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Comparing the effectiveness of teaching cognitive and metacognitive strategies on academic buoyancy

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ABSTRACT

Background and Aim: The present research was designed and implemented to compare the effectiveness of teaching cognitive learning strategies and metacognitive learning strategies on the academic buoyancy of Tehran students in the academic year 2020-21. **Methods:** The current research was conducted as a quasi-experimental study with a pre-test and post-test along with a control and follow-up group. The research population included students who were studying in Tehran in 2021; A random sampling method was used to select the sample. They were replaced in the test 1 and test 2 groups and the control group. First, the pre-test was performed for all three groups, then one training group was taught cognitive learning strategies and the other experimental group was taught metacognitive learning strategies; However, there was no intervention in the control group, and at the end, a post-test was taken from all three groups. The questionnaire used in the research was the Academic Buoyancy Questionnaire by Martin and Marsh (2008). To analyze the data, the method of mixed variance analysis was used. **Results:** The interaction of stages with the experimental group was effective in three stages of measurement in academic monitoring (F=8.78, P=0.001). **Conclusion:** The results showed that according to the average scores of the pre-test and post-test and comparing them with the control group, the academic buoyancy of the students has increased; Also, a follow-up test was taken after one month, in which the post-test changes remained stable and stable.

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Introduction

Academic buoyancy is a structure that is placed in the field of positive psychology from the perspective of concerned evaluation. Buoyancy research focuses on students' ability to deal with conflicts, everyday academic challenges such as low grades, and test pressures that they encounter (Martin & Marsh, 2008), rather than focusing on the risk of psychological injury. The unsuccessful return of students to good grades and proper performance in the educational environment was a good reason to investigate the academic buoyancy variable. Academic buoyancy is a factor that can be controlled by the teacher in educational environments and causes the academic quality of students to change, therefore it is considered an important structure in student education. Martin (2009) defines academic buoyancy as a term to describe students' ability to successfully return after academic difficulties and failures, which is improved by factors such as self-efficacy, commitment and control. Research results (Aleksi & Paraskeva, 2013; Abolghasemi et al., 2014) show that teaching self-regulated learning strategies increases students' self-efficacy beliefs and motivation. Also, Mustafa Sarbaz et al. (2014) showed in a research that students with learning problems have lower self-regulation strategies. The research results of Gholami Lavasani et al. (2011) showed that teaching self-regulated learning strategies has a significant effect on students' academic motivation. The results of several studies also show that the low level of self-regulated learning strategies is related to the high level of learning problems (Zahed et al., 2012).

One of the prominent concepts in contemporary education is self-regulated learning (Shank and Zimmerman, 1977). In the last decade, the main goal of higher education has gradually changed from familiarizing students with a specific field to cultivating independent and feedback learners (Ducci, 2001; cited in Clerk, Galland, & Fernay, 2013). Self-regulation has valuable consequences in the process of learning, education and even success in life. Adaptation and success in school require that students expand and strengthen their cognitions, emotions, or behaviors by developing self-regulation or similar processes in order to achieve their goals (Shank & Zimmerman, 1977). Shank (2005) defined self-regulation as the ability of students to gain control of bodily functions, manage emotions, and maintain attention and concentration, and they believe that the development of self-regulation is the basis of early childhood development and is visible in all aspects of behavior. The theory of self-regulated learning strategies provides a theoretical basis for examining students' efforts to succeed in learning environments (Bianca, 2013). Also, supporting self-regulatory processes is a good predictor of students' success in university (Zimmerman, 2015). Also, students play an important role in their own learning and regulate it, the lack of knowledge of self-regulated learning strategies and students' cognitive styles is undoubtedly an obstacle to effective education (Soleimannejad & Hosseini Nasab, 2012). Therefore, professors should use cognitive learning strategies and metacognitive learning strategies to provide effective education for students; On the other hand, by changing the pessimistic attitude of students towards their abilities and also by believing in their abilities to overcome academic problems and obstacles, it prevents its irreparable effects on various physical, cognitive, and social aspects of learners. Also, to provide the context for the orientation of the learning goal in the learners in order to accompany the students with positive antecedents and suffixes in the field of study. Finally, it can also help a lot in increasing academic motivation in students, considering this issue, it is especially important for students who are about to enter the university and the labor market.

