

Prediction of Educational Achievement Based on Learning Styles Mediated by Academic Self-Efficacy: A Case Study on the Students of Medical Professionals in Kerman University of Medical Sciences, Iran

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Abstract

Background and Objectives: Studying the factors affecting educational achievement is complicated as educational achievement is a multidimensional element and is delicately associated with physical, social, cognitive, and emotional growth of students. The current study aimed to predict educational achievements of students of medical professionals in Kerman University of Medical Sciences, Kerman, Iran, based on learning styles and mediation by educational self-efficacy.

Methods: The current correlational study was conducted cross-sectionally. The study population included all students of medical professionals in Kerman University of Medical Sciences, and, using Cochran's formula, a total of 286 participants were selected by stratified random sampling. The Kolb learning style inventory and McIlroy and Bunting academic self-efficacy scale were used as data gathering tools. Current grade point average (GPA) was used to measure academic achievement. Data were analyzed using structural equations and model fitting indices in AMOS software.

Results: According to the results of the current study, there was a structural relationship between the learning styles mediated by academic self-efficacy and academic achievements. Additionally, results of the current study indicated the fitness of the model in the study population.

Conclusions: Results of the current study indicated the positive effect of different learning styles on academic achievements of students and that different learning styles can be employed to train students. On the other hand, the mediating role of academic achievements of students can enhance their academic achievements. By such methods, teachers can benefit from different educational strategies, and active learning occurs.

Keywords: Learning Styles, Academic Self-efficacy, Academic Achievement

1. Background

The important fact is that, today, all amazing innovations are born from learning. As a wide spectrum of factors affect learning, recognition of such factors is important to solve the problems and insufficiency of learning systems. Students' learning styles are among such factors. Studies conducted on learning styles are rooted in socio-psychological and physiological aspects of the learning process. Recognition and understanding of the variables of learning styles are among the 20th century's substantial achievements in psychology. The term "learning style" was first used by Thelan in 1954. A learning style is the sustainable method a learner uses to learn and employ available motives in learning situations (1).

People use different learning styles based on their personal characteristics. Psychologists believe that, if an individual's learning style does not match his or her studying field or occupation, he or she will be dissatisfied with the

studying field (2).

According to Kolb, a learning style is not a method of recognizing and thinking and does not match the learner's ability but, rather, is a method used to employ the ability. As personal ability plays an important role in success in life, recognition of learning styles is of great importance. In other words, learning styles are personal preferences, not personal abilities. Since people use different learning styles, which affect their academic achievements, teachers should also be quite familiar with different types and situations of learning styles to lead the students toward better learning (3). According to the theory of Kolb, learning is a 4-stage process including visual experience, reflective observation, abstract conceptualization, and active experimentation. The process indicates 2 aspects or continuums: "visual experience versus reflective observation" and "abstract conceptualization versus active experimentation."

Visual experience: This style mostly focuses on emo-

tional states. In this style, the person deals with experiences, encounters the problems from the personal status, and mostly emphasizes from the personalized and intuitive views on theories and generalizations.

Reflective observation: This style mostly focuses on the concept and meaning of an issue or status of its practical application. People in this stage can finely observe and analyze issues from different viewpoints and conceptualize them.

Abstract conceptualization: People with this style emphasize practical applications and benefit from concepts and ideas, and conceptualization based on thoughts and logics is formed in a rigid and serious analytical system. People with this learning style do not focus on their inner and intuitive sensations, show good function, and enjoy regular scheduling and manipulation of abstract symbols.

Active experimentation: In this style, people tend toward practical works, active influence, and changing positions and do not consider passive understanding of phenomena. They enjoy completion of specific actions and take risks and tend to affect the environment and get feedback (4).

