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Original Article

Structural Equation Model of Perceived Communication Skills and Educational Performance in Online Environments: The Role of Virtual Education and Computer Games

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ABSTRACT

Background: The purpose of the present study was to investigate the correlation between perceived communication skills and educational performance with the mediating role of virtual education and computer games in second-year high school students of Kerman City, Iran.

Methods: The research method used descriptive correlation, and the statistical population of the research was all students in the second year of high school in Kerman City, which was carried out between September 2021 and June 2022. Based on Morgan's sampling table, 291 people were selected by multi-stage cluster sampling, and they answered the questionnaires assessing the communication skills developed by Jerabek (2004), the educational performance test of Pham and Taylor (1999), the technology acceptance model (1986), and a researcher-made questionnaire on the computer games. The data were analyzed using structural equation modeling, with a statistical significance level set at 5%.

Results: The results revealed a significant correlation between communication skills and educational performance and virtual education, particularly highlighting the importance of understanding verbal and nonverbal messages. Understanding of verbal and nonverbal messages positively influenced educational performance (γ=0.141, P=0.025) and virtual education (γ=0.208, P=0.001), while assertiveness showed a strong positive correlation with both educational performance (γ=0.197, P=0.002) and virtual education (γ=0.233, P=0.001). However, insights into the communication process did not demonstrate a significant correlation in these areas. In contrast, the analysis of computer games revealed a negative correlation with determined communication (γ=-0.354, P=0.001) and no significant correlation between other components on educational performance (β=-0.098, P=0.078). Additionally, virtual education had a positive and significant direct correlation with educational performance (β=0.276, P=0.001).

Conclusion: Virtual education enables students to study independently while facilitating peer interaction. Additionally, computer games have been shown to enhance concentration and attention, strengthen mathematical skills, and improve logical reasoning, ultimately leading to improved educational performance.

Keywords: Education, Distance, Communication Skills, Video Games, Educational Performance

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Introduction

In every educational system, students' educational performance indicates success in scientific activities (1). Measuring educational performance and the factors affecting it is one issue that has attracted the attention of various researchers. It has been seen many times that students who are similar in learning ability and talent have significant differences in educational performance; these differences are visible not only in learning lessons but also in other emotional and motivational activities (2).

Chen and Wawrzynski (2021) examined educational performance in virtual education, which has a unique and vital place. Virtual education is active and intelligent learning, which plays a fundamental and pivotal role in expanding, deepening, and stabilizing the culture of ICT while transforming the process of teaching and learning, as well as knowledge management (3). Virtual education is one of the new solutions for developing educational justice in the contemporary world by taking advantage of the advances in the information and communication technology industry. Experts say that learning with the help of fava (information and communication technology) creates a context where existing information can be manipulated or changed (4). Learning in this way is producing new products, not the return of received information unchanged. In this type of learning, new solutions to problems are found.

Education based on information technology allows students to think actively and innovatively and use these ideas jointly. It is one of the essential and exciting topics in education and psychology, which is influenced by personal and situational factors, and according to academic progress and high educational performance, the educational system's success can be shown (5, 6). Educational performance refers to the amount of individual learning measured through tests and how to accomplish the various tasks assigned to them by teachers and professors (7). Educational performance is considered an essential factor because it can be regarded as an indicator of the success of education at a country's level. Educational and psychological researchers tried to identify factors that improve educational performance (8).

Educational performance is the extent to which students achieve predetermined educational goals they are expected to achieve in their learning efforts (1). In all educational systems, students' educational performance is a key indicator of success in scientific endeavors. Numerous observations have shown that students with comparable learning abilities and talents can exhibit significant variations in their academic performance. These discrepancies are evident not only in their mastery of course material but also in their engagement in emotional and motivational activities (9).

The issue of educational performance is one of the critical indicators in the evaluation of education, and this system's efforts are actually to cover this issue (10). Students' success is the primary goal of any educational system, and success in school and university includes gaining appropriate experiences in all aspects of cognitive, emotional, social, behavioral, and biological development (11). One of the influencing variables on educational performance is family communication patterns (12). Lent and colleagues (2013) believed that parents with an effective relationship with their children increase their self-efficacy and self-confidence in facing academic challenges. The experiences people gain in the family play a significant role in their growth (13). In flexible families that emphasize dialogue, high responsiveness, and autonomy, compared to families that emphasize obedience to parents, close interaction, and conformity of opinions and attitudes, children can easily show their emotions and feelings. In such families, tensions are reduced, joint decision-making and role flexibility are increased, and members' progress is considered (14).