According to the theoretical foundations and researches, cognitive and metacognitive self-regulation learning strategies have beneficial effects on the education and social life of students, and this point has been confirmed in various researches; However, there has been no research done to determine the effectiveness of cognitive and metacognitive learning strategies on students' academic buoyancy. Therefore, ignoring the effect of teaching these skills on the research variables can be a gap in the research literature; Therefore, the current research aimed to answer the question of whether teaching cognitive and metacognitive self-regulation learning strategies can significantly affect students' buoyancy or not? It

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also compares cognitive and metacognitive learning strategies and evaluates and compares the effectiveness of these strategies on research variables.

The findings of this research have two short-term and long-term results. The short-term result will make the authorities realize the effect of teaching cognitive and metacognitive self-regulation learning strategies on the academic buoyancy of students and take the necessary measures to improve it. Its long-term results will lead to the training of cognitive and metacognitive self-regulation learning skills and, as a result, improving academic buoyancy.

Method

The current research was conducted as a quasi-experimental study with a pre-test, post-test along with a control and follow-up group. The research population included students who were studying in Tehran in 2021. A random sampling method was used to select the sample. First, one university was randomly selected from among the universities, then 3 classrooms were selected from that university and 30 students were randomly selected from among them and replaced in the experimental groups 1 and 2 and the control group. In this way, three groups of 10 people, experimental group 1 was trained in cognitive learning strategies and experimental group 2 was trained in metacognitive learning strategies for 8 sessions as an online class through Skype software. However, there was no intervention in the control group, and in the end, a post-test was taken from all three groups. Follow-up was done after one month. At the end, the data was analyzed using spss software and mixed variance analysis method.

Materials

1. Academic Buoyancy Scale: This scale was created by Martin and Marsh in 2008, it has four self-report items and is based on a seven-point Likert scale, from strongly agree to strongly disagree. The reliability obtained through Cronbach's alpha coefficient is reported as 0.8; Its validity was calculated as 0.66, 0.67, 0.73 and 0.75 respectively for each of the items 1-4 through confirmatory factor analysis. Reliability obtained in Iran using Cronbach's alpha coefficient for the whole scale was 0.87 and its validity through criterion validity using correlation with Pintrich educational questionnaire was reported as 0.568. Cronbach's alpha reported 0.82 for learning factor, 0.73 for performance factor and 0.75 for failure avoidance factor.

2. Teaching cognitive learning strategies

First session

In this meeting, while welcoming the students of experiment group 1 to participate in the training course on cognitive learning strategies and their good selection, they talked about research and its importance, as well as the important role of research samples in research and the importance of the accuracy and correctness of their opinions. In the following, the topic of the current research, i.e. the effect of teaching cognitive learning strategies on academic sustainability, goal orientation and academic motivation of students, and the important role of this research and its variables for students, will be discussed. Also, the time of weekly meetings and their number were determined. In the following, the students, while introducing themselves and getting to know the course instructor, briefly get to know the concept of learning, the types of memory and its structure, and the causes of forgetting, as well as the concept of self-regulated learning and its importance. It should be mentioned that before the start of the meeting, students are motivated and spiritual, in this way, a reception was held in order to welcome them and gain their opinion; It was also explained about the topic of education and its relationship with the realities of students' lives and the effect of education on their academic success.

Session 2

In this session, cognitive strategies are defined and various cognitive strategies including repetition and mental review, expansion and organization were mentioned.

Objectives:

1- Students can define repetition and mental review and give examples for it.

2- Get familiar with different strategies of repetition and mental review, including asking yourself questions, underlining important content, and repeating and retelling content.

