The Effect of E-Learning on Academic Progress, Critical Thinking, Higher Thinking and Student Satisfaction with the Mediating Role of Academic Self-Efficacy, Learning Motivation and Student Participation

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Abstract

The purpose of this research was the effect of e-learning on academic progress, critical thinking, higher thinking and student satisfaction with the mediating role of academic self-efficacy, learning motivation and student participation. he method of the current research was descriptive correlation type with path analysis 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 research data, from eight standard questionnaires, e-learning by Malik Hashim (1402), academic self-efficacy by Morris (2001), academic motivation by Harter (1981), student participation by Wang et al. (2011) , academic progress from Salehi (2014), critical thinking from Ritex (2003), higher level thinking from Abdi et al. (2014), satisfaction with education was used by Ahmadi (2016). The validity and reliability of the questionnaire was confirmed. Data analysis was done using Pearson's correlation coefficient analysis and path analysis in SPSS and Lisrel statistical software. The results showed that the effect of e-learning on academic progress, critical thinking, higher level thinking and satisfaction directly and with the mediating role of academic self-efficacy, learning motivation and participation of students was positive and significant.

Keywords: *E-learning, Academic Progress, Critical Thinking, Higher Thinking, Academic Satisfaction, Academic Self-efficacy, Learning Motivation, Student Participation.*

Introduction

Academic progress is one of the most important criteria in assessing students' ability to complete their education and reach the graduation stage, playing a significant role in predicting learners' future status in terms of acquiring the necessary scientific and practical skills (Vanden, 2019). In psychology, progress is referred to as a response or action that leads to achieving a goal. However, in education, progress is applied to a degree of efficiency where the individual, based on their abilities, reaches satisfaction from their own advancements (Labrag, 2021). Contrary to academic progress, terms such as failure or loss are often mentioned, which can be interpreted as lack of success in education, early dropout, repeating grades and courses, an inappropriate ratio between learner's educational years and prescribed years, low quality of education and learner achievements compared to what should be, acquiring memorization

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instead of knowledge that is forgotten in a short time, the educational system not achieving its original goals, and even unemployment among graduates due to the mismatch between their education and the society's job needs (Abutalebi, 2020)

In addition to this issue, critical thinking is a reasoned and insightful thinking about what to believe and what actions to take (Rimini, 2014). Researchers in the field of critical thinking state that decision evaluation should be done through logical and systematic reasoning, and evidence-based solutions are considered critical thinking (Sivachi and Altas, 2022). There are different opinions about the constituent skills of critical thinking; some studies have shown that the elements or skills constituting critical thinking are expressed as follows: seeking a clear statement of the subject or question, searching for reasons, making efforts to obtain comprehensive information, using and citing credible sources, considering the general situation and the main point, avoiding the increase of the main problem of interest, searching for different aspects, being flexible and adopting a bias-free position, being as accurate as possible, and regularly dealing with each component of the overall situation (Sarbazafar, 2014). The examination of studies indicates that cognitive, metacognitive, and constructivist theories support strengthening and nurturing critical thinking in the teaching process. Cognitive theorists view students in the learning process as active information processors; those who experience and engage in information search for problem-solving. They use what they find useful in their minds for solving new problems and actively choose, exercise, pay attention to, or ignore instead of being passively influenced by the environment. Therefore, cognitivists consider the learning situation to be one of the most important factors in the learning process (Zigmond and Schaufer, 2014). From the perspective of metacognition, a student should have active self-monitoring of their mental processes and regulate and reconstruct their mental activities. Some even believe that cognitive and metacognitive abilities and skills begin to grow around the ages of five to seven and many students experience significant growth (Miller and Malcolm, 2018). Another theory supporting critical thinking is "constructivist theory," which itself has its roots in cognitive thinking. The philosophical foundation of this approach is based on the "epistemological fallibility principle." Constructivists, like cognitive psychologists, consider learning as a process of constructing meaning through experience and believe that curriculum implementers should create a situation where students engage in critical thinking through argumentative discourse that facilitates interaction and analysis (Salmanzadeh, 2017).

