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The Effect of E-Learning on Critical Thinking with the Mediating Role of Academic Self-Efficacy of Students' Participation

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Abstract

The purpose of this research was the effect of e-learning on critical thinking with the mediating role of academic self-efficacy and students' participation. The method of the current research was a description of the correlation type with the structure modeling approach. The statistical population consisted of 1832 high school students of Kufa city, 320 of them were selected by cluster random sampling using Morgan's table. To collect the research data, from four standard questionnaires, e-learning by Jawad Kazem (1402), academic self-efficacy from Morris (2001), student participation from Wang et al. (2011), critical thinking from Ritex (2003)) was used, the validity and reliability of the questionnaire was confirmed. Data analysis was done using Pearson's correlation coefficient analysis and structural modeling in SPSS and Lisrel statistical software. The results showed that the effect of e-learning on critical thinking was positive and significant with a direct and mediating role of academic self-efficacy and students' participation.

Keywords: e-learning, critical thinking, academic self-efficacy, student participation.

Introduction

Critical thinking is a reasoned and sharp thinking about what to believe and what to do (Rimni, 2014). Regarding critical thinking, researchers say that the evaluation of decisions through logical and systematic review and evidence of solutions is called critical thinking (Sivachi and Altas, 2022). There are different opinions about the skills that make up critical thinking, some studies have shown that the elements or skills that make up critical thinking are expressed as follows: searching for a clear statement of the topic or question, searching for reasons, trying to obtain comprehensive information, using and citing reliable sources in Considering the general situation and the main point, not overdoing the main issue of interest, looking for different cracks, being flexible and being biased, taking a position, being as precise as possible with each of the components of the general situation, dealing regularly (Sarzaz Fard, 2013)). The review of studies shows that cognitive, metacognitive and constructivist theories support the strengthening and cultivation of critical thinking in the education process. Cognitive theorists view students as active information processors in the learning process; Those who experience and search for information to solve problems use what they recognize as useful for solving new problems in their mind structure, and instead of being passively influenced by the environment, they actively choose, practice, pay attention. Or they ignore it. For this reason,

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cognitivists consider the learning situation as one of the most important factors in the learning process (Zigmond and Schofer, 2014). From the metacognitive point of view, the student should actively monitor his mental process and organize and reconstruct his mental activities. Some even believe that cognitive and metacognitive abilities and skills begin to grow around the ages of five to seven years and a large number of students have significant growth (Miller and Malcolm, 2018). Another theory that supports critical thinking is "theory of constructivism" which has its roots in cognitive thinking. The philosophical foundations of such an approach are based on the "principle of epistemological fallibility". Constructivists, like cognitive psychologists, consider learning to be a process of action resulting from experience and believe that curriculum administrators should provide a situation in which students engage in critical thinking through argumentative discussion that accelerates and facilitates interaction and analysis (Salmanzadeh, 2016).

Studies show that learners' perceptions of e-learning have a significant impact on their satisfaction, thinking levels, performance and academic progress, students who have online learning experience, their perception also has variable durability and quality. Also, four factors can be considered for success and satisfaction in e-learning: 1. Indicators related to teachers, 2. Indicators related to students, 3. Information technology and infrastructure, 4. Educational system support (Nava, 2010).

One of the types of distance education is electronic learning, which is based on information and communication technology and in which electronic tools such as audio, visual, and computer are used for learning. Educational messages are presented to the learner in the form of text, audio, image and graphics through the educational program (Wanita et al., 2019). In terms of communication, electronic education can be divided into two major categories: simultaneous and non-synchronous. In simultaneous e-learning, all participants must be present in the classroom at the same time. In asynchronous e-learning, educational content is provided from a web server and sent to the learner's computer. Therefore, learners can receive their courses whenever they want (Fallon and Brown, 2019). Electronic learning has several components and elements such as: goals, electronic content, learning activity, learning materials and resources, learning management system, characteristics of the teacher or trainer, characteristic of the electronic learner (Saraji and Attaran, 2017). Considering the characteristics and quality of each of them can help to improve the quality of the virtual curriculum, hence one of the elements of electronic learning is the skills and characteristics of the electronic learner. The input characteristics of the learner include the attitudes and prerequisite skills that learners must have to enter the education process (Gonchals-Ness et al., 2021). Identifying these features helps the designer and manager of e-learning to make realistic decisions about each of the elements of education such as: content, how to sequence content, how to present, how to design activities, how to support learners, and how to choose evaluation tools (Morrison et al., 2004).