3- To be able to identify appropriate repetition and mental review strategies while studying and use them to study their textbooks.

third session

At the beginning of the session, a review of the material taught in the previous session

Objectives:

1. Get to know the benefits of repetition and mental review strategies.

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2. To be able to evaluate the used repetition and mental review strategies using the form and record his opinion.

fourth Session

Objectives:

1- Students can define expansion strategy and give an example for it.

2- Get familiar with different expansion strategies, including giving examples, making connections between new and previous content, thinking about the content, and creating a mental image.

3- To be able to recognize appropriate development strategies while studying and use them to study their textbooks.

4- To be able to evaluate the expansion strategies used and register his opinion using the form.

Session 5

In this session, the use of learned information to solve problems, description and interpretation and analysis of relationships will be taught in the manner of the previous sessions. Finally, students were given assignments for the next session.

Session 6

In this session, the use of learned information to solve problems was taught in the manner of previous sessions. Finally, assignments for the next meeting were given to Danesh.

Session 7

In this session, analogy was taught in the same way as the previous sessions. Finally, students were given assignments for the next session.

Session 8

In this meeting, the assignments related to the previous meetings were reviewed and the materials taught in the previous meetings were reviewed and finally, a summary of what was taught was done.

3. Teaching metacognitive learning strategies

Session 1

In this meeting, while welcoming the students of experimental group 2 to participate in the training course on metacognitive learning strategies and their good selection, they talked about research and its importance, as well as the important role of research samples in research and the importance of accuracy and correctness of their opinions.

Session 2

Objectives:

1- Students can define organization and give examples for it.

2- Get familiar with various organizing strategies including information classification, content listing and preparation of textbook headings, converting the text into a concept plan or map.

Session 3

First of all, students' assignments about organization are reviewed, and collective opinions about the effects of using organization strategies on learning materials are presented.

Objectives:

1- To be able to recognize appropriate organization strategies while studying and use them to study their textbooks.

2- To be able to evaluate the organizational strategies used and record his opinion by using the private form.

Session 4

Before starting the training, the tasks of the previous session on organization were reviewed. At the beginning of the training, organization was first defined as the most complete and best study strategy, then explanations were given about the organization of information and its positive effect on long-term memory and recall. Also, all kinds of organizing strategies included categorizing information, cataloging contents and preparing the headings of a textbook, converting the text into a plan or concept map into a discussion or an example, and the students got to know how to use these strategies in their textbooks. In the end, key points and practical recommendations as well as assignments about organizing strategies were presented to the students. At the end of the fifth session, a summary of cognitive strategies was also done.

Session 5

Objectives:

1- Students can define planning and give examples for it.

2- Be familiar with different planning strategies including determining the purpose of study, brief review before reading the text, asking questions before reading the text, predicting the time required for studying, determining the speed of studying and choosing the appropriate learning strategy.

3- To be able to recognize appropriate planning strategies while studying and use them to study their textbooks.

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4- To be able to evaluate the planning strategies used and record his opinion.

Session 6

Planning strategies (related to before the study) were defined and by presenting a conceptual map of different planning strategies, a clear picture of these strategies was given to the students. In the following, various planning strategies including determining the purpose of study, brief review before reading the text, asking questions before reading the text, predicting the time required for study, determining the speed of study and choosing the appropriate learning strategy were explained. Students got to know how to use them while reading textbooks. At the end, the students were asked to evaluate the application of previously taught strategies and planning strategies and write down their opinion in this regard.

Session 7

Objectives:

1- Students can define control and supervision and give examples for it.

2- Be familiar with different strategies of control and monitoring, including evaluation of progress, monitoring attention and understanding, asking questions while studying and self-evaluation, controlling the time and speed of studying and predicting sample questions in the exam.

3- To be able to recognize appropriate planning strategies while studying and use them to study their textbooks.

4- To be able to evaluate the monitoring and control strategies used and record his opinion.