On the other hand, self-efficacy is an effective motivational factor in learning (5). Self-efficacy was first raised by Bandura through socio-cognitive theory. Bandura believed that self-efficacy is one of the most important behavior-regulating factors. Judging one's inefficacy in a particular situation imposes more pressure than the quality and features. People with lower self-efficacy are pessimistic about their own abilities and, hence, avoid any situations they believe are beyond their abilities. In contrast, people with high self-efficacy consider hard tasks as overcoming challenges. They choose challenging tasks, their self-efficacy improves faster, and they continue their efforts in complications (6).

Therefore, there is a high correlation between self-efficacy and function, and learning style is an effective factor in people's functioning (7). Self-efficacy considerably influences behavior, and people with high self-efficacy are more successful and hopeful (8). Self-efficacy affects people's participation in activities, efforts, and continuation of activities; promotes effort and perseverance, accountability, and emotional reactions; and greatly influences academic achievements and functioning (9). Totally, self-efficacy is under the influence of cognitive, emotional, motivational, physical, and acquisitional features; in other words, self-efficacy means gaining experiences, successful functioning, and mastery over learning, and learning style is among cognitive features associated with self-efficacy (10).

The factors affecting students' performances, such as learning styles, underlie optimum learning and affect the

level of self-efficacy as educated and graduated human resources are among the most important national capitals, and economic, social, political, and cultural developments depend on the specialized human power of the community. Therefore, in the era of rapid development of science and technology, people should upgrade their knowledge via learning. This factor is essential among students on the eve of entering the labor market and functional use of their knowledge and skills.

Since there was no study on the prediction of academic achievement, based on learning styles and mediation by educational self-efficacy and use of structural equations, a similar study was invoked and compared. Izadi evaluated learning styles as a factor to predict educational achievement in high school students and reported a significant relationship among all learning styles and educational performance; according to the results of his study, there was no relationship between reflective observation and educational performance (11). Eskandari et al. evaluated the relationship between the Kolb learning style and personal characteristics and students' academic performance and showed a significant correlation between the learning styles and academic performance. They also reported a negative relationship between the objective experience and academic performance; the other relationships were positively significant (12). Rezaie evaluated the relationship between learning style and academic performance and reported only a significant relationship between the abstract conceptualization and academic performance (13).

Recognition of variables affecting academic achievement results in better prediction of such variables. Recognition of academic achievement-predicting variables prevents the outcomes of failure in learning and promotes a pleasant learning environment; it can also assist with achieving proper styles and relying on the application of preferences. The current study aimed to anticipate academic achievements based on learning styles mediated by educational self-efficacy among the students of medical professionals in Kerman University of Medical Sciences, Kerman, Iran.

2. Methods

The current correlational study was conducted cross-sectionally. The population under study included all students of medical professionals (medicine, pharmacology, and dentistry) in the 2015-16 academic year in Kerman University of Medical Sciences ($n = 1100$). The sample size included 286 participants, calculated based on the population under study using Cochran's formula selected by stratified random sampling. Regarding ethical considerations,

first, the necessary arrangements were made with the university authorities, and the study aims were explained to the participants, who were assured about the confidentiality of data. The participants could participate in the study voluntarily.

According to the protocol of the current study, the Kolb learning style inventory was used. Kolb studied 1446 male and female sophomore students and evaluated the content validity of the questionnaire and reported it as "good." Additionally, the reliability of the questionnaire was measured for visual experience, reflective observation, abstract conceptualization, and active experimentation as with Cronbach's alpha coefficients of 0.82, 0.73, 0.83, and 0.78 respectively, and in total, the reliability was approved (4). The validity indices of the Kolb inventory in Iran, visual experience, reflective observation, abstract conceptualization, and active experimentation, were 0.66, 0.31, 0.65, and 0.61, respectively (14). According to the results of the current study, the Cronbach's alpha coefficients for visual experience, reflective observation, abstract conceptualization, and active experimentation were 0.70, 0.55, 0.65, and 0.64, respectively.