Contrary to many researchers who believe that specialized knowledge and thinking skills for professionals and future citizens are not as important as the ability to learn and construct new information (Fisher et al., 2011). One of the most important of these thinking skills is the skill of higher-order thinking skills. The growth and development of these higher-order thinking skills have been recognized by some researchers as a prominent factor that, regardless of the future role of students, provides the conditions for their transformation, change in knowledge and skills, and movement towards responsible action (Mehrari, 2018). Thinking skills are mental capacities used to explore the world, solve problems, and make judgments (Lucasian, 2013). Thinking skills are divided into two categories: lower Order Thinking Skills (LOTS) and Higher Order Thinking Skills (HOTS). Higher Order Thinking Skills (HOTS) are based on lower Order Thinking Skills (LOTS) such as Distinguish, analysis, and Simple Use and content-related strategies (Lee et al., 2023). Bloom's taxonomy classifies levels into knowledge, which is the ability to recall information, comprehension, which is understanding the meaning of topics, application, which is the ability to apply information in new ways, analysis, which is the ability to break down and analyze information into components, synthesis, which is the ability

to gather different parts of information together, and evaluation, which is the ability to judge or evaluate information (Soltis et al., 2015). High-level thinking skills belong to the highest levels of Bloom's taxonomy, which Bloom (1956) describes as a general method of thinking and problem-solving that is applicable in various subject areas (Zakery, 2013).

Moreover, studies show that satisfaction in education can not only determine the level of enjoyment experienced by students but also determine the effectiveness of the provided education (Joseph et al., 2018). Satisfaction is defined as the perception of the gratification of needs and desires (Negricea et al., 2014). According to Letcher (2010), satisfaction is an evaluation by students based on the performance documents of a specific exchange. School has a profound impact on students' lives and plays a central role in defining students' overall feelings about society. The sense of belonging and attachment to school is related to positive educational and psychological outcomes such as self-perception, social skills, motivation, success, and academic progress. Satisfaction with education, student motivations, and successful completion of the academic course can also be considered as positive outcomes of the sense of belonging and attachment to school (Naibi, 2021).

Studies indicate that learners' perceptions of e-learning have a significant impact on their satisfaction, levels of thinking, performance, and academic progress. Students who experience online learning have varying and lasting perceptions of its quality. Additionally, four factors can be considered for success and satisfaction in e-learning: 1. Teacher-related indicators, 2. Student-related indicators, 3. Information technology and infrastructure, 4. Educational system support (Navah, 2010).

one of the types of distance education is electronic learning, which is based on information and communication technology. In electronic learning, electronic tools such as auditory, visual, and computer-based elements are used for learning. Educational messages are presented to the learner through text, audio, images, and graphics via educational programs (Vanitha et al., 2019). Electronic learning can be categorized into two main types based on synchronicity: synchronous and asynchronous. In synchronous e-learning, all participants must be present in the virtual class simultaneously. In asynchronous e-learning, educational content is delivered from a web-based server to the learner's computer, allowing learners to access their courses at any time (Fallon & Brown, 2020). Electronic learning involves various components and elements, including goals, electronic content, learning activities, learning materials and resources, learning management systems, teacher or instructor characteristics, and electronic learner characteristics (Seraji & Ataran, 2018). Consideration of the characteristics and qualities of each of these elements can contribute to the improvement and quality of virtual curricula. Therefore, one of the elements of e-learning is the skills and characteristics of electronic learners. Learner input characteristics include attitudes and prerequisite skills that learners need to have to enter the learning process (Gonçalves et al., 2021). Identifying these characteristics helps the designer and manager of e-learning to make informed decisions about each of the instructional elements, such as content, sequencing of materials, presentation methods, activity design, learner support methods, and the selection of assessment tools (Morrison et al., 2004). The required skills of electronic learners that can impact the academic quality in virtual courses include access to technology, experience and skills in technology application, independent learning styles, reading skills and habits, goals, lifestyle, and their characteristics and traits (Hammons, 2020).

Research indicates that self-efficacy plays a powerful role in shaping individual behavior, achieving successful goals, and motivating progress (Stajkovic et al., 2006). Studies also show

that self-efficacy, as a crucial motivational behavior, leads to high levels of progress (marzdar roodbaraki 2016). Bandura (2006) introduced the concept of self-efficacy into psychological literature. In the social-cognitive theory, self-efficacy is the sense of competence, efficiency, and capability in coping with life (Basol, 2010). Higher levels of academic self-efficacy lead to higher grades and stability in completing tasks. Therefore, students with higher academic self-efficacy have higher academic adaptability, employ more effective learning strategies, and consequently perform better (Hosseini Nia, 2022). Researchers suggest that self-efficacy leads to increased engagement, resulting in better learning and progress (Bensalem and idri, 2022).

