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

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Background and Aim: Higher education, as a system tasked with training thoughtful and creative human resources, plays a significant role in development, advancement, and the production of new knowledge. The current study aimed to investigate the effectiveness of teaching cognitive and metacognitive strategies on academic identity among students of Tehran University of Applied Sciences, conducted in the 2020-2021 academic year. **Methods:** This research, in terms of purpose, was applied and of a quasi-experimental design with a pre-test, post-test, and follow-up with a control group. The population included all students of the University of Applied Sciences in the 2020-2021 academic year, utilizing convenience sampling due to the need for a therapeutic protocol training method. The sample size comprised 30 individuals, randomly assigned with 10 in the cognitive experiment group, 10 in the metacognitive experiment group, and 10 in the control group. The data collection tool was the Wass and Isaacson (2008) Academic Identity Questionnaire. Both experimental groups underwent training in cognitive and metacognitive strategies for 8 sessions. Data were analyzed using two-way repeated measures analysis of variance (mixed between-within subjects-design). **Results:** The results of the effectiveness of cognitive and metacognitive strategy training showed that it only significantly impacted follow-through academic identity ($F=3.91$, $P=0.032$) and this effect was sustained in the follow-up phase. **Conclusion:** Overall, considering the impact of self-regulated learning skills on students' academic identity, it can be concluded that as students' success in academics and academic challenges is crucial; therefore, enhancing self-regulation can lead to an improvement in the process of academic identity formation.



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Introduction

Higher education, as a system responsible for educating and nurturing thoughtful and creative human resources, plays a crucial role in development, progress, and the generation of new knowledge. Consequently, quantitative and qualitative growth of this system will lead to the development of society, and the employment of efficient and effective strategies for its qualitative development, alongside quantitative growth, is necessary (Safari et al., 2011).

One of the topics that has attracted much empirical and theoretical effort and attention over the past two decades is academic identity formation. This interest might be partly due to the impact of this variable on students' future decision-making. Undoubtedly, in today's advanced world, academic success is one of the signs of an individual's success, without which the development and progress of any country would not be possible. The progress of any country is directly related to advances in science and knowledge. Scientific progress is impossible unless creative individuals are educated. Academic progress not only contributes to the development and prosperity of a country but also leads to finding suitable jobs and consequently sufficient income at higher levels (Abdollahi, Darbani, & Parsakia, 2022). Students who enjoy academic success are those who have a successful academic identity. In such cases, the family and society regard them with respect, they will be more spirited and enthusiastic in society, and it will reduce the heavy costs that the educational system bears due to academic failure (Darban, 2016). Teachers also highlight an important and influential factor called academic identity, which plays a significant role in the progress of students. Graham and Anderson (2008) define academic identity as a personal commitment to a badge of superiority, insisting on challenges, effort, and intrinsic enthusiasm in the learning process. Academic identity is a reflection of various competencies, autonomy, purposefulness, efficacy beliefs, and common emotional experiences that adolescents have in classrooms with their peers and teachers, and it is characterized by how they act in academic fields (Haji Khayyat, 2016).

Academic identity formation is the process of each individual's conscious response to their educational situation, whether to study or not,

which path to choose, and thus to seek their academic identity. The presence of such an identity in an individual creates a sense of movement and success in various academic aspects and also removes existing obstacles to success one by one (Haji Khayyat, 2016). In contrast, a negative academic identity indicates a lack of classroom goals and interest in classes, associated with poor progress, class dropout, withdrawal, and disrespectful relationships with teachers (Fernandez, 2016). Students with an appropriate academic identity can take effective steps in choosing and reaching suitable jobs and somewhat solve their problems in this area (Khayyat, 2016). The increasing research in the field of psychological well-being and identity styles reflects the importance of these topics. Wass and Isaacson, considering the educational domain as one of the important areas of life, presented four statuses of academic identity as follows.

The confused academic identity status refers to a lack of exploration or commitment, often associated with procrastination regarding decisions related to educational values. The premature academic identity indicates commitments of a student to educational values and ideals taken from significant others in their life. The delayed academic identity status refers to a period of educational doubt a student experiences in striving to reach conclusions about educational values and goals. The last status, the successful academic identity, refers to a commitment to a set of educational values that emerged following a period of exploration. Overall, academic identity is a new research field in psychology, and studies have shown that academic identity can determine students' attitudes towards education, their level of commitment, the reasons for commitment, and the use of maladaptive educational behaviors (Haji Khayyat, 2016).

