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Effectiveness of learning strategies (cognitive and metacognitive) in the academic identity development among the students of Tehran University of applied sciences

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Abstract--The present study was conducted to investigate the effectiveness of teaching cognitive and metacognitive strategies in academic identity among the students of Tehran University of Applied Sciences. This is an applied research in terms of purpose and a quasi-experimental study in terms of method, with pre/post-test, follow-up phase, and control group. The statistical population included all students of the University of Applied Sciences in the academic year of 2020-2021. Due to the need for training treatment protocol, the samples (30 participants) were selected through a convenience sampling method. According to the inclusion and exclusion criteria, 20 students were randomly assigned to the experimental groups (10 in the cognitive learning strategies group and 10 in the metacognitive learning strategies group) and 10 students were assigned into to the control group. Data was collected using Waz and Isaacson Educational Identity Questionnaire (2008). Cognitive and metacognitive strategies were trained to the experimental groups for 8 sessions. Data were analyzed using two-way repeated measures ANOVA (between-subject and within-subject mixed design). The results confirmed the effectiveness of teaching cognitive strategies in academic identity development.

Keywords---learning strategies, cognitive, metacognitive, academic identity, students.

Introduction

Higher education as a system that accounts for training and educating thoughtful and creative human resources plays an important role in the development, progress and production of new knowledge. Therefore, the quantitative and qualitative growth of this system will lead to the growth and development of society. However, the use of efficient and effective strategies for qualitative and quantitative development of the system is necessary (Bazargan et al. 2000, quoted by Safari et al. 2011).

Development of academic identity has drawn a great deal of experimental and theoretical attention over the last two decades. Such an interest and attention can be partly related to the impact of academic identity on the subsequent decisions of students. In today's advanced world, undoubtedly, academic success represents any individual's general success, without which the development will not be realized in any country. Development is directly related to the advancement of science and knowledge. Scientific progress is not achieved unless individuals are trained creatively. Academic achievement, while being effective in higher levels of development and prosperity, provides suitable job and position and thus sufficient income. The students with a successful academic identity are more cheerful and blessed with academic success and subsequently a respectful treatment from the family and the society. In such a condition, the heavy costs imposed by academic failure on the education system will decrease (Darben 2016). Further, teachers raise "academic identity" as an influencing factor playing an important role in the development of students. Graham and Anderson consider academic identity a factor affecting students' learning and define it as a personal commitment towards a sign of superiority, the desire to insist on challenge, and effort and enthusiasm over the learning process (Graham & Anderson, 2008). Academic identity is a reflection of the types of competence, autonomy, purposefulness, efficiency beliefs and common emotions that adolescents experience in the classroom with their peers and teachers. It is characterized with students' performance in educational areas (Haji Khayat, 2016).

Development of academic identity is the process of consciously responding to each person's educational status, whether he / she should study or not and thus seek his / her academic identity. If such an identity exists in a person, a sense of movement and success arises in various aspects of education and the existing obstacles of success fade one after another (Haji Khayat, 2016). However, a negative academic identity indicates a lack of class purpose and interest in the classroom which is associated with poor progress, dropout, withdrawal, and disrespectful relationship with the teacher (Fernandez, 2016). Students with a proper academic identity can take effective steps in choosing a good job; thus, they are able to solve occupation-related problems to some extent (Khayat, 2016). Numerous research into psychological well-being and identity styles reveals the importance of the issue. Since education is an important area of life, Waz and Isaacson present the four statuses of academic identity as follows.

Academic identity diffuse refers to a lack of exploration or commitment, often with procrastination in decisions about academic values. Immature academic identity reflects the student's commitment to the educational values and aspirations of important people in his/ her life. Academic identity moratorium refers to the period of a student's academic skepticism as s/he tries to reach a conclusion about academic values and goals. Finally, achieved academic identity refers to a commitment to a set of academic values emerged following a period of exploration. In general, academic identity is a new area of research in psychology. As research shows, it may determine students' attitudes toward education, the degree and manner of their commitment, and adoption of maladaptive academic behaviors (Haji Khayat, 2016).

In recent years, two main approaches have been proposed to examine the factors determining academic identity. The first approach discusses the effect of environmental processes on academic performance (Yar Mohammadian, 2017). The second approach addresses learners-specific learning processes such as cognitive and metacognitive strategies (Kara et al., 2013). The theory of self-regulated learning (cognitive and metacognitive) is frequently used by the researchers. Zimmerman (1994), a cognitive-social theorist, defined self-regulated learning strategies as a type of learning in which learners personally initiate and direct their own efforts for knowledge and skills rather than relying on teachers, parents, or other educators. In other words, self-regulation in learning refers to the learner's active participation in behavior, motivation, cognition and metacognition in the learning process to maximize learning (quoted by Dehghani Mofrad, 2012).