The Kolb learning style inventory includes 12 four-option items. Each item indicates one of the 4 learning styles (visual experience, reflective observation, abstract conceptualization, and active experimentation), and the responder scores the option from 1 to 4 based on the preferred learning style. To assess the students' educational self-efficacy, the McIlroy and Bunting academic self-efficacy scale, with 0.71 validity, was used (15), and the validity of the questionnaire was reported as "good." They also indicated a 0.81 reliability score based on Cronbach's alpha coefficient for the psychology students (15). The students completed the questionnaires based on a 7-option Likert scale for each item from completely disagree = 1 to completely agree = 7; current grade point average (GPA) was used to assess level of academic achievement.

Data analysis was conducted based on the structural equation modelling (SEM) by AMOS software, version 23. SEM is a very general and powerful multivariate analytical technique derived from the multiple regression family and, in more detail, is the general linear model that allows the researcher to assess a sort of regression equation simultaneously. SEM is a kind of comprehensive approach to assess hypotheses on the relationship between the observed and latent variables, which is sometimes called covariance structural analysis casual modelling but nowadays mostly refers to SEM (16).

The root mean square error of approximation (RMSEA) is one of the most important fitness indices, and amounts < 0.06 are considered to indicate good model fit. The acceptance domain was measured as > 0.9 in the good-

ness of fit index (GFI), adjusted GFI (AGFI), comparative fit index (CFI), normed fit index, incremental fit index (IFI), and Tucher-Lewis index (TLI); amounts > 0.9 indicate good model fit (16).

To evaluate the hypotheses, pathway analysis through likelihood estimation was used. According to the obtained results (RMSEA = 0.02, P value = 0.050, degree of freedom = 212, $\chi^2 = 245.35$), the model fit in the community was approved. Additionally, GFI = 0.93, IFI = 0.96, CFI = 0.96, AGFI = 0.91, and TLI = 0.96 indicated model fit.

The direct influence of variables on each other in the general model is shown in Table 1 and Figure 1. The pathway analysis showed that the direct effect of objective experience learning style on the academic achievement was insignificant, but the direct effect of objective experience on educational self-efficacy was positively significant. On the other hand, the educational self-efficacy variable showed positive significant effect on the academic achievement. There was a positive significant relationship between the indirect effects of objective experience learning style on academic achievement via educational self-efficacy mediated by educational self-efficacy.

Results of model fit showed that RMSEA = 0.03, P value = 0.008, df = 206, and $\chi^2 = 258.41$, indicating model fit in the community. Additionally, GFI = 0.90, IFI = 0.94, CFI = 0.93, AGFI = 0.90, and TLI = 0.92 showed the model fit.

Results of the direct effect of variables on each other in the general model are shown in Figure 2 and Table 2. Figure 2 indicates that the direct effect of reflective observation learning style on academic achievement and that of reflective observation on educational self-efficacy were insignificant. Additionally, the indirect effect of reflective observation on the academic achievement via educational self-efficacy indicated that the relationship was insignificant and the educational self-efficacy did not play a mediating role.

Results of the model fit (RMSEA = 0.01, P value = 0.020, df = 210, and $\chi^2 = 223.60$) indicated the model fit in the community. Additionally, GFI = 0.93, IFI = 0.98, CFI = 0.98, AGFI = 0.91, and TLI = 0.98 showed the model fit.

Results of the hypotheses analysis on the direct effect of variables on each other in the general model are shown in Figure 3 and Table 3. The analysis of pathway indicated that the direct effect of abstract conceptualization learning style on the academic achievement and that of abstract conceptualization on the educational self-efficacy were statistically significant. Additionally, the indirect effect of abstract conceptualization on academic achievement via educational self-efficacy was statistically significant, and the mediating role of educational self-efficacy was approved.

Results of the model fit test (RMSEA = 0.02, P value = 0.040, df = 211, $\chi^2 = 247.26$) indicated the model fit in the

Table 1. Analysis of Educational Self-efficacy Between the Objective Experience Learning Style and Academic Achievement Among the Study Participants

Effect	Parameter Estimation	Standard Error	Standardized Parameter (β)	t
Effect of objective experience on educational self-efficacy	0.19	0.07	0.20	2.44 ^a
Effect of educational self-efficacy on academic achievement	0.84	0.24	0.24	3.40 ^a
Effect of objective experience on academic achievement	0.09	0.22	0.03	1.12

^aP value < 0.05.