Among the various approaches selected to examine the determinants of academic identity, two main and primary approaches have emerged in recent years. The first approach discusses the impact of environmental processes on academic performance (Yarmohammadian, 2019), and the second approach talks about specific learning processes of learners, such as cognitive and metacognitive strategies (Kra et al., 2013).

One of the theories that researchers have studied is self-regulated learning theory (cognitive and

metacognitive). Zimmerman (1994), one of the theorists of the social-cognitive theory, defined self-regulated learning strategies as a type of learning in which learners, instead of relying on teachers, parents, or other educational authorities for knowledge and skills acquisition, personally initiate and direct their efforts. In other words, he applied self-regulation in learning to the active participation of the learner in terms of behavioral, motivational, cognitive, and metacognitive involvement in the learning process to maximize learning (Zimmerman, 1994).

Obviously, classroom conditions and environment (learning environment) also affect learning and learners' capabilities (Bradman, 2016). One of these conditions is the social and psychological atmosphere of the classroom, which cognitive and metacognitive strategies provide. In fact, according to the viewpoints of psychologists, alongside the cognitive and emotional prerequisites for any learning task, learners' mastery of appropriate learning strategies and their proper use are essential components of the learning process (Mosarabadi & Seif, 2013). Metacognitive strategies refer to the processes of planning, reviewing, and modifying cognitive activities, and cognitive strategies refer to the solutions learners use for learning, memorization, recall, and understanding of content (Guterkohl, 2004). Students who are self-directed and use cognitive and metacognitive strategies are energetic in academic performance and believe they can overcome problems and challenges, as shown by Mehad and Yousefi (2015) in their study that metacognition predicts self-efficacy. Teachers can guide learners from using surface cognitive study strategies to deep and metacognitive strategies and help learners actively deal with surface tasks and deeply understand academic content.

Learning strategies are behaviors of a learner that affect how new information is acquired. The main field of study of learning strategies originated from the investigations of Weinstein and colleagues in the 1980s at the University of Texas, when two approaches to learning, surface and deep, were recognized (Glover, 2006).

For better and deeper learning, besides using cognitive strategies, there are other methods known as metacognitive strategies. Metacognitive strategies refer to ways of

guiding and monitoring cognitive strategies, where skilled learners use metacognitive strategies to supervise their cognitive strategies to improve their progress (Seif, 2012).

Considering that the goal of contemporary education is to nurture lifelong learners, a prerequisite for lifelong learning is having basic knowledge, a desire to learn, knowledge of learning methods, and awareness of learning assessment styles. To achieve this goal, understanding learners, paying attention to individual differences, and providing necessary training in learning are undeniable. Learners differ in many factors such as learning strategies, working memory, academic identity formation, academic vivacity, and need to be addressed. Moreover, teaching learning and study strategies, in addition to understanding content, affects students' learning speed, metacognitive knowledge, self-concept in learning, working memory, academic vivacity, problem-solving methods, and academic identity formation, and improves the above issues. Typically in schools, learners are expected to study well, solve problems, and memorize a lot of information, but they are never taught the correct methods of studying, problem-solving, and memorizing information. Teachers can help students by teaching learning skills and can be assured that the outcome of this education will be promising (Zare, 2018). In this research, we examined through an experimental method which variables are affected by teaching learning strategies. Several studies have mentioned that teachers can help their students by teaching metacognitive strategies to be more successful learners and play a more active role in their educational destiny. Moreover, metacognition is the learner's ability to be aware of their cognitive capabilities and use these capabilities for learning, and practice through the application of strategies allows learners to assess their progress and adjust their learning approach. Metacognitive strategies include techniques that students use to design learning, monitor learning activities, and evaluate the outcomes of learning activities (Safarzadeh, 2019). Metacognitive strategies are important factors in determining learning behaviors, awareness, and metacognitive understanding. Psychologists have used the term metacognition to explain the knowledge and control individuals have over their thinking and learning activities