Furthermore, the learning environment definitely affects learning and the learners' ability (Bradman, 2016). The social and psychological atmosphere of the classroom is provided by cognitive and metacognitive strategies. In fact, according to the psychology theorists, along with cognitive and emotional prerequisites for each learning task, learners' mastery and proper use of appropriate learning strategies is a basic requirement for the learning process (Mesrabadi & Seif, 2013). Metacognitive strategies refer to a set of processes for planning, reviewing, and modifying cognitive activities while cognitive strategies refer to the strategies that learners use to learn, memorize, recall, and comprehend. Gatterkol (2004) believes that self-regulated students who employ cognitive and metacognitive strategies are energetic in academic performance with the capacity of overcoming problems and challenges. Mahbod and Yousefi (2015) confirmed that metacognition predicts self-efficacy. On the other hand, teachers not only can guide learners to notice and adopt superficial cognitive strategies, but also they can lead them towards deep metacognitive strategies in order to actively deal with superficial assignments and profoundly understand the curriculum (2005).

Learning strategies are a learner's behaviors that affect how the learner acquires new information. The mainstay of learning strategy research stems from the studies by Weinstein and his colleagues at the University of Texas in the 1980s. They recognized superficial and in-depth learning approaches (Glover, 2006). For better and deeper learning, besides using cognitive strategies, there are other ways and methods called metacognitive strategies. Metacognitive strategies are the ways to guide and monitor cognitive strategies. Skilled learners use

metacognitive strategies to improve their progress (Seif, 2012). The purpose of contemporary education is to nurture individuals who are lifelong learners. Lifelong learning requires a basic knowledge, a desire to learn, knowledge of learning methods, and awareness of learning assessment methods. This, undoubtedly, needs to know learners, to consider individual differences and to provide the necessary training. There are plenty of differences among learners regarding learning strategies, working memory, development of academic identity, and academic vitality that need to be addressed.

On the other hand, teaching learning and study strategies, in addition to boosting learners' comprehension, improves their learning rate, metacognitive knowledge, self-study, working memory, academic vitality, problem-solving ability, and development of academic identity. Learners are naturally expected to study well, solve problems and remember a lot of information, but they are never taught the correct methods of studying, problem solving and memorizing information. Teachers can teach learning skills to help students and make sure of the promising fruit of this training (Zare, 2018). Through an experimental method, the present study explores the variables influenced by teaching learning strategies. According to the studies, by teaching metacognitive strategies, teachers can help their students become more successful and play a more active role in their academic destiny. In addition, metacognition is the learner's ability to be aware of cognitive abilities which are used for learning. Practice through the use of strategies allows learners to evaluate their progress and adjust their learning approach. Metacognitive strategies include techniques that students use to design learning, monitor learning activities and evaluate the results of learning activities (Safarzadeh, 2017).

Metacognitive strategies are important factors in determining learning behaviors, awareness and metacognitive understanding. Psychologists have used the term metacognition to explain the knowledge and type of control people have over their thinking and learning activities (Rodriguez, 2017). The term metacognition refers to our knowledge of our cognitive processes and how to use them optimally to achieve learning goals. Metacognitive strategies enable human beings to think critically, predict consequences and thus solve problems. The fact is that educational and personal factors with cognitive and social nature have the greatest impact on academic achievement. Therefore, investigating the effectiveness of teaching learning strategies in development of academic identity is considered by teachers, specialists and learning psychologists. Accordingly, students have to be aware of the effectiveness of teaching learning strategies since they carry on a great deal of importance in academic achievement. In other words, according to the questions and ambiguities regarding impacts of teaching cognitive and metacognitive strategies and its effect on academic identity as well as the proper use of them, this study evaluates the effectiveness of cognitive and metacognitive skills training in academic identity from various perspectives.

Theoretical basis

Academic identity

According to Erikson, the concept of identity emphasizes that stages of development do not end separately; they are interconnected and interdependent.

It consists of steps towards the development of an individual as a complete and self-sufficient person who deserves to play the role of an adult and to fit into the so-called social system in which s/he lives. Development is not achieved by going through successive stages of psychosexual development without any crisis. It relies on reorganization and continuous development, and evolution in adolescence, which allows transitions from childhood dependence to adulthood responsibility. In this case, the internal organization as well as the way through which this organization allows the individual to function properly in society and its internal systems in the expected social roles as an adult are addressed (Akbarzadeh, 1997). James thinks of personal identity as a concept that a person has of him/herself as a person, and this concept is the result of the experience of continuity and distinction; it remains the same over time, though it is different among individuals (Mohseni, 1996).

Development of identity

Development of identity occurs over a sequence of developmental stages. In the presence of a desired environment, identity development arises as a natural event in the development of human personality (Marcia, 1987; quoted by Ahmadi, 2015). This process usually comes about during adolescence and is distinct from the processes of introspection and replication. However, the childhood processes (introspection and replication) play an important role in development of identity. Identity formation in adolescence is a synthesis based on primitive replications but in a new configuration and different from the sum of its components. Identity formation occurs only when the adolescent is able to select some of the childhood imitations based on his or her interests, talents, and values, and to understand others. Identity does not appear suddenly during adolescence, but covers the early stages of development and continues even after adolescence (Krueger, 1996; quoted by Ahmadi, 2015). Although identity is always changing, the rate of change after adolescence will be increasingly slower. Identity development, especially after the early synthesis of adolescence, is a process that goes on even despite severe changes.