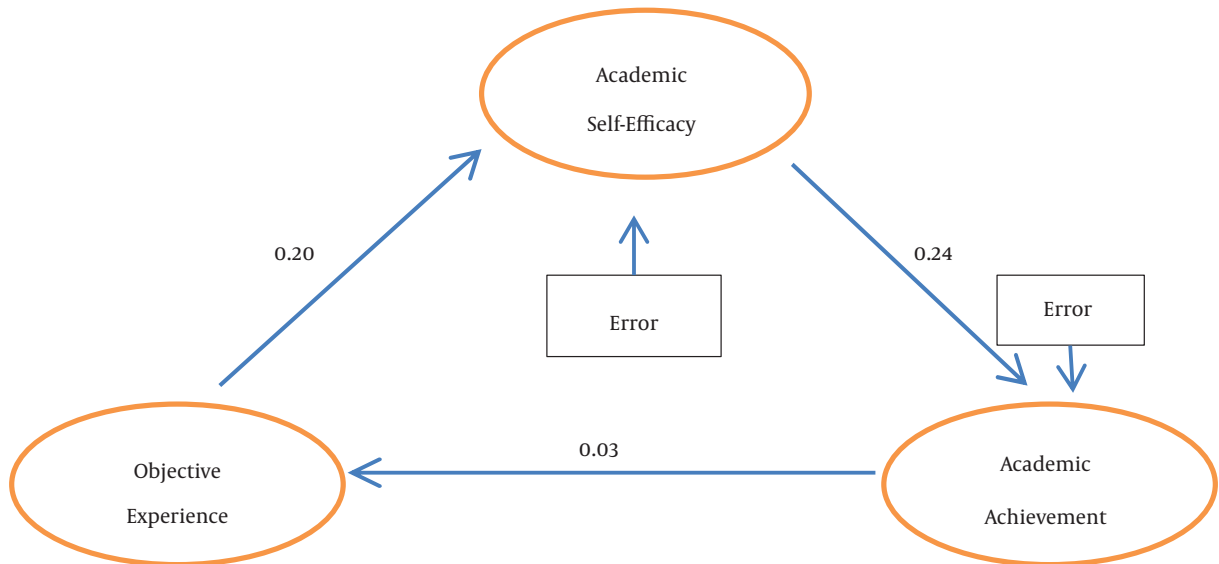


Figure 1. Analysis of Academic Self-efficacy Pathway Among the Learning Styles, Objective Experience, and Students' Academic Achievement