The skills needed by the e-learner that can affect the quality of education in virtual courses include: access to technology, experience and skill in using technology, learning styles independent of the context, study skills and habits, goals, lifestyle and characteristics. It is them (Hammons, 2020). The conducted research shows that self-efficacy plays a powerful role in shaping individual behavior and successful achievement of goals and motivation for progress (Stice et al., 2006). Also, studies show that self-efficacy as an important motivational behavior leads to high levels of progress (Marzdar Rudbarki, 2015). Bandura (2006) introduced the concept of self-efficacy to psychology literature. Self-efficacy is one of the important concepts

in Bandura's social-cognitive theory. In the social-cognitive theory, self-efficacy is the feeling of competence, sufficiency and ability to cope with life (Basol, 2010). High levels of academic self-efficacy lead to higher average grades and persistence in completing assignments. As a result, students who have higher academic self-efficacy have higher academic adaptability and use more useful learning strategies, and as a result, they will perform better (Hosseininia, 1401). Researchers state that self-efficacy leads to more involvement and, as a result, better learning and progress (Bansalem and Edari, 2022).

Also, studies show that students' participation can be effective on the teaching and learning processes and students' academic progress (Naji Ellibavi, 2019), there are different ways to learn. Some methods rely on memory and memory, and the learner only memorizes the material presented by the teacher, but some learning methods force the person to think, in this way, the person is not only passive, but He learns quite actively (Irimias et al., 2022). One of the effective strategies in the learning process at the disposal of teachers is the participation of students, which emphasizes the activity and work of learners with each other and in such a way that group members have internal solidarity, responsibility and accountability, etc. to achieve They strive for common goals (Kalmar et al., 2022). This important thing requires the presence of the teacher in the role of guide and facilitator and provider of the situation and educational materials, and the main operators of the cycle of teaching and learning process are the learners of the classes (Khalki, 2018). In modern educational methods, they emphasize the participation of students in the inclusive teaching-learning process and the interaction of the individual with the environment. It does not ignore the background of the learners and they use it to reconstruct the experience in the present and guide the future experiences and to the needs and desires and interests, the ability to help and get help from others and communicate effectively with others. In such a way that this relationship is acceptable, valuable and profitable for the individual and the other party (Abashzadeh Oaratepe, 2018).

Therefore, the main problem of the current research and the important problem that the current research seeks to explain can be that in the country, despite the many efforts made to make schools more effective, the weakness of schools in the field of students' critical thinking is still under serious criticism. The negative scientific results obtained from the participation of Iraqi students in the international studies of Thames and Pearls, as well as the educational waste in its many forms, which is imposed on the country's education system every year, raises the serious question of what factors are responsible for the emergence of these issues and the expansion of educational inequalities. has an effect and how can one create an educational environment with vitality and successful experience for students by harnessing them, according to what was raised, the main goal of the current research is to answer the question of whether electronic education has an effect on the critical thinking of students with the role Does student participation have an effect on academic self-efficacy?

Research Method

The present research is a descriptive and correlational research in terms of practical purpose and in terms of data collection method. The statistical population of the research is 1832 high school students of Kufa city. Using random cluster sampling, 320 people were selected as a statistical sample, Cochran's formula was used to estimate the sample size. The method of data collection is field and the questionnaire tool was used as follows:

Electronic Education Questionnaire: The electronic education questionnaire was designed and validated by Malik Hashem (1402), this questionnaire contains 30 closed-ended items based on

the five-point Likert scale, the questionnaire measures the four dimensions of reaction, learning knowledge, behavior and results. This questionnaire has been validated by Malik Hashem (1402), in the mentioned research, the reliability of the questionnaire was reported as 0.88 based on Cronbach's alpha coefficient.

Academic Self-Efficacy Questionnaire: Academic Self-Efficacy Questionnaire was designed and validated by Morris (2001), this questionnaire contains 21 closed-ended items based on Likert's five-point scale, the questionnaire measures the three dimensions of social self-efficacy, emotional self-efficacy, academic self-efficacy. gives, this questionnaire has been validated by Derfashan (2012), in the mentioned research, the reliability of the questionnaire was calculated based on Cronbach's alpha coefficient of 0.85.

Questionnaire of students' participation: Questionnaire of active participation in school was designed and compiled by Wang et al. (2011) in order to actively participate in school. This questionnaire has 14 questions, two cognitive and emotional subscales, and 4 components of enthusiasm for learning, sense of belonging in school, self-directed learning, and the use of cognitive strategies, and measures active participation in school based on the Likert scale. In Iran, it has been validated by Hossein Khani and colleagues (2014) in elementary schools. In the mentioned research, the reliability of the questionnaire was calculated based on Cronbach's alpha coefficient of 0.78.