Success or lack of success in education is one of the most critical concerns of any

educational system in all societies. Perceived communication patterns also play an essential role in students' educational performance and adaptation. Students who receive parental acceptance are more willing to confront complex challenges and are better equipped to adjust to external circumstances and conditions (15, 16).

Virtual education is one of the applications of modern information and communication technologies worldwide, and many activities have been started in this direction (17). In other words, due to the rapid changes in the surrounding environment, implementing virtual education to provide new services and technologies in teaching and learning has been raised as a basic need (18).

Virtual education is a form of personalized learning that enables students to attain educational objectives aligned with their abilities while developing self-directed learning skills. This aspect is integral to the overarching aims of education, as learning is a lifelong endeavor (19). Virtual education offers several benefits, including the flexibility to learn anytime and anywhere, the ability to tailor the pace and process of learning to meet individual needs, a reduction in time spent on education by approximately 50%, a cost reduction of around 60%, and enhanced learning experiences through the use of multimedia resources (20).

Virtual education represents a significant application of information technology, encompassing various systems, including computer-based learning, online learning, network-based learning, and online education (21). Virtual learning with features such as increasing the quality of learning and the possibility of presenting lessons in a multimedia environment, thus making the content more attractive. Ease of access to a large amount of information and reduction of educational costs, high flexibility, quick collection of feedback and their analysis, strict monitoring and control of the educational system and information, establishing educational justice, supporting a large number of students in a class, Reducing costs related to commuting and saving time, the possibility of benefiting from education at any time and any place, etc. are being replaced by traditional education methods (22).

Virtual learning environments connected to the Internet enable educators and students to establish learning communities. Within these virtual settings, groups of learners engage in discussions and interactions. In such environments, teachers and students partake in thoughtful and meaningful dialogues through the use of computers, as well as text and images displayed on screens. By sharing their ideas, they exchange unique insights and knowledge (23). This collaborative process fosters the generation of new concepts and understandings, allowing participants to learn from each other's cultural backgrounds, ultimately broadening their intellectual perspectives. While this interaction resembles that found in traditional classrooms, a key distinction is that these online communities facilitate friendships and connections on a global scale (24). A crucial advantage of virtual spaces and emerging communication technologies in education is their ability to enhance educational outcomes.

In recent years, computer games have become a social phenomenon, and other audio and visual media in today's world have chosen their primary audience among children and teenagers due to the significant growth of national communication technologies, which have fantastic traction and attraction (25). These games have not only taken up a substantial part of the free time of this group, but it seems that it has taken up even the time they should devote to doing homework or being with the family. The starting age of the games is more than 7 years old, and its peak is 12-13 years old. Computer games are recognized as the second most popular form of entertainment, following television (26).

The influence of computer games in education is also one of the primary and most important topics in computer games. Several studies have confirmed the effects of

computer games on students' learning (27-30). Computer games have become a tool for identifying the users of computer games. The abundant and unlimited interest of people in this emerging phenomenon indicates that computer games can be used as a new tool for identification and, in a word, socialization of users to influence culture in such a way that computer games draw a virtual space and environment for their audience, whose distinctive feature is inclusiveness and unlimited expansion (31).

The relation between students' academic achievement and technological advancements, especially in their use of contemporary tools, reveals a significant trend: the rising interest in video games among individuals. The surge in video game development and their growing intricacy has contributed to this increasing popularity (32). Computer games represent a significant category of cultural products and mass media. Consequently, they hold considerable importance from both social and educational perspectives. For many children and adolescents, these games serve as an initial gateway into information and communication technology, facilitating the development of essential computer skills (33).

Given the significance of communication skills on educational performance and the influence of virtual education and computer games on today's youth, the current research aimed to explore whether virtual education and computer games mediate the correlation between perceived communication skills and educational performance. To address this question, a conceptual model was devised and tested (Figure 1).

Methods

Study Design and Setting

The current study employs a correlational method with a structural equations approach to explore the mediating influence of computer games and virtual education on the relationship between perceived communication skills and students' educational performance evaluations. This investigation is grounded in an existing theoretical framework that links the variables. Specifically, variance-covariance matrix analysis was utilized, and the correlation between the variables were examined using statistical modeling techniques. The research was conducted among secondary school students in Kerman City, Iran, between September 2021 and June 2022.

Participants and Sampling

The current study's statistical population included all 1,143 secondary school students (521 girls and 622 boys) in Kerman City.