Components of learning strategies

Difference in the types of constituent components of self-regulation is an important issue which strongly needs to be addressed. Some theorists classify specific learning strategies as components of self-regulatory learning (Bucritz, 1999) while others like proponents of self-regulation theory examine the motivational and self-determining components of self-regulation (Barclay, 1997). However, newer theories highlight the integration of the motivational, emotional and environmental components that influence self-regulation or its cyclical processes.

Metacognitive processes

According to Flavell, the concept of metacognition involves two main sub-concepts of metacognitive knowledge and metacognitive monitoring. Metacognition is also a multifaceted concept. It includes knowledge, processes and strategies that evaluate, monitor and control cognition (Ashuri, Dehnavi, Saffarian, 2014). The

processes that monitor and direct cognitive activities have to be carefully examined in order to find out why development of metacognitive skills is important. These skills are effective in and responsible for evaluating the problem, learning strategies to solve it, evaluating the effectiveness of selected strategies, and changing strategies to improve metacognitive learning.

Cognitive learning strategies

Recall strategies include reciting sentences for learning, speaking aloud when reading a text, and highlighting and underlining important material in a relatively active rather than superficial manner. Recall strategies are assumed to help students concentrate and select important information from lists or texts and actively place this information in their working memory. However, these strategies are not processed deeply. Expansion strategies include explaining, interpreting, and summarizing materials for learning, analogy, creative note-taking, and responsiveness. These strategies show a deeper level of learning and require the learner to go beyond the level of the text being studied and to make inferences about it. Organization is another type of deep processing strategy which includes behaviors such as selecting the main idea of the text, underlining, highlighting, using different techniques to select and organize ideas in assignments, designing, and preparing networks or patterns of the important ideas, identification of the structures of a prose, or explanation and interpretation of the text. Organizational strategies lead to a deeper understanding, and most successful and professional learners benefit greatly from these strategies (Aquil & Grayson 2, 2008).

The relationship between cognition and metacognition

According to Flovel (1976), there is an interrelationship between cognitive and metacognitive elements. Cognition and metacognition are two complementary concepts. The former refers to the processes by which we learn, think, and remember, but the later refers to our knowledge of our own cognitive processes and how to use them optimally to achieve learning goals. In other words, metacognition is the knowledge or awareness of one's cognitive system or knowing about knowing. It seems that metacognitive knowledge, metacognitive experience and cognitive behavior provide information for each other and call each other during the cognitive task period. Metacognitive knowledge is the base for metacognitive experience, which in turn increases the use of cognitive and metacognitive strategies. Metacognitive experience can also enhance the review of metacognitive knowledge and provide more metacognitive experiences. Metacognitive strategies stimulate the use of cognitive strategies, review of metacognitive knowledge, and creation of metacognitive experience using cognitive strategies. Learning methods and skills are divided into cognitive and metacognitive strategies.

Review of literature

Jahtalab Ziaberi et al. (2015) showed that academic self-concept of the students blessed with metacognitive education and creativity is significantly higher than the students taught in the usual way. Karami, Karami and Hashemi (2013) conducted a study entitled "*the effectiveness of teaching cognitive and*

metacognitive strategies in creativity, achievement motivation and academic self-concept" and showed that cognitive and metacognitive skills training is effective for creativity, achievement motivation, and academic self-concept. Rahiminejad et al. (2017) conducted research to develop a new scale called Educational Identity for Iranian high school students (AISS). The target population included 2218 high school students out of which 1111 were selected as the sample. In this study, the convergent and divergent reliability of the questionnaire, the relationship between the four academic identity statuses and identity statuses were calculated. The results showed that the scale is valid and reliable and can provide a stable measure of identity for high school students.

Using Waz and Isaacson academic identity scale, Hejazi et al. (2011) investigated the relationship between academic identity status, goal orientation and academic achievement among 301 students. The results showed boys were more likely than girls to have identity diffuse, and mastery-avoidance goal, and girls have higher academic achievement scores than boys. A negative relation was observed between academic identity diffuse and mastery goals, while a positive relationship was reported between mastery goals and academic achievement. Waz et al. (2008) conducted a study with the aim of investigating the academic identity statuses and their relationship with the goals orientation. Using the academic identity Measure (AIM) and the Achievement Goal Questionnaire (AGQ) among 411 newly admitted students at the University of Midwestern; they showed that moratorium identity status had a positive relationship with performance goals. Academic identity diffuse had a negative relationship with mastery goals and a positive relationship with performance-avoidance goals. Foreclosed identity was negatively related to mastery goals and negatively related to performance-avoidance goals. Further, the acquired identity is positively related to mastery goals but negatively associated with performance-avoidance goals. Academic identity diffuse had a negative relationship with mastery goals and a positive relationship with performance-avoidance goals.