Critical thinking questionnaire: The critical thinking questionnaire was designed and validated by Ritex (2003), this questionnaire includes 33 closed-ended items based on the five-point Likert scale, this scale consists of three subscales: creativity, cognitive maturity, and mental engagement. The reliability of this questionnaire was reported by Nazari (2015) by Cronbach's alpha coefficient of 0.81 for the entire sample.

The face and content validity of all the questionnaires were confirmed, and the reliability of the questionnaire was based on Cronbach's alpha coefficient of 0.86 for the e-learning questionnaire, academic self-efficacy 0.92, learning motivation 0.88, student participation 0.90, academic progress 0.84. Critical thinking was 0.87, higher thinking was 0.78, and knowledge satisfaction was 0.89. The analysis of the results of this research was done using SPSS22 and Lisrel statistical software at two descriptive and inferential levels. At the level of descriptive statistics, statistics such as mean and standard deviation, skewness and kurtosis were used, and at the inferential level, coefficient tests were usedPearson's correlation was used to check the relationship between the research variables due to the normality of the data, and structural modeling was used in Lisrel software to check the research hypotheses.

Research Findings

In Table 1, descriptive indices of the variables including mean, standard deviation, skewness and kurtosis are presented. Klein (2011) suggests that in causal modeling, the distribution of variables should be normal. He suggests that the absolute value of skewness and elongation of variables should not be more than 3 and 10 respectively.

Variable	Average	standard deviation	Crookedness	Elongation
E-learning	3/13	0/37	-1/04	2/84
Efficacy educational	3/16	0/64	-0/52	1/03
Student participation	3/46	0/63	-0/68	1/59
Critical Thinking	3/39	0/71	-0/23	0/78

Table 1: Descriptive Indices of Research Variables.

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According to table number 3-4, the absolute value of skewness and elongation of all variables is less than one. Therefore, this presupposition of causal modeling, i.e. univariate normality, is maintained. One of the presuppositions of structural modeling is the correlation matrix between research variables (Klein, 2011). Table No. 2 - the correlation matrix of research variables are presented.

Number	Variable	1	2	3	4	5
1	e-learning	1				
2	Academic self-efficacy	0/63**	1			
3	Student participation	0/69**	0/69**	1		
4	Critical thinking	0/62**	0/66**	0/78**	1	

Table 5-4: Correlation Matrix of Research Variables.

*p<0.05, **p<0.01.

In the following, in order to analyze the hypotheses of the research, structural equations were used, and the results of the analysis are presented below.



Chi-Square=138.04, df=49, P-value=0.00000, RMSEA=0.071 Diagram 1- Tested Research Model in Standard Mode.

According to the information in chart 1, the direct effect of electronic education (0.23) with a T-statistic of 2.75, academic self-efficacy (0.40) with a T-statistic of 3.96, and student participation (0.52) with a T-statistic of 5.45 on thinking Criticism is positive and significant at a significance level of 0.01. Also, the indirect effect of electronic education (0.24) with a T-statistic of 2.98 on critical thinking with a mediating role of academic self-efficacy is positive and significant at a significant at a significance level of 0.01. The indirect effect of electronic education (0.33) with a T-statistic of 3.41 on critical thinking with the mediating role of student participation is positive and significant at a significance level of 0.01.



Chi-Square=138.04, df=49, P-value=0.00000, RMSEA=0.071

Chart 2- The Tested Model of the Research is Significant.

In Table 3, the values obtained in the present study and the acceptable limit of each of the fit indices are reported. According to this table, all the fit indices are at the optimal level and it can be concluded that the tested model has a good fit with the collected data.

AGFI	GFI	CFI	RMSEA	X²/df
The obtained amount				
0/83	0/91	0/92	0/071	2/81
Acceptable limit				
More than 0/80	More than 0/9	More than 0/90	Less than 0/1	Less than 3

Table 3- Characteristics of Suitability of Adaptation.

In the following, a summary of the results of the research routes tested in the route analysis is presented in Table 4.

Table 4- Paths Tested in the Structural Equation Model on Critical Thinking of E-Learning.