Based on Cochran's formula, Karjesi and Morgan's table was employed to determine the appropriate sample size. Given the statistical population of 1,143 individuals, approximately 287 samples were required. Considering the possibility of dropout, questionnaires were distributed to 350 individuals.

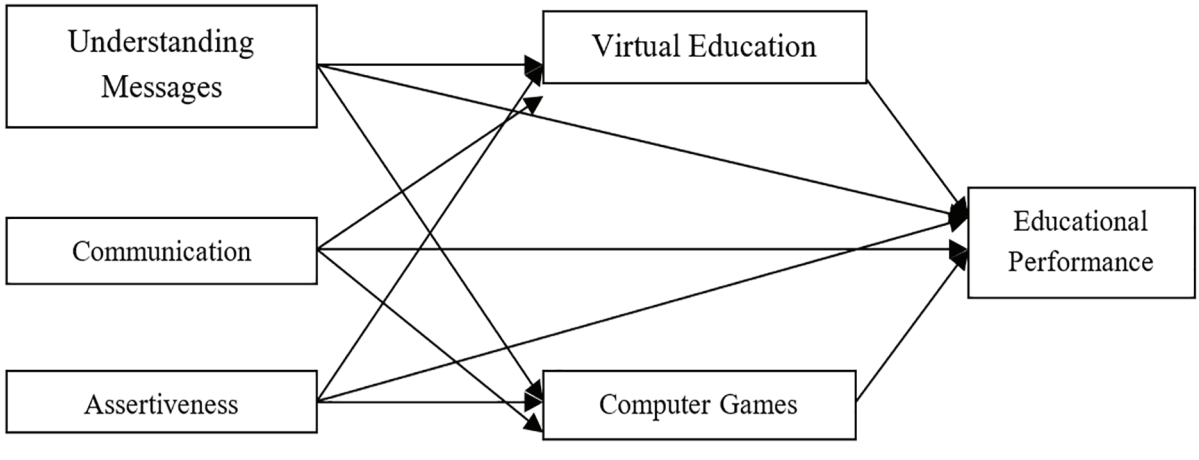

Figure 1: Conceptual model of research

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N}\left[\frac{z^2 pq}{d^2} - 1\right]}$$

A two-stage cluster sampling method was employed for sample selection. Five of the seven secondary schools in the second grade were randomly selected, comprising two girls' and three boys' schools. Subsequently, 10 classes were randomly chosen from these selected schools.

Participants aged between 15 to 18, comprising boy and girl students, who were willing to engage in research activities and virtual education platforms such as the Shad program, Skyroom, Adobe Connect, Google Meet, ETA, and computer games played in a home setting.

One of the criteria for participation in the study was the ability to recall past actions. Additionally, students' dissatisfaction or withdrawal from the test, previous failures, and incomplete questionnaires led to their exclusion from the research.

Tools/Instruments

In this research, four standard questionnaires were used:

a) Communication Skills Questionnaire

The communication skills questionnaire designed by Jerabek (2004) includes five skills: listening skills, understanding verbal and nonverbal messages, insight into the communication process, emotional regulation, and assertiveness (34). The initial English questionnaire consists of 34 items organized into five components. For the current study, a 19-item version was utilized, emphasizing three primary aspects: understanding verbal and nonverbal messages, insight into the communication process, and assertiveness. This version was derived from a standardized Persian version (35) with scores ranging from 19 to 95. However, this study utilized a 5-point Likert scale to calculate the average score of each participant rather than their total score. Each item on the questionnaire is rated from 1 (never) to 5 (always). Hossein Chari and Fedakar (2006) examined this questionnaire in terms of validity and reliability. In their study, construct validity was obtained using the factor analysis method. Also, reliability was obtained by Cronbach's alpha, and the half-split method as 0.69 and 0.71, respectively (35). In the present study, Cronbach's alpha reliability was used, and overall reliability was estimated as 0.86; for the component of understanding verbal and nonverbal messages, it was estimated as 0.81; for insight into the communication process as 0.79, and for assertiveness as 0.79.

b) Educational Performance Test (EPT)