Among the factors related to the academic progress of learners, their learning motivation is significant. Learning motivation is considered a means for mental preparedness or prerequisite input behavior for learning, and learning itself can be a cause for its emergence or decline. Deep and successful learning leads to increased motivation for reading and research in students, resulting in high academic progress (Ghobadi and Piri, 2013). Learning motivation guides and directs students' academic activities. In other words, learning motivation represents the personal and individual reasons for students to perform or avoid a task or academic activity (Gulacar et al., 2020). According to Mei and colleagues (2020), motivational strategies for learning are one of the most influential components of learning, and if educators pay attention to this component, learning environments will be more engaging and lively for learners. The type of learning motivation in students significantly affects the level of learning and the use of their cognitive strategies, being one of the determining factors in academic success (Baqeri Fard, 2019).

Studies indicate that student participation can be effective in the processes of teaching, learning, and academic progress (Naji allibawi, 2020). There are various methods for learning. Some methods rely on memorization and memory, where learners only memorize the materials provided by the teacher. However, some learning methods encourage individuals to think actively, allowing them not only to be reactive but to learn in a completely active manner (Irimias et al., 2022). One effective strategy in the learning process available to teachers is student participation, emphasizing the collaborative activities and work of learners with each other. In this approach, group members work together with internal cohesion, responsibility, and accountability to achieve common goals (Kalmar et al., 2022). This requires the teacher to play a guiding, facilitating, and organizing role, with learners being the main operators of the teaching and learning cycle in the classroom (Khalghi, 2019). In modern teaching methods, the emphasis is on student participation in the teaching-learning process, making it learner-centered and focusing on individual interaction with the environment. These methods consider learners' backgrounds for reconstructing their experiences in the present and guiding future experiences. They support learners' needs, desires, interests, and the ability to help and receive help from others while establishing effective relationships with others in a way that these connections are acceptable, valuable, and beneficial for both the individual and the other party (Abesh Zadeh Ghareh Tappeh, 2019).

Therefore, the main issue of the current research and the significant problem that this research aims to elucidate is that, despite the abundant efforts made to enhance the effectiveness of schools in the country, schools still face criticism for their weaknesses in academic progress, critical thinking, higher-order thinking, and student satisfaction. The low scientific results obtained by Iraqi students in international studies such as TIMSS and PIRLS, along with the educational waste in various forms imposed on the country's educational system every year,

raise a serious question about the factors influencing the emergence of these issues and the spread of educational inequalities. How can these factors be mastered to create an educational environment with activity and successful experiences for students? Given the above, the primary objective of the current research is to answer the question of whether e-learning affects academic progress, critical thinking, higher-order thinking, and student satisfaction with the mediating role of academic self-efficacy, learning motivation, and student participation or not.

Research Methodology

The present research is applied in terms of purpose and descriptive-correlational in terms of data collection method. The statistical population of the research consists of high school students in the city of Kufa, totaling 1832 individuals. Using a clustered random sampling method, 320 individuals were selected as the sample size. The Cochran formula was employed to estimate the sample size. The data collection method is field research, and the instrument used is a questionnaire as follows:

1. E-learning Questionnaire: The e-learning questionnaire was designed and validated by Malek Hashem (2023). This questionnaire includes 30 closed-ended items based on a five-point Likert scale. It assesses four dimensions: reaction, learning knowledge, behavior, and results. The reliability of the questionnaire was reported as 0.88 based on the Cronbach's alpha coefficient in the mentioned research.
2. Academic Self-Efficacy Questionnaire: The Academic Self-Efficacy Questionnaire was designed and validated by Morris (2001). This questionnaire consists of 21 closed-ended items based on a five-point Likert scale. It assesses three dimensions of self-efficacy: social, emotional, and academic. The questionnaire was validated by Derakhshan (2013), and its reliability in the mentioned research was calculated as 0.85 based on the Cronbach's alpha coefficient.
3. Scientific Motivation Questionnaire: This questionnaire is a modified version of Harter's Academic Motivation Questionnaire (1980-1981), consisting of 33 items scored on a 5-point Likert scale. This tool is a modified form of Harter's scale (1980-1981) used to measure academic motivation. As mentioned, Harter's original scale measures academic motivation with bipolar questions, where one pole is intrinsic motivation, and the other pole is extrinsic motivation. The reliability of this questionnaire, as reported by Zahirinav and Rajabi (2009), is 0.92 based on the Cronbach's alpha coefficient.
4. Student Participation Questionnaire: The Student Participation Questionnaire, designed and developed by Wang et al. (2011), consists of 14 questions covering cognitive, emotional, and behavioral sub-scales. It includes four components: enthusiasm for learning, sense of belonging to school, self-directed learning, and the use of cognitive strategies. The questionnaire uses a Likert scale to measure active participation in school. In Iran, it has been validated by Hossein Khani et al. (2015) in elementary schools, reporting a reliability of 0.78 based on the Cronbach's alpha coefficient in the mentioned research.
5. Academic Progress Questionnaire: The Academic Progress Questionnaire, designed and validated by Salehi (2015), consists of 50 closed-ended items scored on a five-point Likert scale. Salehi (2015) validated this questionnaire during the research process. The validity of the questionnaire was confirmed by experts and confirmatory factor analysis. The reliability of the questionnaire was also reported as 0.86 based on the Cronbach's alpha coefficient.
6. Critical Thinking Questionnaire: The Critical Thinking Questionnaire, designed and validated by Retz (2003), consists of 33 closed-ended items scored on a five-point Likert scale. The scale comprises three sub-scales: creativity, cognitive maturity, and mental

engagement. The reliability of this questionnaire, as reported by Nazari (2016), is 0.81 based on the Cronbach's alpha coefficient for the entire sample.

7. Higher-Order Thinking Questionnaire: The Higher-Order Thinking Questionnaire, designed and validated by Abdi et al. (2014), comprises seven closed-ended items scored on a five-point Likert scale. Moradi (2018) validated this questionnaire, reporting a reliability of 0.81 based on the Cronbach's alpha coefficient.

8. Satisfaction with Education Questionnaire: The Satisfaction with Education Questionnaire, designed and validated by Ahmadi (2009), consists of 30 items scored on a five-point Likert scale. It includes four sub-scales: satisfaction with the school, satisfaction with the academic field, attitude toward education, and satisfaction with teacher behavior. Sheikh al-Islami and Ahmadi (2011) validated this questionnaire, reporting a reliability of 0.73 based on the Cronbach's alpha coefficient in the mentioned research.

The face and content validity of all the questionnaires were confirmed, and the reliability of the questionnaires, based on the Cronbach's alpha coefficient, was as follows: 86.0 for the E-learning questionnaire, 92.0 for the Academic Self-Efficacy questionnaire, 88.0 for the Learning Motivation questionnaire, 90.0 for the Student Participation questionnaire, 84.0 for the Academic Progress questionnaire, 87.0 for the Critical Thinking questionnaire, 78.0 for the Higher-Order Thinking questionnaire, and 89.0 for the Satisfaction with Education questionnaire. The results of this research were analyzed using statistical software, SPSS 22, and Lisrel, at both descriptive and inferential levels. Descriptive statistics such as mean, standard deviation, skewness, and kurtosis were used at the descriptive level. At the inferential level, Pearson correlation coefficient tests were employed to examine the relationship between research variables, taking into account the normality of the data. Additionally, path analysis in Lisrel software was utilized to investigate the research hypotheses.

Research Findings

Table 1: Descriptive Indices of Research Variables.

variable	average	Standard deviation	skew	kurtosis
e-learning	3/28	0/66	-0/13	0/26
Academic self-efficacy	3/29	0/53	-0/39	0/90
Motivation to learn	3/31	0/53	-0/34	0/96
Student participation	3/28	0/54	-0/34	0/89
Academic Achievement	3/46	0/69	-0/17	0/14
Critical Thinking	3/39	0/70	-0/21	-0/07
Higher level thinking	3/25	0/66	-0/20	0/06
Academic satisfaction	3/34	0/68	-0/38	0/39

In Table 1, descriptive statistics of variables, including mean, standard deviation, skewness, and kurtosis, are presented. Klein (2011) suggests that in structural equation modeling, the distribution of variables should be normal. He recommends that the absolute value of skewness and kurtosis for variables should not exceed 3 and 10, respectively. According to Table 4-3, the absolute values of skewness and kurtosis for all variables are less than one. Therefore, the assumption of univariate normality in structural equation modeling is met. The meaningful assumption of structural modeling

is the correlation matrix between research variables (Klein, 2011). Table 2 presents the correlation matrix of the research variables.