Berzonsky et al. (1997) investigated identity statuses and goal orientation among 2173 Polish samples with a mean age of 27 years. They used Polish translation of Berzonsky Identity Statuses Questionnaire with 41 short items graded on a Likert scale. The results showed that information status is related to autonomy and inner control. Akin (2008) studied individual differences in academic identity and self-disability among 318 undergraduate psychology students of about 29 years old at Midwest University. The results of correlation analysis showed that self-disability had a positive relationship with diffuse and moratorium academic identity, and a negative relationship with achieved identity. The relationship was much greater among those with academic identity diffuse. This study provided important implications for students and teachers. Javidan, Hossein Khazadeh and Abolghasemi (2015) examined the effectiveness of metacognitive skills in students' feelings of self-disability and self-efficacy. The results showed that training of metacognitive skills was effective in reducing self-disability, but no difference was observed for self-efficacy variable. Therefore, it can be concluded that metacognitive skills training can be used as an effective educational program to reduce students' self-disability.

Method

This is a fundamental-interventional and a quasi-experimental study. The statistical population included students of Tehran University of Applied Sciences. The desired center was selected using available sampling so that 10 subjects were randomly selected out of 4 centers. Finally, three groups of 10 individuals (control and two experimental groups) participated in the study. They were subjected to pre/posttest and follow-up phase. Prior to the study, the subjects' consent was obtained and they were asked to refrain from writing their names in the tests in order to ensure the information privacy. They were also informed of the intervention to teach cognitive and metacognitive methods. Then, the groups' development of academic identity was tested by a pre-test. Then, cognitive and metacognitive learning strategies were taught to the experimental group for 8 sessions; the control group did not receive any intervention. Once the intervention was implemented, development of academic identity was tested by a post test for both groups. The follow-up phase was run one month later. The data were analyzed in SPSS using two-way repeated measures ANOVA (between-subject and within-subject mixed design).

Instruments

Waz and Isaacson Educational Identity Questionnaire is a 40-item five-point Likert scale (strongly disagree = 1 to strongly agree = 5) that measures academic identity achievement, academic identity foreclose, and moratorium academic identity. Hejazi et al. (2011) evaluated the psychometric properties of the academic identity questionnaire for Iranian students and confirmed the content validity and good fit of the scale. In the present study, the reliability of the questionnaire was checked by Cronbach's alpha method: 0.76 for achieved academic identity, 0.39 for the moratorium academic identity, 0.61 for the foreclosed academic identity, and 0.71 for academic identity diffuse. However, due to poor reliability coefficient (0.39), the subscale of moratorium academic identity was ignored in all statistical calculations. The correlation of item scores with the relevant subscales was used to evaluate the validity of the questionnaire.

Cognitive and metacognitive strategies training protocol

The Metacognitive Strategies Training Package 1 (Sexton et al., 1983) was used to train the experimental groups. The pre-test was performed for both groups under the same conditions before the study began. The researcher taught the strategies over the sessions of 16 minutes that were run 8 times a week. The sessions followed as the below:

- Session 1
Communicating and breaking members' emotional ice- greeting, getting to know group members and rules (e.g. being on time, attending all meetings, not talking to each other, and so on)- and presenting a full explanation of metacognitive strategies benefits.
Planning skills: Activating the student's awareness- identifying tools- stating the problem to generate idea and categorize planning- determining the objectives of the study- and predicting the time required for the study.

- Session 2
Learning- determining the rate of study and analyzing how to deal with the subject of learning- predicting the time needed to study and read- and reminding adjustment of reading rate.
- Session 3
Attention and concentration training: The subjects were explained that attention is a key factor in learning, comprehending, and resolving problems when reading (when and where to read). The study should be done in a suitable environment and away from disturbing stimuli that cause distraction and lack of concentration and attention (disturbing visual, auditory, etc. stimuli).
- Session 4
Analyzing the way to cope with the subject of learning- conscious control of the individual's overall learning approach by self-study and internal dialogue- emphasizing the student's ability to deal with the subject of learning- and enabling students to learn new ways of learning while learning.
- Session 5
Semantic expansion strategies. Strategies for summarizing- using intermediaries and mental images- summarizing- semantic expansion tactics for simpler content, including the use of intermediaries- using mental intermediaries to memorize two words (mental imagery)-establishing relationships in the content (location method)- visualizing the location of objects in the mind (keywords and keywords)- tactics for more complex content including taking notes, summarizing, marking and annotating- analogy- summarizing content in one's own words- and retelling content to others and teaching them.
- Session 6
Arranging or organizing and the post-closing method- adjusting the rate of study- modifying or changing cognitive strategies- regulatory strategies with monitoring and evaluation tactics- categorizing and organizing the tasks while studying to avoid forgetting.
- Session 7
Training problem solving skills. Creativity- intellectual maturity- self-responsibility- improving self-confidence- learning new ways of learning- and finding ways to overcome obstacles.
- Session 8
Modifying and revising plan: Reconstructing and finding important points and clarifying them- monitoring the student in ending the ideas- providing more interesting and useful problem solving methods- developing creative thinking.
- Session 9
Modifying methods and words passed or written. Planning, following the order and solving rules
Respecting the ideas and thoughts of friends and classmates during the discussion- doing arrangements to find solutions and solve problems and practice (brainstorming).
- Session 10

Summarizing the sessions, reviewing the strategies and providing additional explanations in order to consolidate the contents- reviewing the defects and shortcomings, and conclusion. Then the post-test was performed for the two experimental groups in a coordinated manner and in the same environment and conditions.

