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The effectiveness of Metacognitive Strategies on Creativity and Academic Achievement of Male Grade Three High School Students in Tonekabon, Iran

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Abstract: The present study was conducted with the aim of investigating the effectiveness of metacognitive strategies on creativity and academic achievement of grade three high school male students Tonekabon, Iran. This research was an experimental study and the statistical population included all of the grade three high school male students in the academic year 2010-2011 in Tonekabon, Iran. The sampling method was random, in a way that from 8 high schools, 3 were selected randomly and questionnaires were distributed to the students. Among those students whose creativity score was low and also their average in the previous term was lower than 16, a total of 45 students were selected and were randomly divided into 3 groups of 15 individuals. Data analysis was performed using multivariate variance method which showed that teaching metacognitive strategies has been effective on creativity and academic achievement of students. Teaching metacognitive strategies has resulted in promotion of students' creativity and academic achievement.
KEYWORDS: Meta-cognitive strategy, creativity, achievement

INTRODUCTION

In recent years a great emphasis has been put on education, with the aim of promoting cognitive and metacognitive skills among students. These methods instead of focusing on observable behavior in a way that is proposed in the behaviorist model puts emphasis on mental processes. Recent research findings indicate that many of the problems of some students in implementing learning are related to weak cognitive and metacognitive skills (Wong, 1985, Baker 1982, quoting the Chele and Chan, 1990, translated by Maheri, 1993). Training and cognitive and metacognitive skills and strategies to students in various areas can be effective. One of the reasons for the interest of many researchers in the field of meta-cognition is that they believe that this area has important contents in the field of education (Baker, 1982, Baker and Brown, 1984; Brown et al., 1983, Brown et al., 1983; Markman, 1981; Paris et al., 1981; Flavon, 1988, translated by Maher, 1998).

Results of Hoffman et al.s' studies (2000) suggest that teaching cognitive and metacognitive strategies is significantly affective in students' academic progress and successful completion of assignments, therefore, these researchers propose that teachers themselves in addition to being familiar with and having enough knowledge about effective strategies on learning, should teach these strategies to students and recommend them use these strategies. It is for years that a lot of studies in different countries have been showing the limiting impact of the school environment on children's creativity. These studies show that children are born creative, but by their entrance into kindergarten at the age 5, their creativity reduces. The restrictive impact on children's creative ability has been confirmed by several researchers (Smootheni, Waker, Yank and Mach Troat, 1996, Biehler & Snowman, 1990, quoted in Khanzadeh, 2006, Neler, 1990, quoted by Mosaddad, 1369 French, 1966, Shovon, 1989, quoted by the Minakari, 1987).

Researchers conducted in the field of training creativity, mainly reached to the conclusion that creativity can also be taught and developed. Torrance and Torrance (1973) point out that over 15 years of their experience in research and teaching creative thinking, they have seen evidence which show that creativity can be taught. Also, with regard to the importance of nurturing creative thinking different dimensions and approaches can be taken into account, but all of these approaches are unanimous, it means that creative nurturing of the present generation will lead to creativity of human resources that because of creating good characteristics such as feeling of self-reliance, development motivation, self-confidence and etc. that have been internalized, will be more effective in solving a lot of psychological - social complications, therefore in this it can pave society's superiority way in achieving the development of human (Ghavidel, 2009) and this important affair

will be possible through applying appropriate approaches to foster creativity and academic achievement by teaching metacognitive strategy. This study seeks to test the following hypothesis:
1) Teaching metacognitive strategies on increasing male students' academic achievement.
2) Teaching metacognitive strategies on increasing male students' creativity.

RESEARCH METHOD

This study regarding the nature of its aims and hypotheses was an experimental study with pretest and posttest with control group, this design has two experimental groups and one control group. In this research two groups (experimental and control) were selected and both groups were tested twice (once before the test and once after the test). Groups were randomly selected and replaced in the same groups. The statistical population in this study included all of the male grade three high school students in Tonekabon during the academic year 2010-2011. In order to measure the dependent variable in the two pre-test and post-test contexts, Torrance's creativity test was used to as the measuring instrument. Torrance's creativity questionnaire contains 60 questions that each of them has three answers or options. First the subjects were required to carefully read each of the questions, then selected one of the responses provided below each question with an asterisk (*). In the general technical manual of the test, the results of several studies suggest regarding the reliability of giving score showed that correlation between various inter raters has been from 0.80 to 0.90. Studies on the reliability of the unique forms during a short time showed that the obtained coefficients are usually variable from 0.70 to 0.90. (Baraheni, 1985, quoted by Ghavidel, 2009). In this study, two general statistical approaches have been used, in the descriptive statistical section parameters such as mean, standard deviation, were used to show the status of data in the state of central tendency and dispersion, and in the inferential statistics section and according to present design that was a two group pretest - posttest type with a control group the multivariate analysis of covariance (MANCOVA) and post hoc tests (Tukey).

RESULTS

The effectiveness of the test of metacognitive strategies on male students' creativity and academic achievement is different. To test the above hypothesis the multivariate analysis of covariance was used, since this statistical method allows researchers to assess the effect of an independent variable on the dependent variable and eliminates the effects of other variables. Before performing multivariate analysis of covariance test first its assumptions: the homogeneity of regression, having linear relation, spatiality of data, normality of distribution and randomness of data were evaluated and approved.