Table 5-4: Correlation Matrix of Research Variables.

num	variable	1	2	3	4	5			
1	e-learning	1							
2	Academic self-efficacy	0/58**	1						
3	Motivation to learn	0/68**	0/77**	1					
4	Student participation	0/65**	0/72**	0/73**	1				
5	Academic Achievement	0/68**	0/62**	0/66**	0/63**	1			
6	Critical Thinking	0/50**	0/61**	0/65**	0/59**	0/50**	1		
7	Higher level thinking	0/77**	0/63**	0/72**	0/64**	0/64**	0/69**	1	
8	Academic satisfaction	0/57**	0/59**	0/66**	0/59**	0/56**	0/58**	0/70**	1
						*p<0.05, **p<0.01			

In the following, the path analysis method was used to analyze the research hypotheses, and the results of the analysis are presented below.

Chi-Square=25.86, df=9, P-value=0.29854, RMSEA=0.074
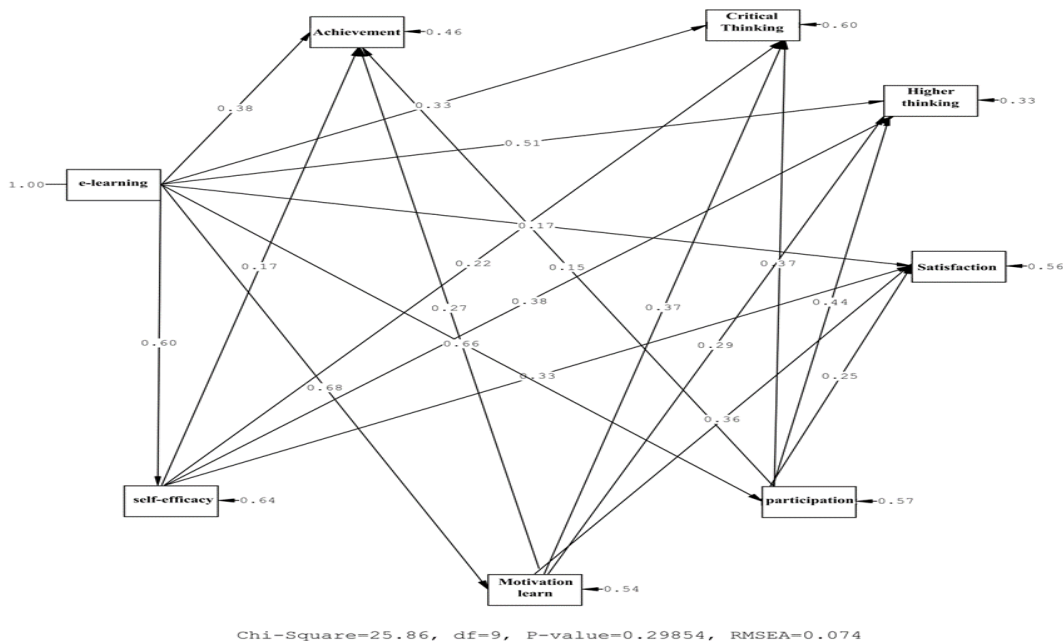
Diagram 1- Tested Research Model in Standard Mode.

Table 3- Goodness of Fit Indices of The Tested Research Model.

index	X2/df	RMSEA	P
Obtained amount	2/87	0/07	0/29

	Acceptable limit	Less than 3	Less than 0.08	More than 0.05

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. 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.

Indirect impact of e-learning	direct impact	variables
		On educational achievement
	0/38**	e-learning
0/11*	0/17**	Academic self-efficacy
0/18**	0/27**	Motivation to learn
0/09	0/17**	Student participation
		On critical thinking
	0/33**	e-learning
0/13**	0/22**	Academic self-efficacy
0/25**	0/37**	Motivation to learn
0/24**	0/37**	Student participation
		On higher level thinking
	0/51**	e-learning
0/22**	0/38**	Academic self-efficacy
0/19**	0/29**	Motivation to learn
0/29**	0/44**	Student participation
		on satisfying
	0/17**	e-learning
0/19**	0/33**	Academic self-efficacy
0/24**	0/36**	Motivation to learn
0/19**	0/25**	Student participation
	p<0.01 **p<0.05*	