Results

Descriptive findings

Table 1
Statistical description of academic identity development scores in the measurement steps

Group	Variable		Pre-test		Post-test		Follow-up	
			Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Control	Academic achievement	identity	28.70	2.452	29.26	1.969	29.13	2.350
	Academic foreclose	identity	29.70	6.800	28.30	7.704	29.40	7.291
	Academic identity diffuse		24.20	6.877	24.80	6.579	23.30	6.832
	Moratorium identity	academic	26.60	6.310	25.90	6.173	26.80	5.633
Cognitive learning strategies	Academic achievement	identity	28.60	2.633	31.60	2.797	31.01	3.229
	Academic foreclose	identity	32.40	7.090	28.90	6.707	29.50	6.948
	Academic identity diffuse		23.40	7.604	20.80	7.540	21.15	6.403
	Moratorium identity	academic	24.10	6.967	20.70	6.584	21.66	6.342
Metacognitive learning strategies	Academic achievement	identity	27.90	3.107	32.50	3.064	31.87	3.409
	Academic diffuse	foreclose	31.50	6.819	26.70	6.447	27.10	6.574
	Academic identity diffuse		21.20	6.321	17.50	5.359	18.40	5.641
	Moratorium identity	academic	21.10	6.226	17.30	5.417	18.70	4.496

Table 1 presents the descriptive statistics (mean and standard deviation) of pre-test, post-test and follow-up scores of academic identity development for the control group, cognitive learning strategy group and metacognitive learning strategy group. As seen, the mean pre-test scores of control group are not much different compared to the post-test and follow-up scores. In the experimental groups, the post-test and follow-up scores of achievement, foreclose, moratorium, and diffuse statuses have improved compared to the pre-test scores.

Normality test

Table 2
Kolmogorov-Smirnov test results to check normality of scores distribution

Variable	Pre-test		Post-test		Follow-up	
	Kolmogorov-Smirnov Z	Significance level	Kolmogorov-Smirnov Z	Significance level	Kolmogorov-Smirnov Z	Significance level
Academic identity achievement	0.126	0.680	0.150	0.467	0.091	0.945
Academic identity foreclose	0.172	0.304	0.084	0.971	0.128	0.666
Academic identity diffuse	0.111	0.811	0.125	0.688	0.117	0.759
Moratorium academic identity	0.097	0.914	0.087	0.963	0.069	0.997

Table 2 shows the results of the Kolmogorov-Smirnov test -Smirnov test to check the distribution normality of the pre-test, post-test and follow-up scores. According to the table, the significance level of calculated statistic for all variables is greater than 0.05, so the assumption of normal distribution of scores is accepted.

Hypothesis testing

Teaching cognitive and metacognitive learning strategies is effective in students' academic identity. The effectiveness of teaching cognitive and metacognitive learning strategies in development of academic identity was checked using two-way repeated measures ANOVA. The results are presented below. Since the significance level of the Box test (0.478) is greater than 0.05 that is required to reject the null hypothesis, the null hypothesis based on the homogeneity matrix of covariance is confirmed.

Table 3
Results of Levin test to examine the homogeneity of variances

Variable	F	Degree of freedom1	Degree of freedom2	Significance level
Achieved identity pretest	0.157	2	27	0.855

Achieved identity post-test	0.953	2	27	0.398
Achieved identity follow-up	0.612	2	27	0.550
Foreclosed identity pre-test	0.002	2	27	0.998
Foreclosed identity post-test	0.626	2	27	0.542
Foreclosed identity follow-up	0.226	2	27	0.799
Identity diffuse pre-test	0.206	2	27	0.815
Identity diffuse post-test	0.680	2	27	0.515
Identity diffuse follow-up	0.133	2	27	0.876
Moratorium identity pre-test	0.131	2	27	0.877
Moratorium identity post-test	0.336	2	27	0.718
Moratorium identity follow-up	0.884	2	27	0.425

As shown in Table 3, the Levin test results are not significant. Hence, the null hypothesis of variances homogeneity is confirmed.

Table 4
Results of multivariate tests of within-subjects effects to compare the academic identity development for control and experimental groups

Effect		Value	F	Effect degree of freedom	Error degree of freedom	Significance level	Effect size
Replication	pillai's trace	0.933	11.374	8	104	0.001	0.467
	wilks' lambda	0.144	20.804	8	102	0.001	0.620
	hotelling's trace	5.388	33.672	8	100	0.001	0.729
	Roy's largest root	5.286	68.715	4	52	0.001	0.841
Replication* Group	pillai's trace	0.810	3.426	16	216	0.001	0.202
	wilks' lambda	0.296	4.791	16	156.445	0.001	0.263
	hotelling's trace	2.033	6.290	16	198	0.001	0.337
	Roy's largest root	1.852	25	4	54	0.001	0.649

Table 4 presents the results of multivariate tests to examine the differences between the mean scores of academic identity development for control group, cognitive and metacognitive learning strategies group during the treatment process. The data in the table above shows that all multivariate tests are significant, indicating that the main effect is due to the replication factor (pre-test, post-test and follow-up) as well as the interactive effect between groups and replication (i.e. the difference between groups during the measurement process).