The educational performance questionnaire was developed by Pham and Taylor (1999) to assess the different aspects of educational performance (36). This questionnaire has 48 questions and five dimensions: self-efficiency, emotional effects, planning, lack of consequence control, and motivation. Scoring each item was based on a 5-point Likert scale ranging from "Not at all" (score 1) to "Very much" (score 5). The range of scores in this questionnaire is between 48 and 240, but this study was based on a 5-point Likert scale, and the average score of each participant was used instead of the total score. In Dortaj's research, the content validity of the educational performance questionnaire was confirmed based on the professors' viewpoints. The reliability of the questionnaire was also reported by Cronbach's alpha as 0.74 (37). Based on Noor Mohammadian's research, the reliability of each of the factors of the questionnaire in consecutive order is 0.91, 0.92, 0.73, 0.63, and 0.72 (38). Content validity was also assessed in Qoltash and colleagues' study (39). In this study, the reliability was assessed using Cronbach's alpha, yielding an overall reliability coefficient of 0.97. The reliability for the individual components of self-efficacy was estimated as 0.92, for emotional effects as 0.89, for planning as 0.9, for lack of consequence control as 0.76, and for motivation as 0.88.

c) Virtual Education Questionnaire

An extended technology acceptance model, introduced in 1986, was adopted to evaluate the implementation of virtual education and its various dimensions (39). A standardized Persian version consisting of 21 items across seven dimensions, including intention to use virtual education, attitude toward using, perceived usefulness of virtual education, perceived ease of use, compatibility with virtual education (actual use), current social factors for use, and perceived enjoyment of virtual education was employed. The questionnaire was scored using a 5-point Likert scale. The range of scores in this questionnaire was between 21 and 105, but in this study, the average score of each participant was calculated instead of the total score. The validity and reliability of this questionnaire have been assessed previously in several studies (40-43). The current study assessed reliability using Cronbach's alpha method, with an overall reliability of 0.93. The reliability for the components of intention to use virtual education was estimated as 0.82, for attitude towards using as 0.68, for perceived usefulness as 0.83, for perceived ease of use as 0.82, for actual use as 0.58, for social effects as 0.67, and perceived enjoyment as 0.67.

d) Questionnaire of Computer Games

The computer game questionnaire was researcher-made and consisted of 12 items. These items assessed various attributes of the game, including its level of interest, excitement, diversity, modernity, sound and image quality, visual appeal, concentration required, and time. The questionnaire was scored using a 5-point Likert scale. The range of scores was between 12 and 60, but in this study, the average score of each participant was calculated instead of the total score. The content validity index of each item was 0.70-1.00. The reliability was also estimated at 0.85, determined by Cronbach's alpha for internal consistency.

Data Collection

We used four standard questionnaires distributed in-person by researchers between September 2021 and June 2022. To obtain a sample from the seven second-grade secondary schools, five schools—comprising two girls' schools and three boys' schools we randomly selected. Subsequently, ten classes were chosen at random from these selected schools.

Data Analysis

For data analysis, Pearson's correlation coefficient and structural equation modeling using SPSS V.26 and Amos V.24 software and the Sobel test (indirect effects) using Mplus 7.4 software were used (31).

Ethics—All participants were thoroughly briefed on the study's objectives, specific aims, and potential implications. They were made aware of their right to withdraw from the study at any point without any repercussions. Additionally, the procedures implemented to safeguard the confidentiality and anonymity of their responses were clearly communicated. Informed consent was obtained from all student participants, and ethical approval was obtained from the research deputy of Kerman University.

Results

Demographic Characteristics

Of the 350 distributed questionnaires, 291 were answered entirely. Out of 291 participating students, 137 (47.1%) male students and 154 (52.9%) female students participated, of which 36 (12.4%) belonged to low socio-economic status, 238 (81.8%) belonged to middle socio-economic status, and 17 (5.8%) belonged to high socio-economic status.

Descriptive Findings

Table 1 presents the descriptive statistics for study participants, including means and standard deviations, as well as minimum and maximum scores across various communication and virtual education variables.

Table 1: Descriptive indices of the participant's scores in the variables

Variable	Component	Mean±SD	Minimum score	Maximum score
Communication skills				
	Understanding verbal and nonverbal messages	3.26±0.70	1.75	4.62
	Insights into the communication process	3.21±0.76	1.40	4.80
	Assertiveness	3.09±0.66	1.20	4.60
Educational performance				
	Self-efficiency	2.76±0.89	1.00	5.00
	Emotional effects	2.84±0.86	1.00	4.75
	Planning	2.95±0.79	1.00	4.14
	Lack of consequence control	2.99±0.90	1.00	4.50
	Motivation	2.77±0.72	1.00	4.31
Virtual education				
	Intention to use	2.80±0.96	1.33	5.00
	Attitude towards using	2.71±0.89	1.00	4.67
	Perceived usefulness	2.74±0.99	1.25	4.75
	Perceived ease of use	2.63±0.91	1.50	4.75
	Social factors for use	2.73±0.95	1.00	4.50
	Perceived enjoyment	2.86±0.81	1.00	4.67
	Actual use	2.74±0.80	1.00	5.00
Computer games				
Total Score		2.96±0.38	2.00	4.33

