Analysis of the effect of metacognition on educational progress of students in topic of logarithm

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Abstract

In this article, we study the effect of metacognition education on educational progress of students and we examine this by studying the case of teaching logarithm to seventh grade students. First, two groups of experiment and control are considered. Then the control group was subjected to metacognition education and it has been demonstrated that this education have a favorable effect on educational progress of the students.

Keywords: metacognition – educational progress

1. Introduction

Today, the topic of teaching methods is one of teachers' challenges and it is very significant to apply the suitable method to teaching a particular subject. For this, the phenomena of how to teach is being taught and in some references it is called metacognition.

The aim of education is to improve the level of learning for students. But learning is not a unique and determined subject and almost all of activities that we do in our life are rooted in our learning experiences.

Teachers know that their traditional role as an expositor and questioner of textbooks is finished and the future generation expects them to provide life skills such as creative thinking, problem solving ability and critical thinking.

To learn and to learn by heart is one of the problems which students always face and so far there have been methods proposed by experts in order to learn better.

Experience has shown that many students study for hours but their results are not satisfactory and they learn a little. Because they are not familiar with correct methods of learning and studying, they try hard to learn and waste so much time and energy. Still, they do not succeed. Nonetheless, they could learn better more easily and they could succeed in exams if they used correct strategies of learning and studying.

Metacognition education is an effective strategy which makes students of every grade more capable in a way that today metacognition is one the most important factors in explaining educational progress of students.

When students who have some learning incapability issues are taught mathematics with metacognition methods, they have better performance compared to those who have been taught with usual methods.

2. History of the research

Metacognition was introduced in mid 1970s by *Flavell* and it is defined as any knowledge or cognitive activity whose subject is some aspects of cognitive actions and its regulation. *Meichenbaum* (1985) defines metacognition as individual's awareness of his own system of knowledge and the way it works and *Zimmerman* (1990) defines it as active supervision on knowledge and strategies by which one uses knowledge efficiently.

Schraw & *Dennison* (1994) talk about metacognition awareness and they consider it as having two parts: Knowledge about cognition and regulation of cognition. According to them, knowledge about cognition includes verbal knowledge, methodical knowledge and situational knowledge.

Different studies have been done on role of metacognition on educational progress. *Plantes* (2000) observed that two factors of knowledge about cognition and regulation of cognition explain 12% of educational performance variance altogether and *Amini* (2003) concluded that 11% of educational progress variance is explained by cognitive and metacognitive strategies. Similar results about correlation between metacognition and educational progress have been reported and some examples are papers by *Prins* , *Veenman* & *Elshout* (2006), *Coutinho* (2006) and *Foolad Chang* (2013).

On the other hand *Pintrich* & *DeGroot* (1990) found that metacognition and its strategies has no relation with high educational progress. Class and laboratory researches shown that educational progress in mathematics not only depends on basic knowledge of individuals but also on factors like awareness of different learning strategies, how to use this knowledge and to do one's homework.

3. Method

In this paper a principal hypothesis is examined: Is metacognition education effective on educational progress of students in topic of logarithm?

The method was descriptive study and was conducted using questionnaires and collecting data followed by a test. In spring of 1393 students of seventh grade were divided into two groups of control and experiment and 71 questionnaires were handed out among students and then they were tested. These questionnaires have been organized based on Likert method. In order to evaluate the validity of the results two tests of Bartlet and KMO have been used. The results for these two tests were 0.828 and 0.721 respectively. Since these two are more than 0.6, so the questionnaire' validity is good. To evaluate the reliability, the final questionnaire was handed out among 20 members of the sample and after the analysis, Cronbach's alpha factor was obtained 0.836 for traditional education and 0.823 for metacognition education and therefore its reliability was confirmed with high degree. In order to analyze data, SPSS and Lizrel softwares have been used.

4. Results of the study

The questionnaires have been organized in 6 areas to examine educational progress of metacognition education: reading exactly, strategic recalling, realizing, review, interaction inside classroom and support. Table one shows the relation between any of these variables and educational progress using regression method.

indices / variable	df	Significant factor	T	Degree of correlation	Beta factor
reading exactly	70	.000	5.520	0.296	0.553
strategic recalling	70	.000	4.022	0.178	0.436
realizing	70	.000	2.599	0.076	0.299
review	70	.000	4.005	0.177	0.434
interaction	70	.000	4.842	0.243	0.504
support	70	.000	4.807	0.240	0.501

Table 1. The relation between the variables and educational progress using regression method

In *Table* 1 and for each variable, the values of Beta factor are more than corresponding values of degree of correlation. This means that these six variables are effective in metacognition education.

In order to examine existing conditions of variables in sample metacognition, according to answers given for questions, single-sample t-test has been used (based on three averages, average mode of likert range) and the results are shown in *Table 2*.

Indices / variables	t	df	Significant factor	Average difference	Upper and lower limit Of confidence interval	
					Lower limit	Upper limit
reading exactly	13.791	70	.000	0.99531	0.8514	1.1392
strategic recalling	10.584	70	.000	0.83099	0.6744	0.9876
realizing	4.724	70	.000	0.43662	0.2523	0.6210
review	8.730	70	.000	0.68545	0.5288	0.8420
interaction	10.293	70	.000	0.96479	0.7779	1.1517
support	11.289	70	.000	0.96244	0.7924	1.1325

Table 2. examining the conditions of variables in experiment group by using single-sample t-test

Since the difference of significant factor in all of six variables is less than 0.01 and lower and upper limit are bigger than zero, existing conditions of all six variables is favorable.

Also, to examine existing conditions of variables in control group, according to answers given for questions, single-sample t-test has been used and the results are shown in *Table 3*.

Indices / variables	t	df	Significant factor	Average difference	Upper and lower limit Of confidence interval	
					Lower limit	Upper limit
reading exactly	-13.588	70	.000	-0.87324	-1.0014	-0.7451
strategic recalling	-12.584	70	.000	-0.79812	-0.9250	-0.6713
realizing	-14.044	70	.000	-1.04225	-1.1903	-0.8942
review	-11.576	70	.000	-0.84038	-0.9852	-0.6956
interaction	-8.744	70	.000	-0.85211	-1.0465	-0.6578
support	-10.996	70	.000	-0.88263	-1.0427	-0.7225

Table 3. examining the conditions of variables in control group by using single-sample t-test

Since the difference of significant factor in all of six variables is less than 0.01 and lower and upper limit are less than zero, existing conditions of all six variables is in unfavorable mode.

5. Conclusion

In this paper we examined the effect of metacognition education on educational progress of students. The method was descriptive study using questionnaires, collecting data and posttest. Collected data were analyzed by regression method and single-sample t-test. The results demonstrated that six areas of reading exactly, strategic recalling, realizing, review, interaction inside classroom and support are effective on metacognition education. Also, it has been shown that control group which was taught by metacognition education had a favorable educational progress.

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