Bonferroni post hoc test was used to compare paired mean scores during the measurement steps (Table 5).

Table 5
Bonferroni post hoc test

Group	Dependent variable	Step	Step	Mean difference	Standard error	Significance level
Control	Achieved academic identity	Pre-test	Post-test	-0.560	0.358	0.389
			Follow-up	-0.430	0.610	1
		Post-test	Follow-up	0.130	0.481	1

	Foreclosed academic identity	Pre-test	Post-test	1.400	0.887	0.379
			Follow-up	0.300	0.428	1
		Post-test	Follow-up	-1.100	0.910	0.712
	Academic identity diffuse	Pre-test	Post-test	-0.600	0.360	0.320
			Follow-up	0.900	0.746	0.714
		Post-test	Follow-up	1.500	0.729	0.148
	Moratorium academic identity	Pre-test	Post-test	0.700	0.456	0.409
			Follow-up	-0.200	0.753	1
		Post-test	Follow-up	-0.900	0.768	0.755
Cognitive learning strategies	Achieved academic identity	Pre-test	Post-test	-3.000	0.358	0.001
			Follow-up	-2.410	0.610	0.002
		Post-test	Follow-up	0.590	0.481	0.691
	Foreclosed academic identity	Pre-test	Post-test	3.500	0.887	0.002
			Follow-up	2.900	0.428	0.001
		Post-test	Follow-up	-0.600	0.910	1
	Academic identity diffuse	Pre-test	Post-test	2.600	0.360	0.001
			Follow-up	2.250	0.746	0.017
		Post-test	Follow-up	-0.350	0.729	1
	Moratorium academic identity	Pre-test	Post-test	3.400	0.456	0.001
			Follow-up	2.440	0.753	0.009
		Post-test	Follow-up	-0.960	0.768	0.667
Metacognitive learning strategies	Achieved academic identity	Pre-test	Post-test	-4.600	0.358	0.001
			Follow-up	-3.970	0.610	0.001
		Post-test	Follow-up	0.630	0.481	0.603
	Foreclosed academic identity	Pre-test	Post-test	4.800	0.887	0.001
			Follow-up	4.400	0.428	0.001
		Post-test	Follow-up	-0.400	0.910	1
	Academic identity diffuse	Pre-test	Post-test	3.700	0.360	0.001
			Follow-up	2.800	0.746	0.003
		Post-test	Follow-up	-0.900	0.729	0.683
	Moratorium academic identity	Pre-test	Post-test	3.800	0.456	0.001
			Follow-up	2.400	0.753	0.011
		Post-test	Follow-up	-1.400	0.768	0.239

Table 5 provides pairwise comparisons to examine the differences of academic identity development scores during the treatment process for the control, cognitive and metacognitive learning strategies groups. According to the results, the difference between the mean pre-test, post-test and follow-up scores is significant ($p < 0.01$) in the experimental groups. Comparing the mean scores in three steps, it is seen that the scores of achievement, foreclose, diffuse and moratorium statuses have significantly improved in the post-test and follow-up phase compared to the pre-test step. The difference between the post-test and the follow-up scores is not significant ($p < 0.05$), which indicates the stability of treatment effects over time. In the control group, the difference between the pre-test, post-test and follow-up is not significant ($p < 0.05$).

Table 6
Results of between-subject effects test to compare the mean scores of academic identity development

Variation source	Variable	sum of squares	Degree of freedom	Sum of squares	of F	Significance level
Group	Achieved identity	49.923	2	24.961	1.171	0.325
	Foreclosed identity	51.356	2	25.678	0.185	0.832
	Identity diffuse	386.006	2	193.003	1.519	0.237
	Moratorium identity	828.128	2	414.064	3.914	0.032
Error	Achieved identity	575.526	27	21.316		
	Foreclosed identity	3740.033	27	138.520		
	Identity diffuse	3431.342	27	127.087		
	Moratorium identity	2856.148	27	105.783		

Table 6 presents the results of the between-subject effects test to examine the mean scores of identity statuses for the control and experimental groups. According to results, only the F value of moratorium academic identity is significant ($P < 0.05$).

Table 7
Bonferroni post hoc test

Dependent variable	Group1	Group2	Mean difference	Standard error	Significance level
Achieved identity	Control	Cognitive strategy	-1.373	1.192	0.778
		Metacognitive strategy	-1.727	1.192	0.477
	Cognitive strategy	Metacognitive strategy	-0.353	1.192	1
Foreclosed identity	Control	Cognitive strategy	-1.133	3.039	1
		Metacognitive strategy	0.700	3.039	1
	Cognitive strategy	Metacognitive strategy	1.833	3.039	1
Identity diffuse	Control	Cognitive strategy	2.317	2.911	1
		Metacognitive strategy	5.067	2.911	0.279
	Cognitive strategy	Metacognitive strategy	2.750	2.911	1
Moratorium identity	Control	Cognitive strategy	4.280	2.656	0.356
		Metacognitive strategy	7.400	2.656	0.029
	Cognitive strategy	Metacognitive strategy	3.120	2.656	0.751

Table 7 shows pairwise comparisons to examine the mean scores of identity statuses for the control and experimental groups. According to the results, the mean scores of moratorium identity are significantly different between the control group and the metacognitive strategy group ($p < 0.05$).