N=291; SD: Standard Deviation

Table 2: Correlation between the latent variables of the research

Variable		Correlation					
		1	2	5	4	5	6
Communication skills components	1) Understanding verbal and nonverbal messages	1					
	2) Insights into the communication process	0.51**	1				
	3) Assertiveness	0.46**	0.31**	1			
Other components	4) Virtual education	0.36**	0.33**	0.36**	1		
	5) Computer games	-0.13**	-0.13**	-0.34**	-0.13**	1	
	6) Educational performance	0.35**	0.34**	0.41**	0.46**	-0.22**	1

P<0.01**

Regarding communication skills, the mean score of "understanding verbal and nonverbal messages" was more significant (3.26±0.70), indicating the most significant level among all variables. Regarding virtual education, the mean score of the "Perceived enjoyment of virtual education" was more significant (2.86±0.81), and regarding educational performance, the mean score of the "lack of consequence control" was more significant (2.99±0.90). Besides, the "perceived ease of use of virtual education" received the lowest score among all the variables (2.63±0.91).

Analytical Findings

Linear Correlation between Variables

As presented in Table 2, the correlation analysis between latent variables revealed a positive and statistically significant correlation between the ability to understand verbal and nonverbal messages and both virtual education (r=0.36, P=0.001) and educational performance (r=0.35, P=0.001). Conversely, a negative and statistically significant correlation was observed with computer games (r=-0.13, P=0.001).

The findings revealed a positive and

statistically significant correlation between insight into the communication process (r=0.33, P=0.001) and educational performance (r=0.34, P=0.001). Conversely, a negative and statistically significant correlation was observed with computer games (r=-0.13, P=0.001). Furthermore, a positive and statistically significant correlation between assertiveness and both virtual education (r=0.36, P=0.001) and educational performance (r=0.41, P=0.001) was observed. Conversely, assertiveness exhibited a negative and statistically significant correlation with engagement in computer games (r=-0.34, P=0.001).

The results showed that a positive and statistically significant correlation between virtual education and educational performance (r=0.46, P=0.001). Conversely, a negative and statistically significant correlation was observed between virtual education and computer games (r=-0.13, P=0.001), as well as between educational performance and computer games (r=-0.22, P=0.001).

Structural Equation Modeling

The results of Table 3 show the fit indices of the analyzed model. The results showed that the value is (RSMEA=0.063, P<0.001, df=90, χ^2=194.73), which indicates the acceptable suitability of the model in society. Also, to determine the suitability of the model with the data, the fit indices were used. The results showed that the smoothed Goodness-of-Fit Index (NFI)=0.95 and the Comparative Goodness-of-Fit Index (CFI)=0.96 indicate the acceptable fit of the model with the data. The value of CFI, according to Mueller (1996), should be above 0.9, and according to Seton and Gore Jr (2006), it should be above 0.95 for the model to have a good fit with the data since it is not affected by the sample size (44, 45). Also, if the Root Mean Square of the Approximation Error (RMSEA≤0.05) is very good, between 0.05 and 0.08, the fit is acceptable, and if it is higher than 0.08, the fit is poor. In this study, the RMSEA was between 0.05 and 0.08, which indicates an acceptable fit (Table 3 and Figure 2).

Correlation between the Variables

Following the analysis of the direct effects of the components of communication skills on educational performance, the results indicated a positive and significant correlation between understanding verbal and nonverbal messages and educational performance (γ=0.141, t=2.23, P=0.025), and also between the assertiveness and educational performance (γ=0.197, t=3.07, P=0.002), while there was no significant correlation for insight into the communication process (γ=0.064, t=0.97, P=0.32).

The results of analyzing the direct effects of the components of communication skills on virtual education indicated a significant correlation between understanding verbal and nonverbal messages and virtual education (γ=0.208, t=3.69, P=0.001), and also between assertiveness and virtual education (γ=0.233, t=3.31, P=0.001), while there was no significant correlation for insight into the communication process (γ=0.08, t=1.14, P=0.25).