In this meeting, the students' self-evaluation assignments regarding the implementation of the strategies taught and the planning strategy are reviewed, and the strengths and weaknesses of the students were noted by the instructor. Then the training related to control and monitoring strategies started

Session 8

In this session, firstly, the tasks related to the control and monitoring strategies of the students were reviewed, and the strategies of ordering, which consist of stable metacognitive adaptations and improvements made by learning against feedback related to errors, were taught. Finally, a summary and review of what was taught was done.

Implementation

One week after the completion of the training sessions in both test groups 1 and 2, a post-test will be done from all three groups of test 1, test group 2, and control group; Again, one month after the implementation of the training, all three groups will be tested for test 1 and test 2 and the follow-up test related to the questionnaires of academic persistence, goal orientation and academic motivation.

Results

The information about the age of the sample is given separately for the control groups, the cognitive strategy group, and the metacognitive strategy group. In the control group, 7 people are between 18 and 20 years old, 1 person is between 21 and 22 years old, and 2 people are between 23 and 24 years old. In the cognitive strategy group, 6 people are between 18 and 20 years old, 2 people are between 21 and 22 years old, and 2 people are between 23 and 24 years old. In the metacognitive strategy group, 6 people are between 18 and 20 years old and 4 people are between 21 and 22 years old.

Table 1. Descriptive statistics findings

Variable	Group	Stage	Mean	SD
Academic buoyancy	Control	Pre-test	13.50	3.629
		Post-test	14.20	3.393
		Follow-up	14	3.528
	Self-regulation	Pre-test	12.40	5.441
		Post-test	21	3.464
		Follow-up	20.20	3.190
	Metacognitive	Pre-test	13	4.055
		Post-test	22.90	2.378
		Follow-up	23.70	2.163

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In Table 1, the descriptive statistics related to the mean and standard deviation of academic buoyancy scores are shown separately for people in the control groups, cognitive learning strategy and metacognitive learning strategy, in three measurement stages (pre-test, post-test and follow-up). As can be seen, in the control Kolmogorov-Smirnov test was performed to check the normality of pre-test, post-test and follow-up score distribution. Based on the results, the significance level of the calculated statistic for all variables was greater than 0.05; Therefore, the assumption of normality of the distribution of scores was accepted. Based on the findings, the significance level of M-box test is equal to 0.076. Since this value is greater than the significance level (0.05) required to reject the null hypothesis, the null hypothesis based on the homogeneity of the covariance matrix was confirmed. Finally, the results of Levene's test were not significant. Therefore, the null hypothesis based on the homogeneity of variance of the variables was confirmed.

groups, the mean scores in the pre-test compared to the post-test and follow-up stages do not show much change, but in the experimental groups, we see an increase in the academic buoyancy scores in the post-test and follow-up stages compared to the pre-test.

Table 2. Mixed analysis of variance with repeated measures in three steps

Source	Effect	SS	Df	MS	F	p	Effect size
Academic buoyancy	Stage	75.810	36.1	21.595	26.143	001.0	84.0
	Stage × Group	77.353	72.2	86.129	25.31	001.0	69.0
	Group	35.553	2	67.276	41.8	001.0	27.0

The results of the above table show that the interaction of the stages with the experimental group was effective in the three stages of measurement in academic buoyancy (F=8.78, P=0.001) with an effect size of 0.27. In order to compare the mean scores during the measurement stages, Bonferroni's post hoc test was used, and the results are presented below.

Table 3. Bonferroni post-hoc test

Group	Var.	Stage	Stage	Mean diff.	SE	p
Control	Academic buoyancy	Pre-test	Post-test	-0.700	0.851	1
			Follow-up	-0.500	0.891	1
		Post-test	Follow-up	0.200	0.425	1
Self-regulation	Academic buoyancy	Pre-test	Post-test	-8.600	0.851	0.001
			Follow-up	-7.800	0.891	0.001
		Post-test	Follow-up	0.800	0.425	0.212
Metacognitive	Academic buoyancy	Pre-test	Post-test	-9.900	0.851	0.001
			Follow-up	-10.700	0.891	0.001
		Post-test	Follow-up	-0.800	0.425	0.212

