control group was influenced by training the metacognitive skills in an indirect way; second, anxiety of approaching the second semester examinations, a large amount of lessons to be studied, makeup classes, and generally stressful conditions while taking exams; Third, discomfort in communicating with students (they were female), and hence, training had less effect on academic achievement; Fourth, moving from secondary school to high school, in turn, leads to academic failure.

Suggestion 1: many students are metacognitive-impaired, that is, they have basic knowledge about a field, but they have no clue how to use it. Considering the importance of metacognitive, the parents as main base of training are required to encourage their children to cognitive dependence and self-direction. It necessitates to train the parents; therefore, it is suggested to the authorities to take required action in this regard. Second, as the impact of training the metacognitive skills and using them in routine life is gradual and slow, it is suggested to consider more time further researches in the future. That means, the researchers should provide training in more sessions and more intervals in order to allow students to use them in their real life. Third, using the metacognitive strategies are influential on learning related materials of reference. It is suggested to train the teachers to train the metacognitive strategies and teach them to act, in a metacognitive way, in learning lessons and doing assignments of reference.

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