Indirect effects e-learning	Direct effects	Variables
	0/23**	E-learning
0/24**	0/40**	Academic Self-efficacy
0/33**	0/52**	Student participation
	p<0.01 **p<0.05*	

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Discussion

The analysis of research data showed that the impact of e-learning on students' critical thinking is positive and significant. In the research of Santos-Menzes et al. (2023), the effect of elearning courses on students' critical thinking was reported to be positive and significant. In the study of Liu et al. (2021), they reported the effect of a combined method based on electronic education in improving positive and meaningful critical thinking. Liang and Fang (2020) reported that the effect of the web-based educational program Quest for practicing critical thinking is positive and significant. Ebadi and Rahimi (2018) showed the impact of web-based online education courses in the development of positive and meaningful learners' critical thinking. The results are consistent with the findings of the present study because they reached similar results. In line with the results obtained, it can be stated that the development of information and communication technology, especially the Internet, has created a new model in the process of teaching and learning, e-learning is a new educational system in which the entire process of teaching and learning through technology Information and communication takes place. Extraordinary flexibility, students, and not depending on space and time limitations is one of the basic characteristics of e-learning, e-learning provides a context for learners to develop the most effective learning methods and strategies, the application of cognitive and metacognitive strategies has the most powerful effect. in learning and thinking of learners. Cognitive and metacognitive strategies are a powerful tool to reveal how the learning process develops, and these strategies increase self-learning skills, promote learner independence and critical thinking in students. In the shadow of electronic education and the use of teaching methods such as the concept-oriented model of development, critical thinking can be provided. The thinking-oriented classroom is more compatible with the patterns of curriculum design and concept-based education. These patterns deal with cultivating the mind while acquiring knowledge, definitely different from the traditional patterns. Critical thinking requires the ability to critically assess factual information; connecting it with previous knowledge; Understanding patterns and relationships; meaningful understanding at the conceptual level; rational judgment based on available evidence; The transfer of understanding is appropriate to the time or situation, as well as the use of conceptual understanding to creatively solve a problem or create a product, a process, or a new idea that e-learning can provide. The analysis of the sixth hypothesis of the research showed that the effect of e-learning on students' critical thinking with a mediating role of academic self-efficacy, learning motivation and students' participation is positive and significant. Tsang et al. (2022) reported the effect of multidimensional teaching strategy on self-efficacy and thinking style tendencies as positive and significant. In the study of Santos-Menzes et al. (2023), the mediating role of participation in e-learning on positive and meaningful critical thinking was reported. The results are consistent with the findings of the present study because they reached similar results. In explaining the obtained results, it can be stated that e-learning provides a context for students to participate in the learning process with more motivation and academic enthusiasm for the ease of access to information and educational content, which leads to the improvement of their self-efficacy. The main feature of e-learning, in addition to easy access to information, is its communicative and interactive features, which are philosophically based on a constructivist and collaborative perspective, e-learning is organized in such a way that there is enough opportunity for learners to interact with their classmates. teachers and other educational factors will be provided, in the context of this interaction, the motivation to learn knowledge will increase and they will believe that they have the ability to solve problems and carry out educational processes, as a result, the conditions for creating critical thinking in

students will grow. In this regard, it can be seen that students analyze, evaluate, infer, inductive and comparative reasoning in dealing with academic issues and situations, and try to increase the optimal range of behaviors by using strategies and cognitive skills. Those who have this type of thinking have clarity of positions, correction of attitudes and reduction of pressure caused by conflicts and imposed beliefs.

The emergence of new theories of learning and teaching, the paradigm shift from teacher-centered to learner-centered, as well as the growth and evolution of new means of communication have provided a context for the educational systems of the new age to free themselves from the fence of location dependence by using new methods of teaching and learning. And when it is freed and can provide the desired training anywhere and everywhere according to the needs and wishes of the learners. In this regard, electronic education provides a context for students to understand the concept and evaluate concepts and materials from different angles, conceptual understanding is a key aspect of learning and one of the important goals of teaching is to help students understand the basic concepts of a subject. It is a place to keep them like a parrot. When in e-learning, a subject is examined in depth and interesting examples are presented about a specific concept, it adds to the conceptual understanding of most students. Concepts are the building blocks of thinking, traditional patterns of curriculum design lack a database with a strong conceptual structure; For this reason, they cause superficial teaching and learning. More importantly, each discipline has an inherent conceptual structure; As the information base in the discipline expands, the importance of the role of these conceptual structures in modeling, categorizing and processing new information is also increasingly revealed. As much as the level of factual information increases, a higher level of abstraction and abstraction becomes necessary for the organization and processing of information. Therefore, elearning provides access to high levels of thinking, including metacognitive skills and problem solving ability. In line with the results, it is suggested that electronic learning should be given more value in educational systems. The facilities of this learning process should be prepared in schools. How to use electronic education equipment and facilities for effective use of students should be taught. Students should be equipped with the basic skills of working with computers. Electronic training workshops should be held several times a week and students should also participate. It is suggested that Madrasas be equipped with continuous technologies, to eliminate repeated disturbances in the electronic education network. Classrooms should be equipped with computers with appropriate hardware features. All students have access to the required software. It is suggested that there are video broadcasting facilities in all classrooms so that students can be in regular contact with the lecturer in e-learning and the lecturers are used up-to-date.

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