Besides, the results of analyzing the direct effects of the components of communication skills on computer games, indicated a significant correlation between assertiveness and computer games (γ=-0.354, t=-5.65, P=0.001), while there was no significat correlation regarding the understanding verbal and nonverbal messages (γ=-0.056, t=-0.86, P=0.38) and insights into the communication process (γ=0.06, t=0.86, P=0.38).

Table 3: Model fit indices

Fitness indicators	(χ^2)	(df)	(χ^2/df)	Sig	(RMSEA)	(NFI)	(NNFI)	(CFI)	(GFI)	(AGFI)
Index value	19.734	90	2.16	0.001	0.063	0.95	0.94	0.96	0.93	0.90

χ^2: Chi-Square; df: degree of freedom; RMSEA: Root Mean Square Error; NFI: Normed Fit Index; NNFI: Non-Normed Fit Index; CFI: Comparative Fit Index; GFI: Goodness-of-Fit Index; AGFI: Adjusted Goodness-of-Fit Index

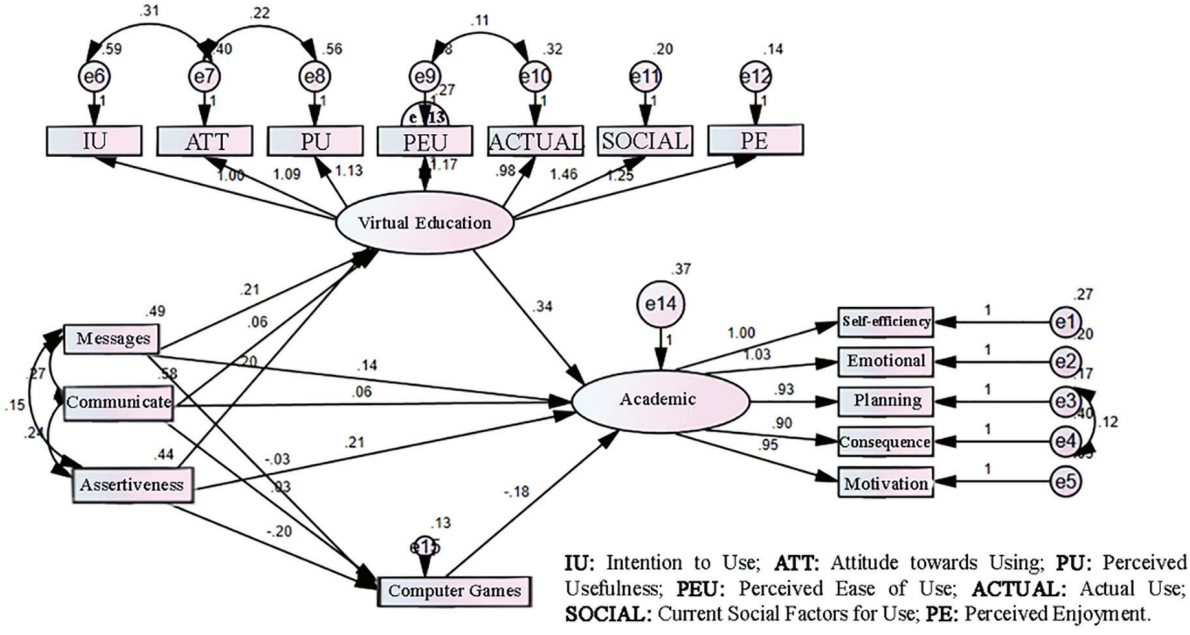

Figure 2: Prediction path diagram based on standardized path coefficients

The direct correlation between virtual education and educational performance was positive and significant (β=0.276, t=4.16, P=0.001), while the direct correlation between computer games and educational performance was not significant (β=-0.098, t=1.76, P=0.078) (Table 4).

The results of Table 5 showed that virtual education has a positive and significant mediating role in correlation

Table 4: Direct effect of communication skills on educational performance, virtual education, and computer games

Endogenous/Exogenous Variables	Unstandardized coefficients γ	Standardized Coefficients β	Standard error	T-value	P-Value
Communication Skills Components * Educational performance					
• Understanding verbal and nonverbal messages	0.144	0.141	0.060	2.23	0.025
• Insight into the communication process	0.061	0.064	0.060	0.97	0.320
• Assertiveness	0.213	0.197	0.060	3.07	0.002
Communication Skills Components * Virtual Education					
• Understanding verbal and nonverbal messages	0.252	0.208	0.050	3.69	0.001
• Insights into the Communication Process	0.061	0.080	0.050	1.14	0.250
• Assertiveness	0.202	0.233	0.050	3.31	0.001
Communication Skills Components * Computer Games					
• Understanding verbal and nonverbal messages	-0.031	-0.056	0.030	-0.86	0.380
• Insight into the communication process	0.030	0.060	0.030	0.86	0.380
• Assertiveness	-0.203	-0.354	0.030	-5.65	0.001
Educational performance * Virtual Education	0.342	0.276	0.080	4.16	0.001
Educational performance * Computer Games	-0.183	-0.098	0.100	-1.76	0.078