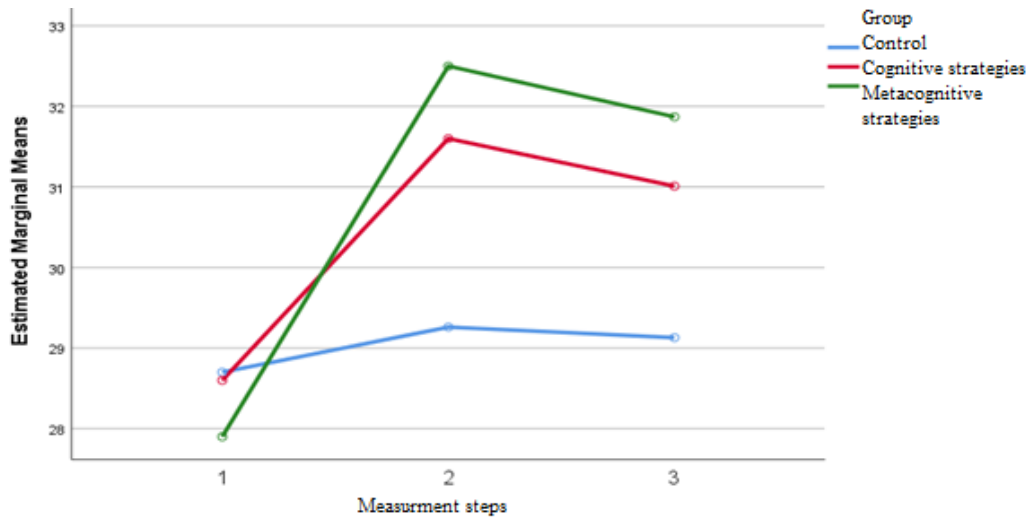


Figure 1. Mean scores of achieved identity

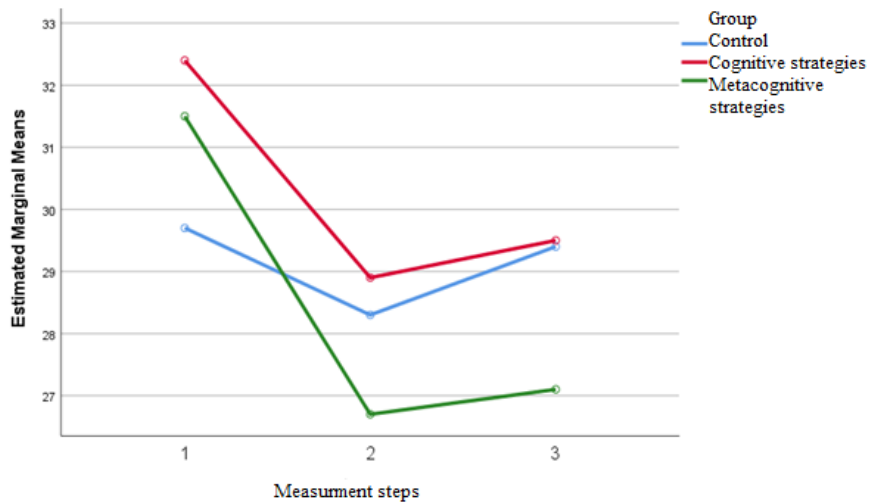


Figure 2. Mean scores of foreclosed identity

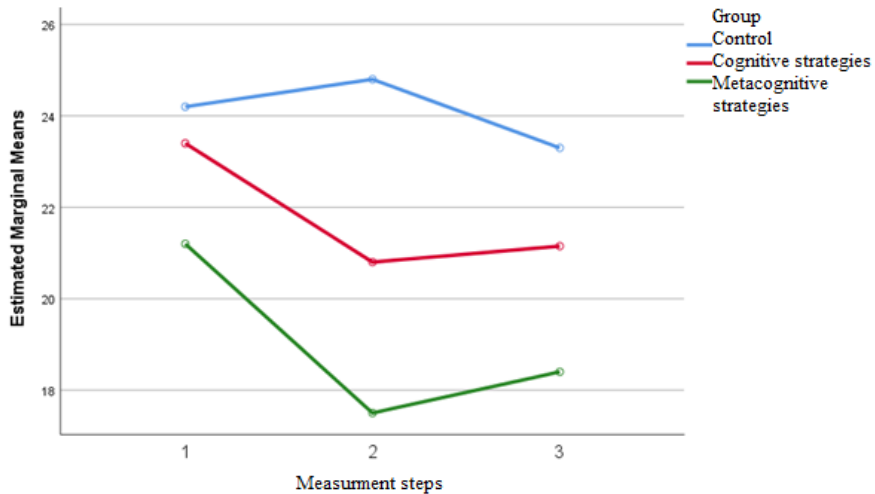


Figure 3. Mean scores of identity diffuse

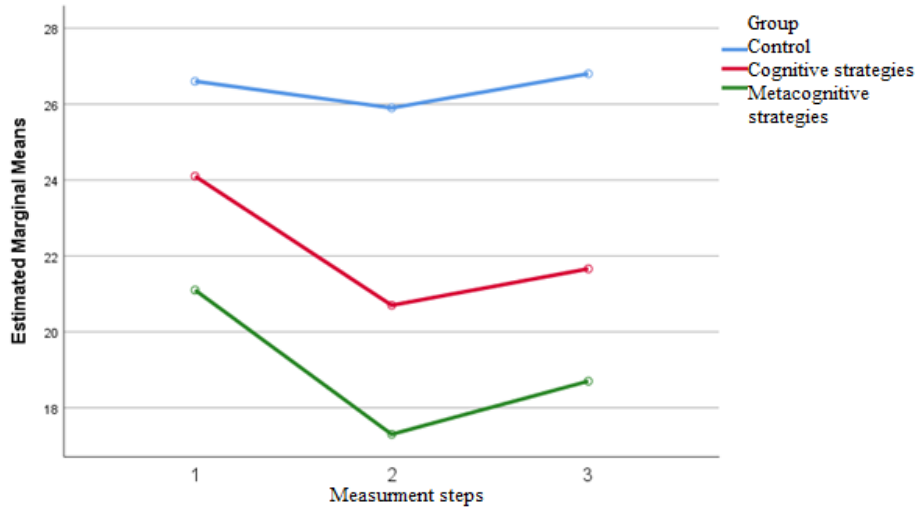


Figure 4. Mean scores of moratorium identity

Figure 1 shows the mean scores of academic identity development in three measurement steps separately for the control group, cognitive learning strategies group, and metacognitive learning strategies group. As seen, the mean scores of achieved, foreclosed, diffuse, and moratorium statuses have improved in the experimental groups.

Discussion and Conclusion

The present study evaluated the effectiveness of cognitive and metacognitive learning strategies in development of academic identity among the students of the University of Applied Sciences in Tehran. The results showed that teaching cognitive and metacognitive learning strategies is effective in students' academic identity development; i.e. it is effective for achieved academic identity and the

relationship is significant at the level of $p < 0.05$. Two-way repeated measures ANOVA was used to analyze the effect of teaching cognitive and metacognitive strategies. The null hypothesis, that is, 'the covariance matrix is homogeneous' is confirmed. The findings show that all multivariate tests are significant, indicating that the main effect is due to the replication factor (pre-test, post-test and follow-up) as well as the interactive effect between groups and replication (i.e. the difference between groups during the measurement process).

Comparing the mean scores of the three steps, it is clear that the mean scores of achieved, foreclosed, diffuse, and moratorium statuses in the post-test and follow-up phase have significantly improved compared to the pre-test scores. In other words, the mean scores of achieved, foreclosed, diffuse, and moratorium academic identity have significantly improved in the experimental groups during the treatment. Thus the research hypothesis is confirmed, indicating the effectiveness of teaching cognitive and metacognitive strategies in students' academic identity development. Although our findings have not been directly and similarly checked in a study, they are indirectly in line with the results of Amani (2010), Omidian and Shokrkon (2004) and Tabatabai et al. (2011).