Discussion and Conclusions

The analysis of the research findings indicates that the impact of e-learning on students' academic progress is positive and significant. In the study by Shirdel and Rezaei Rad (2022), it was revealed that the use of electronic content in online education has a positive and meaningful effect on academic performance. Tahmasbipour and colleagues (2021) reported that the influence of using electronic content in math courses has a positive and significant impact on academic progress. In a study by Innab and colleagues (2022), the positive and meaningful impact of satisfaction with e-learning on students' academic progress was reported. Al-Salhi and colleagues (2020) demonstrated the positive and meaningful role of university e-books in academic progress. Research by Nursyahidah and colleagues (2018) showed that the effective elements of e-learning in higher education are influential in the academic success of students. The results align with the findings of the present research, as they arrived at similar

conclusions. In line with the obtained results, it can be stated that the development of information and communication technology, especially the internet, has created a new pattern in the process of teaching and learning. E-learning is a modern educational system in which the entire process of teaching and learning takes place through information and communication technology. The extraordinary flexibility, independence from spatial and temporal constraints, and other essential features make e-learning an effective method. E-learning promotes better learning, cognitive progress, comprehension, application, content analysis, and overall academic progress. Learners in e-learning acquire a deeper understanding of the materials, participate confidently in the learning process, and, consequently, experience academic advancement.

The analysis of the second hypothesis of the research indicates that the impact of e-learning on students' critical thinking is positive and significant. In the study by Santos-Mendoza and colleagues (2023), the positive and meaningful influence of e-learning courses on students' critical thinking was reported. Liu and colleagues (2021) found a positive and significant impact of a combined method based on e-learning on improving critical thinking. Liang and Fang (2020) reported that the effect of a web-based instructional program on critical thinking exercises is positive and meaningful. Abadi and Rahimi (2018) demonstrated that web-based online courses positively and significantly contribute to the development of learners' critical thinking. The results are in line with the findings of the present research, as they arrived at similar conclusions. In line with the obtained results, it can be stated that e-learning provides a platform for learners to develop the most effective learning methods and strategies. Cognitive and metacognitive strategies have the most significant impact on learners' learning and thinking. Cognitive and metacognitive strategies are powerful tools for revealing the development process of learning, enhancing self-learning skills, improving learner independence, and fostering critical thinking in students. E-learning, coupled with teaching methods such as concept-based models, can create an environment conducive to the growth of critical thinking. A classroom focused on critical thinking, with curriculum design patterns and concept-based compatibility, has greater adaptability. These patterns foster mental development during knowledge acquisition and are undoubtedly different from traditional patterns. Critical thinking requires the ability to critically assess factual information, relate it to prior knowledge, understand patterns and relationships, comprehend meaningful concepts, make logical judgments based on available evidence, adapt understanding to time or situation, and use conceptual understanding to solve problems creatively or generate a new product, process, or idea, which e-learning can facilitate.

The analysis of the third hypothesis of the research indicates that the impact of e-learning on higher-order thinking of students is positive and significant. In the study by Faramarzi (2019), the positive and meaningful effect of synchronous online discussions on enhancing higher-order thinking skills of learners was reported. In Shafiei's research (1394), it was shown that the relationship between teachers' teaching styles and the development of higher-order thinking skills is positive and meaningful. Li and colleagues (2023) reported a positive and meaningful relationship between students' learning engagements and higher-order thinking skills. In the study by Soltis and colleagues (2015), the strategy of process-oriented inquiry-based learning (WebQuest) positively and significantly influenced higher-order thinking skills. The results align with the findings of the present research, as they arrived at similar conclusions. In line with the obtained results, it can be stated that the emergence of new theories of learning and education, a paradigm shift from teacher-centered to learner-centered approaches, and the growth and evolution of modern communication tools have provided a foundation for new

educational systems. By employing innovative teaching and learning methods, these systems break free from the constraints of time and place and can provide desirable education anywhere and anytime based on the needs and desires of learners. In this regard, e-learning creates an environment for students to engage in deep understanding and evaluate concepts and content from different perspectives. Conceptual understanding is a key aspect of learning, and one of the main goals of teaching is to help students understand the fundamental concepts of a subject instead of memorizing them like parrots. When a topic is thoroughly examined in e-learning, and interesting examples are provided about a specific concept, the conceptual understanding of students often increases. Concepts are the building blocks of thinking, and traditional curriculum design patterns lack a strong conceptual structure; therefore, they lead to superficial teaching and learning. Furthermore, each discipline has an inherent conceptual structure. As the information database in a discipline expands, the importance of these conceptual structures in organizing, categorizing, and processing new information becomes increasingly apparent. Moreover, as the level of factual information increases, a higher level of abstraction and abstraction becomes necessary for organizing and processing information. Therefore, e-learning facilitates the attainment of higher levels of thinking, including metacognitive skills and problem-solving abilities.