(Rodriguez, 2017). The term metacognition refers to our knowledge about our cognitive processes and how to optimally use them to achieve learning goals. Metacognitive strategies enable one to think critically, predict consequences, and consequently solve problems. The reality is that these educational and individual factors, with their cognitive and social nature, have the greatest impact on academic progress. Therefore, the discussion of the effectiveness of teaching learning strategies on academic identity formation is of interest to teachers, specialists, and learning psychologists. Based on this, it is necessary for learners to be familiar with the effectiveness of teaching learning strategies due to the importance and position they hold in academic progress. In other words, considering the questions and ambiguities that exist regarding the impact of teaching cognitive and metacognitive strategies and their impact on academic identity and the optimal use of them, in this research we studied the effectiveness of teaching cognitive and metacognitive skills on academic identity formation to examine the importance and necessity of the topic through more research from different perspectives and angles.

Method

The present study was a fundamental-interventional research conducted in a quasi-experimental manner, selected randomly, and examined through a pre-test, post-test, control group, and follow-up. The center was chosen using convenience sampling, where from each of the four centers, 10 individuals were randomly selected, forming a total sample of 30

participants, divided into experimental and control groups for cognitive and metacognitive training.

Materials

1. Wass and Isaacson (2008) Academic Identity Questionnaire: This 40-item questionnaire is classified on a Likert scale, measuring successful academic identity, delayed academic identity, and follow-through academic identity. The questionnaire was developed by Wass and Isaacson (2008) and is set on a five-point Likert scale (strongly disagree=1 to strongly agree=5). In a study by Hejazi et al. (2011), evaluating the psychometric properties of the Academic Identity Questionnaire among Iranian students, the findings showed a good fit of the obtained content validity model with the data. In the present study, the reliability of the questionnaire was assessed using Cronbach's alpha method, with the values obtained being 0.76 for successful academic identity, 0.39 for follow-through academic identity, 0.61 for delayed academic identity, and 0.71 for confused academic identity. Due to the weak reliability coefficient (0.39), the follow-through academic identity sub-scale was excluded from all statistical calculations. The validity of this questionnaire was also examined by calculating the correlation of items' scores with the scores of their related sub-scale.

2. Cognitive Learning Strategies Training: The training sessions of cognitive learning strategies were conducted in 8 sessions and implemented as follows:

Table 1. The content of cognitive training sessions

Session	Content
1	Welcome and introduction to the importance of the study and the significant role of research samples, brief overview of learning, types of memory, causes of forgetting, self-regulated learning, and its importance. Motivation and hospitality were provided, and the relevance of the training to the students' real-life and academic success was explained.
2	Definition of cognitive strategies and discussion on various cognitive strategies including repetition and mental review, with objectives to define, recognize, and apply these strategies in study.
3	Review of the previous session's content, with objectives to understand the benefits of repetition and mental review strategies, and self-assessment of these strategies.
4	Introduction to expansion strategies, examples, and different methods like relating new information to previous knowledge, thinking about the content, and creating mental images. Objectives included defining, recognizing, and applying expansion strategies in study.
5	Application of learned information for problem-solving, explanation, and analysis in the style of previous sessions, with assignments given for the next session.
6	Continued teaching of applying learned information for problem-solving, with assignments for the next session.
7	Teaching analogical reasoning in the style of previous sessions, with assignments for the next session.
8	Review of the content taught in previous sessions and a final summary of the training provided.

3. Metacognitive Learning Strategies Training: The training sessions on metacognitive learning strategies were developed and conducted in 8 sessions as per the following schedule:

Table 2. The content of metacognitive training sessions

Session	Content
1	<ul style="list-style-type: none"> - The training sessions on metacognitive learning strategies were developed and conducted in 8 sessions as per the following schedule: - Welcoming the students of experimental group 2 to the training course on metacognitive learning strategies, discussing the research, its importance, and the significant role of research samples in the study, emphasizing the accuracy and correctness of their opinions.
2	<ul style="list-style-type: none"> - Students should be able to define organization and provide examples. - Familiarization with different organization strategies including categorizing information, listing content, preparing chapter outlines of a textbook, and converting text into a conceptual map or diagram.
3	<ul style="list-style-type: none"> - Review of student assignments on organization, discussing the effects of applying organization strategies on learning. - Identifying appropriate organization strategies during study and using them for studying textbooks. - Evaluating their own use of organization strategies and recording their opinions.
4	<p>Before beginning the session, a review of the previous session's assignments on organization. Organization was then defined as the most comprehensive and best study strategy. Explanation on organizing information and its positive impact on long-term memory and recall. Various organization strategies, including categorization, listing, and conceptual mapping, were discussed with examples. Key points, practical recommendations, and assignments on organization strategies were given. A summary of cognitive strategies was also conducted at the end of session five.</p>
5	<ul style="list-style-type: none"> - Students should be able to define planning and provide examples. - Familiarization with different planning strategies including setting study goals, brief review before reading, posing questions before reading, predicting study time, determining reading speed, and choosing appropriate learning strategies. - Identifying appropriate planning strategies during study and using them for studying textbooks. - Evaluating their own use of planning strategies and recording their opinions.
6	<p>Definition of planning strategies (related to pre-study) and presentation of a conceptual map of various planning strategies. Explanation of different planning strategies, including setting study goals, brief review before reading, posing questions, predicting study time, and selecting learning strategies. Students learned how to apply these strategies while studying textbooks. They were then asked to evaluate the previously taught strategies and the planning strategies and record their opinions.</p>
7	<ul style="list-style-type: none"> - Students should be able to define monitoring and control and provide examples. - Familiarization with different monitoring and control strategies, including evaluating progress, monitoring attention and comprehension, questioning during study, self-assessment, time control, and predicting exam questions. - Identifying appropriate planning strategies during study and using them for studying textbooks. - Evaluating their own use of monitoring and control strategies and recording their opinions. - The session began with reviewing student self-assessments regarding the execution of taught strategies and planning strategy. Strengths and weaknesses were noted by the instructor. Then, training on monitoring and control strategies began.
8	<p>Review of students' assignments on monitoring and control strategies. Training on regulation strategies, including enduring metacognitive adaptations and improvements in response to feedback related to errors. Finally, a summary and review of the taught content were conducted. One week after the completion of the training sessions in both experimental groups 1 and 2, a post-test on the persistence in education questionnaire was conducted for all three groups: experimental 1, experimental 2, and the control group. Again, one month after the training, a follow-up test on the questionnaires of persistence in education, goal orientation, and academic motivation was conducted for all three groups: experimental 1, experimental 2, and the control group.</p>

Implementation

Prior to implementation, full consent was obtained from the participants, and they were asked to refrain from writing their names on the

tests to ensure their confidentiality. Then, interventions in cognitive and metacognitive learning methods were introduced. All groups were initially assessed using the pre-test of

academic identity formation. The experimental group then received 8 sessions of training in cognitive and metacognitive learning strategies, while the control group received no training. Subsequently, the academic identity formation test was administered to both control and experimental groups, and a follow-up was conducted after one month. The data obtained were analyzed using SPSS software and two-way repeated measures ANOVA (mixed between-within subjects design).

Results

Information regarding the age of the sample participants is provided separately for the

control group, the cognitive strategy group, and the metacognitive strategy group. In the control group, 6 individuals are between 18 and 20 years old, 3 individuals are between 21 and 22 years, and 1 individual is between 23 and 24 years old. In the cognitive strategy group, there are 4 individuals between 18 and 20 years, 4 individuals between 21 and 22 years, and 2 individuals between 23 and 24 years old. In the metacognitive strategy group, there are 5 individuals between 18 and 20 years, 4 individuals between 21 and 22 years, and 1 individual between 23 and 24 years old.

Table 3. Descriptive statistics findings

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

Table 3 presents the descriptive statistics related to the mean and standard deviation of the scores for academic identity formation, separately for the control group, the cognitive learning strategy group, and the metacognitive learning strategy group, across three assessment stages (pre-test, post-test, and follow-up). As observed, the mean scores in the control group do not show significant changes from the pre-test stage to the post-test and follow-up stages. However, in the experimental groups, there is an increase in the scores for successful academic identity and a decrease in scores for delayed academic identity, confused academic identity, and follow-through academic identity in the post-test and follow-up stages compared to the pre-test.

Based on the Kolmogorov-Smirnov test results, the significance level of the calculated statistic

for all variables is greater than 0.05, therefore, the assumption of normal distribution of scores is accepted.