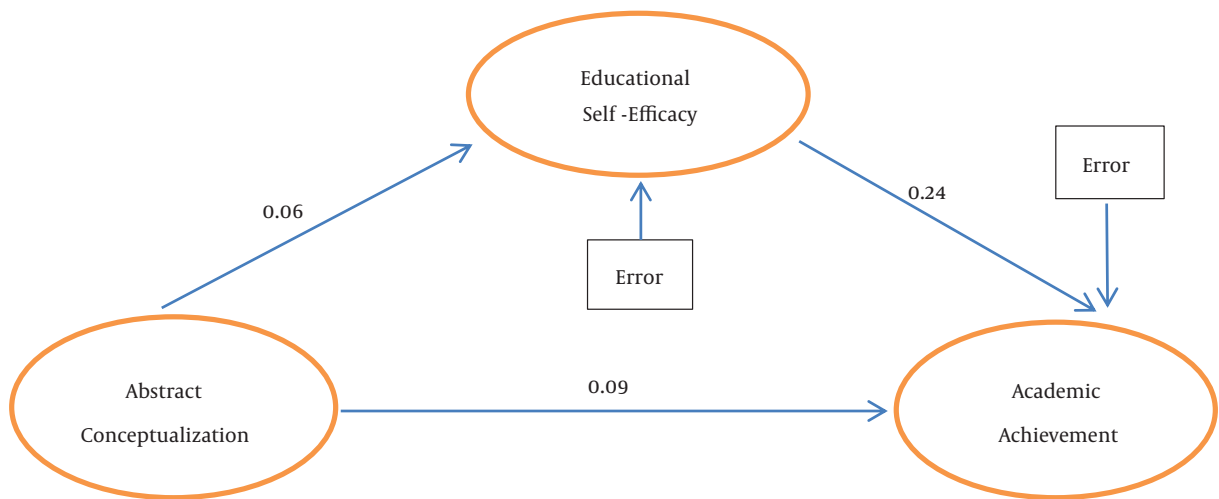


Figure 2. Analysis of Educational Self-efficacy Pathway Between the Reflective Observation Learning Style and Academic Achievement of the Study Participants

community. Additionally, GFI = 0.93, IFI = 0.95, CFI = 0.95, AGFI = 0.91, and TFI = 0.94 showed the model fit.

Table 2. Analysis of Educational Self-efficacy Pathway Between the Reflective Observation Learning Style and the Academic Achievement of the Study Participants

Effect	Parameter Estimation	Standard Error	Standardized Parameter (β)	t
Effect of reflective observation on educational self-efficacy	0.09	0.11	0.06	0.75
Effect of educational self-efficacy on academic achievement	0.84	0.24	0.24	3.40 ^a
Effect of reflective observation on academic achievement	0.46	0.36	0.09	1.26

^aP value < 0.05.

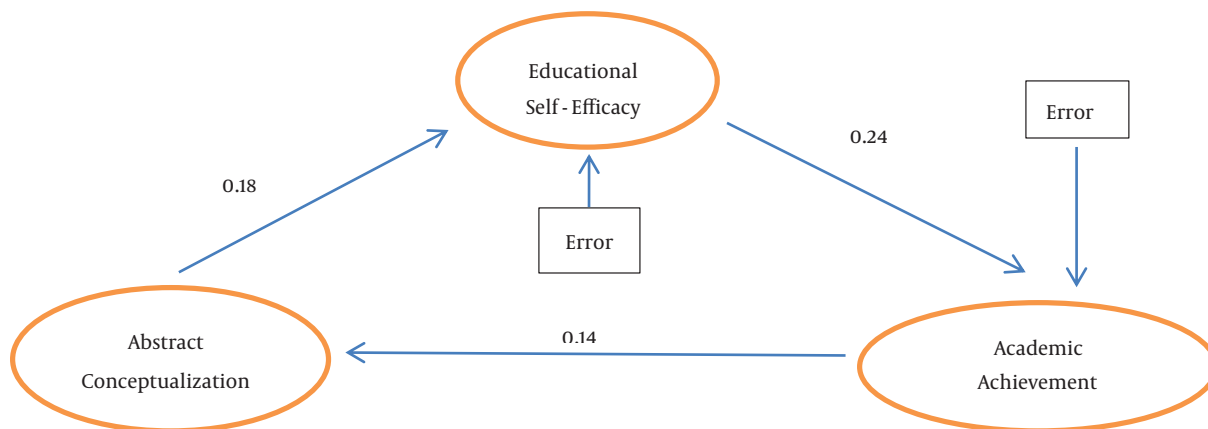


Figure 3. Analysis of Educational Self-efficacy Pathway Between Abstract Conceptualization and the Academic Achievement of the Study Participants

Table 3. Analysis of Educational Self-efficacy Between the Abstract Conceptualization Learning Style and the Academic Achievement of the Study Participants

Effect	Parameter Estimation	Standard Error	Standardized Parameter (β)	t
Effect of abstract conceptualization on educational self-efficacy	0.14	0.09	0.18	1.97 ^a
Effect of educational self-efficacy on academic achievement	0.84	0.24	0.24	3.40 ^a
Effect of abstract conceptualization on academic achievement	0.17	0.27	0.14	0.63

^aP value < 0.05.