Table 1: Distribution of mean and standard deviation of test and control groups

Group	Test	$\bar{X}$ mean	Standard deviation
Experiment	Pretest of academic achievement of metacognitive approaches	14.28	1.59
	Posttest of academic achievement of metacognitive approaches	15.25	1.62
	Pretest of creativity of metacognitive approaches	37.31	16.98
	Posttest of creativity of metacognitive teaching	58.41	16.51
Control	Pretest of academic achievement	14.68	1.35
	Posttest of academic achievement	14.78	1.31
	Pretest of creativity	38.25	17.38
	posttest of creativity	38.65	17.68

First hypothesis: Cognitive strategies are effective in increasing academic achievement.

Table 2: Statistical analysis between metacognitive strategies and control group on the rate of academic achievement

	Sum of squares	d.f	Mean of squares	F	Level of sig.
Posttest of academic achievement	9.124	1	9.124	322.265	0.000
Error of posttest of academic achievement	1.125	40	0.031		

Table 3: Post hoc test for comparison of means between the group of teaching metacognitive strategies and the control group on increasing the academic achievement

	Difference of means	Standard deviation	P	Level of Sig.
Group of metacognitive strategies and control group	1.121	0.061	P < 0.0005	0.000

According to the results presented in Table 2, the calculated F, Sig = 0.000, F = 245.322 and (d.f = 1, 40), since the level of significance is (P < 0.0005) and with respect to significance of the calculated F it can be concluded that the metacognitive strategies are effective on increasing the academic achievement, and by

using post hoc test the difference between the means of the groups was investigated that there was a difference (1.121) between the mean of metacognitive strategies group and that of the control group and this difference is significant at statistical level of 0.01.

Given the significant differences between the averages 0.99, it can be expressed with confidence that the third subsidiary hypothesis that is the metacognitive strategies are effective in increasing academic achievement is confirmed.

The second hypothesis: Metacognitive strategies effective on increasing creativity.

Table 4: Statistical analysis between metacognitive strategies and control group on creativity

	Sum of squares	d.f	Mean of squares	F	Level of Sig.
Post-test of creativity	2528.181	1	2528.181	324.325	0.000
Error of posttest of creativity	545.128	40	14.241		

Table 5: The post hoc test for comparison of means between the group of teaching metacognitive strategies and the control group on increasing academic achievement

	Difference of means	Standard deviation	P	Level of Sig.
Group of metacognitive strategies and control group	20.114	1.421	P < 0.0005	0.000

According to the results presented in Table 4, the calculated F, Sig = 0.000, F = 324.325 and (d.f = 1, 40), since the level of significance is (P < 0.0005) and with regard to significance of the calculated F, it can be concluded that metacognitive strategies are effective on increasing the rate of creativity, and using the post hoc test the difference between the means of the groups was compared that showed that there is difference (20.114) between the means of these two groups that is significant at the statistical level of 0.01.

Given the significant differences between the means 0.99, it can be said with certainty that fourth subsidiary research hypothesis that the metacognitive strategies are effective on increasing creativity, is confirmed.

DISCUSSION AND CONCLUSION

As it was observed, with regard to the difference of means the main research hypothesis that the effectiveness of metacognitive strategies on creativity and academic achievement of students is different, is confirmed and also according to the used post-hoc test, it was found that teaching metacognitive strategies has the greatest impact on students' achievement. In regard to the effectiveness of teaching metacognitive strategies with research findings, the findings of this research is in line with the findings of Given Varid (2005), Anderson (2002), Golestan Jahromi (2009), Maleki (2005), Dehgani and Amir Molavi (2007).

One of the main goals of each education system is to achieve approaches that transfer the necessary knowledge and concepts, principles and skills in a very simple and easier ways to individuals under its support, also to be able to help individuals to nurture their own mental abilities. An example of these knowledges and skills is the metacognitive strategies that give students knowledge and dominance over the thinking and learning processes make them creative, active, autonomous and productive in the affaire of learning.

The importance of teaching thinking skills due to a large number of studies have been highlighted in various countries, therefore, kids do not have the right to learn thinking skills, in order to be creative and critical citizenship to be able to build the future of their community. At first, the education system should concentrate on this fact that how students should think, rather than what to think. In order to achieve this goal, all the people in the community should play their own part in the situation of these people. Teaching thinking skills should be present as a constructive and important component in all of the educational programs. We will not succeed in our mission unless teachers that we have skilled and expert teachers, selected and outstanding students and interested families (Ahmed Asif, 2009).

With regard to the significant differences between the means, the first subsidiary hypothesis that teaching metacognitive strategies is effective on increasing students' achievement is confirmed that is in line with the findings of the following studies: Anderson (2002) Sarikuban (2008) and Rezvan Homami (2001) Golestan Jahromi (2009).

Teaching metacognitive strategies (planning, control and supervision, regulation) leads to increase of knowledge and metacognitive control and improvement students' performance. Teaching these strategies leads to an increase in students' metacognitive knowledge about the individual, task and strategy, and they learn how to plan, control and regulate their own learning.

Weinstein and Hume (1998) believe that teaching metacognitive strategies by teachers to students plays an effective role in their academic performance.

Moreover, the results of Haman et al. (2000) show the success of teaching metacognitive strategies to students in the experimental group on increasing their academic achievement and doing their homework.

Considering the significant differences between the means, the second hypothesis that teaching metacognitive strategies is effective on enhancing students' creativity is confirmed that is in line with the findings of Gulistan Jahromi (2009) and Ansari Jafari (1997) regarding the main role of metacognition in students' creativity.

Generally speaking, the findings show that teaching metacognitive strategies play a significant role in developing academic performance and creativity of the learners and the fact that such positive results to be achieved in a short period of time is very important, because these kinds of education alongside other teaching and interruptive methods are economically money saving in country's educational system and in terms of effectiveness and efficiency, it is very efficient.

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