To investigate the effectiveness of teaching cognitive and metacognitive learning strategies on students' academic identity formation, a two-way repeated measures analysis of variance was used. The results of this test and the examination of its assumptions are presented subsequently. The significance level of the Box's test is 0.478. Since this value is greater than the required significance level of 0.05 for rejecting the null hypothesis, the null hypothesis regarding the homogeneity of covariance matrices is confirmed. Additionally, the results of Levene's test are not significant, confirming the null hypothesis of the homogeneity of variances of the variables.

Table 4. The results of between group effects

Effect		Values	F	Df hyp.	Df err.	p	Effect size
Time	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
	Hotellings' 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
Time*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
	Hotellings' 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 difference in the mean scores of academic identity formation among the control group, the cognitive learning strategies group, and the metacognitive learning strategies group during the treatment stages. The information in the table indicates that all multivariate tests are significant, suggesting the presence of a main effect related to the repetition factor (pre-test,

post-test, and follow-up) and an interactive effect between groups and repetition (i.e., the presence of differences between groups during the measurement stages).

To perform pairwise comparisons of mean scores during the measurement stages, the Bonferroni post-hoc test was used, and its results are presented subsequently.

Table 5. Bonferroni post-hoc test (Stages)

Group	Dependent variable	Stage	Stage	Mean diff	SE	p	
Control	Successful 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	
			Delayed academic identity	Pre-test	Post-test	1.400	0.887
		Follow-up		0.300	0.428	1	
		Post-test	Follow-up	-1.100	0.910	0.712	
	Confused academic identity		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	
			Follow-through academic identity	Pre-test	Post-test	0.700	0.456
		Follow-up		-0.200	0.753	1	
		Post-test	Follow-up	-0.900	0.768	0.755	
Cognitive	Successful 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	
			Delayed academic identity	Pre-test	Post-test	3.500	0.887
		Follow-up		2.900	0.428	0.001	
		Post-test	Follow-up	-0.600	0.910	1	
	Confused academic identity		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	
			Follow-through academic identity	Pre-test	Post-test	3.400	0.456
		Follow-up		2.440	0.753	0.009	
		Post-test	Follow-up	-0.960	0.768	0.667	
Metacognitive	Successful 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	
			Delayed academic identity	Pre-test	Post-test	4.800	0.887
	Follow-up	4.400		0.428	0.001		
	Post-test	Follow-up		-0.400	0.910	1	
		Confused academic identity		Pre-test	Post-test	3.700	0.360

		Follow-up	2.800	0.746	0.003
	Post-test	Follow-up	-0.900	0.729	0.683
Follow-through 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 presents pairwise comparisons to examine the difference in academic identity formation scores during the treatment stages for each of the control group, the cognitive learning strategies group, and the metacognitive learning strategies group. Based on the results obtained, the difference between the mean scores of the pre-test stage and the post-test and follow-up stages is significant ($p < 0.01$) in both groups taught cognitive and metacognitive learning strategies. The comparison of mean scores across the three stages shows that the mean scores for successful academic identity

significantly increase, and the mean scores for delayed academic identity, confused academic identity, and follow-through academic identity decrease in the post-test and follow-up stages compared to the pre-test stage. The difference between the post-test scores and the follow-up scores is not significant ($p > 0.05$), indicating the stability of 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 post-test and follow-up scores, is not significant ($p > 0.05$).

Table 6. The results of within subject tests

Source	Variable	SS	df	MS	F	p
Group	Successful academic identity	49.923	2	24.961	1.171	0.325
	Delayed academic identity	51.356	2	25.678	0.185	0.832
	Confused academic identity	386.006	2	193.003	1.519	0.237
	Follow-through academic identity	828.128	2	414.064	3.914	0.032
Error	Successful academic identity	575.526	27	21.316		
	Delayed academic identity	3740.033	27	138.520		
	Confused academic identity	3431.342	27	127.087		
	Follow-through academic identity	2856.148	27	105.783		

Table 6 presents the results of the test of between-subjects effects to examine the mean scores of academic identity formation among the control group, the cognitive learning strategies group, and the metacognitive learning

strategies group. Based on the results obtained, only the F value for the variable of follow-through academic identity is significant ($p > 0.05$).