Table 5: Mediating role of computer games and virtual education

Variables		Indirect effects			
Exogenous: computer skills		**Unstandardized Coefficients**	**Standardized Coefficients**	**Standard Error**	**T-value**
• Understanding verbal and nonverbal messages	Mediation: Computer Games	0.071	0.069	0.020	2.89
• Insights into the communication process		0.021	0.022	0.010	1.10
• Assertiveness		0.069	0.064	0.020	2.82
• Understanding verbal and nonverbal messages	Endogenous: Educational performance	0.006	0.005	0.007	0.77
• Insights into the communication process		-0.006	-0.006	0.007	-0.77
• Assertiveness		0.037	0.035	0.022	1.67

with understanding of verbal and nonverbal messages and educational performance (β_{IDN}=0.069, t=2.89, P=0.048) and the correlation between insight into the communication process and educational performance (β_{IDN}=0.064, t=2.82, P=0.048). In contrast, it does not have a significant mediating role in correlation with assertiveness and educational performance (β_{IDN}=0.022, t=1.1, P=0.78).

Also, the results of Table 5 showed that computer games play a significant mediating role in correlation with understanding of verbal and nonverbal messages and educational performance (β_{IDN}=0.005, t=0.77, P=0.84), and insight into the communication process and educational performance (β_{IDN}=0.006, t=0.77, P=0.84). At the same time, there is no correlation between assertiveness and educational performance (β_{IDN}=0.035, t=1.67, P=0.42).

Discussion

The study aimed to explore the correlation between perceived communication skills and educational performance in second-year high school students in Kerman City, Iran, with a focus on the mediating roles of virtual education and computer games. The findings highlighted that communication skills, particularly the ability to effectively receive and send messages, significantly impact educational performance. This is consistent with research emphasizing the importance of effective communication in academic settings, where clear messaging by teachers enhances student understanding and academic progress (46, 47).

However, the role of insight in the communication process was found to be less significant in affecting educational performance. This could be due to a lack of effective communication and understanding of emotions, suggesting a need for increased education and awareness among teachers and students (48, 49).

Assertiveness is a crucial communication skill that substantially influences educational performance. When educators demonstrate assertive behavior, it can motivate students to engage more deeply with their lessons and invest additional effort. This is because assertiveness fosters an environment where students feel valued and motivated, ultimately leading to enhanced academic outcomes (46, 50). A positive and statistically significant correlation between assertiveness and both virtual education and educational performance was observed which aligns with previous research (50, 51). Conversely, assertiveness exhibited a negative and statistically significant correlation with engagement in computer games, suggesting that assertive individuals may prioritize academic engagement over such distractions. While there is limited direct research on the negative correlation between assertiveness and gaming engagement, studies on assertiveness

often highlight its role in prioritizing tasks and managing time effectively (52-54).

Virtual education was identified as having a positive mediating role in correlation with communication skills and educational performance, which aligns with Khansari's research. It allows students to access materials independently and interact with teachers and peers through technology, enhancing communication skills and academic engagement (55).

Virtual education had a positive and significant mediating role in correlation between the ability to receive and send messages and educational performance, and a significant role between insight into the process of communication and educational performance. Besides, it had a significant mediating role in correlation with communication combined with assertiveness and educational performance. However, previous studies have not consistently found a significant mediating role of virtual education in correlation between general communication skills and educational performance (56-58). In explaining these findings, if virtual training is conducted with the right information and awareness, it can lead to the correct transmission of messages, enhancing educational outcomes. Virtual education offers valuable advantages by allowing learners to access maximum information in minimal time without time constraints (59, 60). Research conducted by Berry has highlighted the benefits of virtual learning environments in enhancing motivation and collaborative learning, though the impact on academic attainment can vary (61). Furthermore, studies like those by Garrison and Anderson emphasize the importance of communication in educational interactions, suggesting that virtual environments can significantly influence learning outcomes (62). However, inconsistent findings across studies underscore the need for more research to fully understand the role of virtual education in mediating communication skills and educational performance.