Overall, considering the effect of self-regulatory learning skills on students' academic identity and the importance of students' success in lessons and academic challenges, improvement of self-regulation can boost the process of developing academic identity. By facilitating successful experiences and creating opportunities for practice, self-regulated learning strategies promote academic achievement and successful learning experience, which in turn develops one's beliefs about her/his learning abilities. Development of positive perceptions not only affects learners' education but also acts as a positive factor for achieving perfection in the learning process and its consequences.

As a result, the use of these strategies provokes positive beliefs, enthusiasm and interest in the curriculum, which leads to learners' participation in educational activities and experiences of meaningful learning. Thus, they will succeed in learning and developing the sense of empowerment in learning activities. Eventually, development of academic identity and subsequently academic achievement will be realized. Therefore, teaching learning strategies and using them by students will increase their academic performance while reducing their inefficiency, apathy and fatigue, which in turn makes students less prone to academic burnout.

According to the findings of this study, teaching self-regulated learning strategies motivate successful academic identity; so, educational psychologists and specialists are recommended to apply these educational programs as a selective intervention to improve academic identity and other variables among the students. Our findings might help education practitioners to improve and enrich the learning process. Professors and teachers need to be educated about the effectiveness of students' self-regulated academic identity in educational, social and emotional consequences of the education process in school and university. Therefore, it is emphasized to inform teachers, professors and educational planners about the effectiveness of self-regulated and lively students as well as the prominent role of these factors in solving educational and social-emotional

problems of learners. As a limitation, since the participants included only students of bachelor and associate degree, generalization of the results to students of other education levels requires caution.

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