Results of the hypotheses tests on the direct effects of variables on each other in the general method are shown in Table 4 and Figure 4. The analysis of the pathway indicated the insignificant direct effect of active experimentation learning style on the academic achievement and that of active experimentation on educational self-efficacy. Additionally, the indirect effect of active experimentation on the academic achievement through educational self-efficacy indicated the significance of relationships; the educational self-efficacy also played a mediating role.

3. Discussion and Conclusions

Personal differences in learning were investigated by educationalists long ago. The idea that personal differences in learning resulted from differences in talent and in-

telligence was accepted for a long time in the world of education, but that idea changed, and researchers showed that students used different learning styles. In other words, students analyze data and learn knowledge through different styles and methods. Styles, such as abilities, mostly result from interaction between the individual and the environment and can be developed and modified; hence, they are not permanent but changing. In other words, different styles are applied under different circumstances; for example, one may use a style in a certain matter but change the style in different situations. Therefore, although people mostly use and employ a certain style, they not held in that style and can sync their styles with different situations and tasks.

Results of the current study showed no significant relationship among the objective experiment, reflective ob-

Table 4. Analysis of Educational Self-efficacy Between the Active Experimentation Learning Style and the Academic Achievement of the Study Participants

Effect	Parameter Estimation	Standard Error	Standardized Parameter (β)	t
Effect of active experimentation on educational self-efficacy	0.20	0.09	0.13	2.10 ^a
Effect of educational self-efficacy on academic achievement	0.84	0.24	0.24	3.40 ^a
Effect of active experimentation on academic achievement	0.05	0.28	0.04	1.91 ^a

^aP value < 0.05.

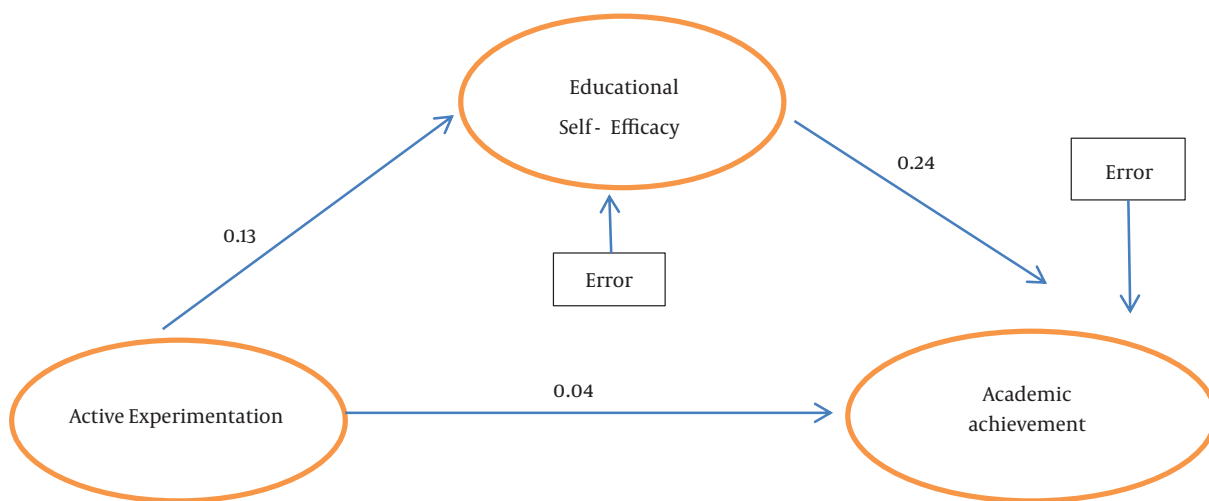


Figure 4. Analysis of Educational Self-efficacy Pathway Between the Active Experimentation Learning Style and the Academic Achievement of the Study Participants

servation, active experimentation learning styles, and academic achievement of students of medical professionals. On the other hand, these learning styles could not anticipate the academic achievement of students (P value > 0.05), but there was a significant relationship between the abstract conceptualization and academic achievement of the students. In other words, only the abstract conceptualization could anticipate the academic achievement of students of medical professionals (P value < 0.05).