The analysis of the fourth hypothesis of the research indicates that the impact of e-learning on the critical thinking of students is positive and significant. In the study by Shirdel and Rezaei Rad (2022), it was reported that the use of electronic content in online education has a positive and meaningful impact on students' academic performance. Esfijani (2018) revealed that blended learning based on information technology has a positive and meaningful effect on student satisfaction. Badleh and Sabety (2017) reported that the web quest-based teaching method has a positive and meaningful impact on the satisfaction of students and teachers. Klement and Dostal (2019) found that the quality of multimedia materials, the use of simulations, and the existence of online discussion forums contribute positively and meaningfully to enhancing virtual students' attitudes. The results are in line with the findings of the present research, as they arrived at similar conclusions. In accordance with the obtained results, it can be stated that e-learning stimulates greater interest and curiosity, discovery of new ideas, and the expansion of beliefs and thoughts in students. In the current knowledge-based era, effective performance in such a society requires sufficient social capital and 21st-century skills, including readiness for accepting e-learning. E-learning considers a process in which students, with or without the help of others, engage in recognizing their learning needs, setting goals, identifying information sources for learning, and implementing appropriate learning strategies. It empowers students to take initiative in their learning. Student satisfaction in e-learning is beneficial in increasing awareness of the educational process and its quality, indicating students' attention and interest in learning and e-learning. Student satisfaction in the e-learning environment is influenced by factors such as communication and interaction, feedback, preparation, and access to areas related to teaching methods, knowledge acquisition, and encouragement. Therefore, considering the impact of e-learning, conditions and environments should always be provided to ensure learner satisfaction.

The analysis of the fifth hypothesis of the research reveals that the impact of e-learning on students' academic progress is positive and meaningful, with the mediating role of academic self-efficacy and positive learning motivation. In the study by Asgari and Rahdari (2021), the positive and meaningful impact of e-learning on students' academic progress with the mediating role of academic self-efficacy was reported. Ramadan (1396) found a positive and

meaningful relationship between emotional intelligence and academic progress with the mediating role of academic self-efficacy. Azizi Shemami and colleagues (2017) reported a positive and meaningful relationship between attitude toward e-learning and students' progress with the mediating role of self-regulation. Esteban and colleagues (2022) reported a positive and meaningful impact of academic self-efficacy and the use of social media on students' academic progress. The results are in line with the findings of the present research, as they arrived at similar conclusions. According to the obtained results, e-learning provides a platform and conditions for students to have the ability to perform primary educational tasks, such as finding required academic resources from libraries and reputable websites, critically evaluating articles, and solving problems. They believe they can succeed in the educational processes. Furthermore, e-learning encourages students to have motivation for learning, an interest in reading and studying because they want to get good grades. It allows them to actively participate in class activities for success and continuously strive for success in their studies. As a result, conditions for students' academic progress are provided. E-learning creates an environment where students have the ability to perform tasks independently, find the necessary academic resources, and engage in critical thinking. It fosters a sense of self-efficacy and motivates students to actively participate in their learning process. The skills acquired from the presented courses contribute to the improvement of academic progress. Academic progress is a key indicator in the evaluation of education and training, and in today's advanced world, it is a crucial sign of individual success, contributing to the development and advancement of any country.