Computer games generally did not have a significant mediating role in correlation with communication skills and educational performance. They often focus on individual performance and can distract from educational activities, reducing the time available for more productive learning experiences (63). While games may enhance certain skills, they are not typically designed to improve communication skills relevant to academic success (64, 65).

Computer games may not affect receiving and sending messages, insight into the communication process, and communication with certainty in educational performance for the following reasons:

They mainly emphasize physical and mental skills and are generally played in solo or offline environments. Communication in these games is generally used for coordination in multi-person groups, the possession of general communication skills that are necessary for effective communication in everyday life are not considered in these games (66, 67).

Furthermore, computer games often emphasize individual performance, where the speed of action and personal efficiency are key factors (68). Too much time spent playing computer games is not directly related to education. This time could have been spent reading books, solving exercises, and participating in more productive educational activities. Such games have less impact on a person's ability in communication processes. To progress in this field, it is better to follow other methods such as participating in group discussions and practicing speaking in public meetings (69, 70).

In spite of all, computer games cannot directly affect decisiveness. More decisiveness depends on factors such as experience, skills, and circumstances of the person. Finally, the effect of computer games on assertiveness depends on various factors, including the type of game, the time spent playing, and the style of the player (52, 71-73).

Effective communication involves

accurately sending and receiving messages, which is vital for understanding and conveying information. It also provides insight into the communication process. Some key factors can influence educational performance. The learning style of the person using visual, auditory or practical methods in the insight of the communication process may not have much effect on the academic performance (74-76). Another factor that may affect this issue is the situation of individuals, which can even affect their preferences and learning styles. Some people may have other priorities in their lives, such as part-time work, extracurriculars, family responsibilities, and others. In this case, the person may not have much effect on educational performance, and it helps to commit and focus on education. Students can improve their educational performance by acquiring and progressing in these skills. Consistent with these findings, research by Karimian and colleagues revealed that students in virtual courses, who were mostly married and employed, preferred project-based and multimedia methods, despite they predominantly relied on reading-writing learning styles. This may be affected by the individuals' situations rather than inherent learning tendencies (77).

In virtual education, students have the flexibility to access course materials at their own pace, whenever needed. This approach enables them to enhance their communication skills through technology and study independently, typically following set schedules. Virtual training is now offered online, eliminating the need for in-person meetings, which allows students to learn independently while still interacting with others through digital platforms (78).

Virtual education serves as a positive mediator between communication skills and educational performance. It offers students the flexibility to access course materials independently and interact with peers and teachers through digital platforms, thereby enhancing communication skills and academic engagement. This method allows for self-directed learning and can improve academic outcomes by providing students with more control over their learning pace.

Limitations and Suggestions

This study employed a multivariate approach with rigorous statistical methods. However, it is essential to acknowledge the limitations inherent in using self-report questionnaires and the geographical restriction to students from a single city. Consequently, caution is advised when extrapolating these findings to broader populations. To enhance the validity of the results, replication of this study is recommended. Furthermore, the heterogeneity of statistical samples may influence the outcomes, suggesting the need for future research to be conducted across diverse educational settings, such as schools and universities, to facilitate comparative analyses.

Conclusion

The research underscores the potential of virtual education and computer games as valuable tools for enhancing students' educational performance. Educators can create more dynamic and interactive learning experiences that cater to students' diverse needs by promoting effective communication and leveraging engaging learning modalities. This study advocates for a balanced approach to integrating technology in education, emphasizing that virtual environments and gaming can significantly enrich the academic landscape when utilized appropriately.

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Authors' Contribution

J. MA was the principal author of the manuscript. He drafted it and was responsible for the design and writing of all sections. He contributed to conceiving and interpreting the research findings, ensuring that all

critical intellectual content was thoroughly addressed. The principal author approved the final version of the manuscript.

Conflict of Interest

The authors of this study declare that they have no conflicts of interest.

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Ethical Considerations

Before data collection, ethical approval was obtained from the research deputy of Kerman University (Approval No. D47/034/1155). All participants were informed about the study's purpose, their right to withdraw at any time, and the measures taken to ensure confidentiality and anonymity of their responses. Informed consent was obtained from students, ensuring that all ethical standards were upheld throughout the research.

Availability of Data and Materials

Data can be accessed through published articles and their respective DOIs. Upon reasonable inquiry, the corresponding author can provide additional data, including the Persian version of the questionnaires.

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