Table 7. Bonferroni post-hoc test (Groups)

Dependent variable	Group 1	Group 2	Mean diff	SE	p
Successful academic identity	Control	Cognitive	-1.373	1.192	0.778
		Metacognitive	-1.727	1.192	0.477
	Cognitive	Metacognitive	-0.353	1.192	1
Delayed academic identity	Cntrl	Cognitive	-1.133	3.039	1
		Metacognitive	0.700	3.039	1
	Cognitive	Metacognitive	1.833	3.039	1
Confused academic identity	Control	Cognitive	2.317	2.911	1
		Metacognitive	5.067	2.911	0.279
	Cognitive	Metacognitive	2.750	2.911	1
Follow-through academic identity	Control	Cognitive	4.280	2.656	0.356
		Metacognitive	7.400	2.656	0.029
	Cognitive	Metacognitive	3.120	2.656	0.751

Table 7 presents pairwise comparisons to examine the mean scores of academic identity

formation among the control group, the cognitive learning strategies group, and the

metacognitive learning strategies group. Based on the results obtained, the difference between the mean scores of follow-through academic identity in the metacognitive strategy group and the control group is significant ($p > 0.05$).

Conclusion

The aim of the present study was to assess the effectiveness of cognitive and metacognitive learning strategies on academic identity formation in students of the University of Applied Sciences in Tehran. The results show that teaching cognitive and metacognitive learning strategies effectively impacts students' academic identity formation. The research findings confirm the impact of teaching cognitive and metacognitive strategies on successful academic identity, with a significant relationship at $p < 0.05$. The null hypothesis regarding the homogeneity of covariance matrices is confirmed. The findings indicate that all multivariate tests are significant, demonstrating the presence of a main effect related to the repetition factor (pre-test, post-test, and follow-up) and an interactive effect between groups and repetition (i.e., the presence of differences between groups during the measurement stages).

The comparison of mean scores across the three stages shows that the mean scores for successful academic identity increase significantly in the post-test and follow-up stages compared to the pre-test stage, while the mean scores for delayed academic identity, confused academic identity, and follow-through academic identity decrease. The mean scores for successful academic identity increase, and the mean scores for delayed academic identity, confused academic identity, and follow-through academic identity decrease in both the cognitive learning strategies and metacognitive learning strategies groups during the treatment stages, confirming the research hypothesis. This finding also confirms the hypothesis that teaching cognitive and metacognitive strategies impacts students' academic identity.

Although the results of this research have not been directly and similarly examined in any study, they indirectly align with the findings of studies by Amani (2010), Omidian and Shokrkon (2004), and Tabatabaei et al. (2011). Overall, considering the impact of self-regulated learning skills on students' academic identity, it can be concluded that since students' success in academics and academic challenges is

important, increasing self-regulation can lead to improved academic identity formation processes. Students, by employing self-regulated learning strategies, facilitate successful learning experiences and create opportunities for practice, thereby enhancing academic progress and successful learning experiences, which in turn positively impact their beliefs about their own abilities in relation to academic learning. The formation of these positive perceptions in experimental group students not only affects their studies but also serves as a positive factor in achieving ideal outcomes in learning processes and their consequences.

As a result, the use of these strategies increases students' positive beliefs, enthusiasm, and interest in academic subjects, promoting their participation in educational activities and the acquisition of meaningful learning experiences, which in turn leads to their success in academic learning and fosters a sense of competence in learning activities. The results of all these outcomes fulfill the improvement in the process of academic identity formation and correspondingly lead to the academic progress of students. Therefore, teaching learning strategies and their use by students, by increasing their academic performance, reduces their inefficiency, disinterest, and fatigue, which in turn reduces the likelihood of students experiencing academic burnout.

In light of the findings of this research, it is recommended that educational psychologists and related specialists consider these educational programs as elective interventions to enhance academic identity and other variables in students and pupils.

In the practical realm, the findings of this research can assist educational practitioners in improving and enriching the learning process of students. The necessity of training teachers and lecturers on the impact of students' self-regulated academic identity on the educational, social, and emotional outcomes of the teaching and learning process in schools and universities is among the practical applications of this research. Therefore, raising awareness among teachers, lecturers, and educational planners about the impact of having self-regulated and vivacious students and the extensive role of these factors in solving educational and socio-emotional problems of students is one of the

practical necessities emphasized by this research.

Finally, one limitation of this research is that the participants were only undergraduate and associate degree students; hence, caution should be exercised in generalizing the results to students and pupils of other educational levels.

Conflict of Interest

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

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