The analysis of the sixth hypothesis of the research demonstrated that the impact of e-learning on students' critical thinking is positive and meaningful with the mediating role of academic self-efficacy, learning motivation, and positive and meaningful student participation. Tsang and colleagues (2022) reported a positive and meaningful effect of multidimensional teaching strategies on self-efficacy and thinking style orientations. In the study by Santos-Mendez et al. (2023), the mediating role of participation in e-learning on positive and meaningful critical thinking was reported. The results align with the findings of the present research, as they arrived at similar conclusions. In explaining the obtained results, it can be stated that e-learning provides a context in which students, due to the ease of access to information and educational content, engage more actively in the learning process with increased motivation and enthusiasm. This leads to the enhancement of their self-efficacy. The main feature of e-learning, in addition to easy access to information, is its communicative and interactive characteristics based on a constructivist and participatory philosophy. E-learning is organized in a way that provides sufficient opportunities for learners to interact with classmates, teachers, and other educational factors. In this interactive environment, learners' learning motivation increases, and they develop the belief that they have the ability to solve problems and perform academic tasks. As a result, conditions are created for the development of critical thinking in students. In this regard, students are observed to analyze, evaluate, infer, inductively and deductively reason when dealing with educational problems and situations. By utilizing cognitive strategies and skills, they strive to expand the range of desirable behaviors. Individuals with this type of thinking demonstrate transparency of positions, correction of attitudes, and reduction of pressure arising from conflicts and generalized beliefs when dealing with issues and educational situations.

The analysis of the seventh hypothesis of the research showed that the impact of e-learning on higher-order thinking of students is positive and meaningful, with the mediating role of academic self-efficacy, learning motivation, positive and meaningful student participation. In

the study by New and colleagues (2023), the impact of blended learning based on online education on thinking skills with the mediating role of positive and meaningful participation was reported. The results are in line with the findings of the present research as they reached similar conclusions. In line with the obtained results, it can be stated that e-learning involves learning experiences and educational technologies. The environment and structure of these teachings lead to the growth of participatory skills in learners since active teaching methods are employed. An important feature of this teaching method is that group members collaborate to achieve a common goal that benefits both the group as a whole and individual member. A crucial factor in the progress of this method is the assistance learners provide to each other in learning course concepts. Thus, motivation for learning is found in interactive environments. Based on this, students enjoy participating in a classroom activity because of the pleasure derived from it, and they pursue solving coursework for the enjoyment and excitement of the challenge, problem-solving, and engaging in a classroom activity. In this process, self-efficacy beliefs grow, and these beliefs are considered the fundamental and central axis of students' motivation. The extent to which students benefit from these beliefs increases their likelihood of success in task completion and can lead to higher levels of thinking. As a result, research skills, problem-solving, exploration and writing, creative thinking, critical thinking, and conceptual thinking grow in students.

The analysis of the eighth hypothesis of the research indicated that the impact of e-learning on student satisfaction is positive and meaningful, with the mediating role of academic self-efficacy, learning motivation, and positive and meaningful student participation. In the study by Woo and colleagues (2023), the impact of group interaction on satisfaction in online learning with the mediating role of academic emotions and positive and meaningful self-regulated learning was reported. Kim and Park (2021) demonstrated a positive and meaningful mediating role of social anxiety in the relationship between e-learning and student satisfaction. The results are consistent with the findings of the present research as they reached similar conclusions. In the context of the obtained results, it can be stated that among the various factors influencing learners' satisfaction, learning motivation plays a prominent and, indeed, a more important role. Therefore, appropriate recognition and analysis of learners' motivation for the efficiency and effectiveness of teaching and learning activities are of great importance. According to the results, e-learning has an impact on students' learning motivation, and this contributes to more effective learning through collaboration. Unlike classroom learning, e-learning is generally characterized by solitary engagement. However, learners still need to establish connections with each other to express their opinions, complete presented information, receive feedback, and identify gaps in their knowledge. Creating such an environment in e-learning is crucial, as it can deepen learning by allowing learners to exchange their experiences and learn from their peers. In this interaction, students engage in tasks and problem-solving in various situations, leading to increased self-efficacy. As a result of these conditions, satisfaction with education is achieved for them. Consequently, in the students' attitudes and feelings toward education, the learning environment, the field of study, and the behavior of teachers will significantly influence their satisfaction.

In line with the obtained results, it is recommended to allocate greater resources to electronic learning in educational systems. Facilities for this learning process should be provided in schools. The method of using electronic learning tools and facilities for effective student utilization should be taught. Students should be equipped with basic computer skills. It is suggested to organize electronic learning workshops several times a week, and students should

actively participate. Schools should be equipped with continuous technologies, and any repetitive disruptions in the electronic learning network should be addressed. Classrooms should be equipped with computers with suitable hardware features. All students should have access to the necessary software. It is recommended that video playback facilities be available in all classrooms so that students can regularly engage with instructors in electronic learning and benefit from up-to-date teaching methods.

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