There was a significant relationship among objective experiment, abstract conceptualization and active experimentation, and educational self-efficacy in the students of medical professionals, and the 3 learning styles could anticipate the educational self-efficacy (P value < 0.05), but no significant relationship was observed between the reflective observation and educational self-efficacy of students, and the reflective observation could not anticipate the educational self-efficacy (P value < 0.05). In addition, a significant relationship was observed between the educational self-efficacy and academic achievement of the students of medical professionals (P value < 0.05), and

the educational self-efficacy could anticipate the academic achievement of the students.

Educational self-efficacy played a mediating role among the objective experience, abstract conceptualization and active experimentation, and academic achievement of the students of medical professionals. In other words, increasing the students' educational self-efficacy increased their academic achievement (P value < 0.05), but the educational self-efficacy did not play a mediating role between the reflective observation and academic achievement of the students of medical professionals. Educational self-efficacy could not play a mediating role between the reflective observation and academic achievement (P value > 0.05).

Results of the current study indicated that abstract conceptualization could anticipate the academic achievement of the students of medical professionals, and educational self-efficacy, by playing the mediating role, could anticipate academic achievement. Generally, the current study participants tended to use 3 learning styles provided in detail below.

The objective experiment: Students using this style deal with experiences and encounter problems from the personal status and mostly emphasize the personalized and intuitive views toward theories and generalizations. Students using this style make decisions intuitively and have good performance in unstructured situations; they are open-minded or, in other words, flexible and enjoy communicating with others. They mostly rely on their feelings rather than their minds and, in different situations, rely on their abilities in a disciplined approach to solve problems.

Abstract conceptualization: The students in this style emphasize practical application and employment of concepts and beliefs, and conceptualization based on thoughts and logics is formed in a rigid and serious analytical system. Students with such a learning style do not focus on their inner and intuitive sensations; they show good function and enjoy regular scheduling and manipulation of abstract symbols. These people mostly benefit from their logic and thoughts instead of their feelings to understand issues and usually learn through experiencing instead of merely observing and affecting people and events. This learning style causes people to mostly use logic and thoughts instead of sensations to understand issues and situations.

Active experimentation: Students with this learning style tend toward practical works, active influence, and changing positions and do not consider passive understanding of phenomenon. They enjoy completion of specific actions and take risks and tend to affect the environment and get feedback. According to the results of the current study, people use different learning styles based on their personal differences.

3.1. Conclusions

Results of the current study indicated the positive effect of different learning styles on the academic achievement of the study participants and that different learning styles can be used to educate students. On the other hand, the mediating role of educational self-efficacy increased the academic achievement in the students. Through the assistance of such styles, teachers can benefit from different educational strategies to present and create active learning in the learners. Additionally, considering the important role of learning styles in the learning process, it is better to hold workshops for teachers to familiarize them with different learning styles. Certainly, it cannot be said that any learning style is better or worse than another. For better understanding, every style may be good or bad depending on the conditions and learning issues. However, the teacher should not neglect personal differences but should always provide occasions and situations in various tasks to

let the learners employ the most suitable learning style. Challenging tasks encourage cognitive development and self-efficacy beliefs in students.

Lack of new and relevant references was one of the study limitations, which imposed difficulties in citation. Participants' mistakes in responding to the Kolb inventory, due to different scoring formats (prioritizing the options instead of choosing an option), and negligence in reading the instruction of the questionnaire were other limitations. Limited domestic and foreign relevant references faced comparisons with difficulties. The focus on the students of medical professionals in Kerman University of Medical Sciences and lack of attention to other universities were among other study limitations, which may disrupt the generalization of the results.

Supplementary Material

Supplementary material(s) is available [here](#).

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