In the above table, pairwise comparisons are given to examine the difference between academic buoyancy scores during the treatment stages, for each of the control groups, cognitive and metacognitive learning strategies. Based on the results obtained in the groups of cognitive learning strategies training and metacognitive learning strategy training, the difference between the mean scores of the pre-test stage with the post-test and follow-up stages is significant ($p<0.01$). By comparing the mean scores in the three stages, it can be seen that the mean academic buoyancy scores in the post-exam and follow-up stages have increased significantly compared to the pre-exam stage. The difference between the scores of the post-test phase and the scores of the follow-up phase is not significant ($p<0.05$), which indicates the stability of the treatment effects over time. In the control group, the difference between the scores of the pre-test stage and the post-test and follow-up stages, as well as the difference

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between the scores of the post-test stage and the follow-up scores, is not significant ($p<0.05$).

Conclusion

The findings of the research showed that there is a difference between the effectiveness of teaching cognitive and metacognitive learning strategies on students' academic buoyancy. In order to compare the effectiveness of teaching cognitive and metacognitive learning strategies on students' academic buoyancy, the analysis of variance test with repeated measurement of the gap was used. Based on the results obtained in the groups of cognitive learning strategies training and metacognitive learning strategy training, the difference between the mean scores of the pre-test stage with the post-test and follow-up stages is significant. By comparing the mean scores in the three stages, it can be seen that the mean academic buoyancy scores in the post-exam and follow-up stages have increased significantly compared to the pre-exam stage. The difference between the scores of the post-test phase and the scores of the follow-up phase is not significant, which indicates the stability of the treatment effects over time. In the control group, the difference between the scores of the pre-test stage and the post-test and follow-up stages, as well as the difference between the scores of the post-test stage and the follow-up stages, is not significant. Also, according to the results related to the interaction effects between groups and repetition (that is, the existence of differences between groups during the measurement steps), it is significant at the alpha level of 0.01. The significance of the interaction effects indicates the existence of differences between the changes in the academic buoyancy scores of the control groups, cognitive and metacognitive learning strategies during the measurement stages.

In explaining the results of the between-subjects effects test to check the mean academic buoyancy scores of the control groups, cognitive and metacognitive learning strategies have been presented. Based on the obtained results, it is significant for the academic buoyancy variable. In explaining the findings, it can be said that The theory of self-regulated learning strategies provides a theoretical basis for examining students' efforts to succeed in learning environments (Bianca, 2013). Also, supporting self-regulatory processes is a good predictor of students' success in university (Zimmerman, 2015). Also, students play an important role in their own learning and regulate it, the lack of knowledge of self-regulated learning strategies and students' cognitive styles is undoubtedly an obstacle to effective education (Soleimannejad & Hosseini Nasab, 2012). In metacognitive therapy sessions, students were given a clear picture of these strategies by presenting a conceptual map of different planning strategies. In the following, various planning strategies including determining the purpose of the study, brief review before reading the text, asking questions before reading the text, predicting the time required to study, determining the speed of study and choosing the appropriate learning strategy were explained; And students got to know how to use them while studying textbooks.

This research, like other researches, faced limitations; One of these limitations was the sampling method used as well as its statistical population, which makes it difficult to generalize the findings. Another main limitation of the present study was the use of a self-report questionnaire to collect data, which may affect the accuracy of the results due to the error of the respondents.

Based on the findings, according to the effectiveness of teaching cognitive and learning strategies, it is recommended to health psychology counseling centers to use them to improve and raise the quality. Considering that this research was conducted on students, the extension of the results to other societies should be done with caution. Finally, in order to increase the background of studies in this field, it is suggested to conduct a research in the field of comparing these two educational approaches on the components of other psychological variables and compare the results with the results of this research.

Conflict of Interest

According to the authors, this article has no financial sponsor or conflict of interest.

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