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Original Article

Enhancing Arabic Language Education through Virtual Education: Validation of a Teaching Model in Iraqi Secondary Schools

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ABSTRACT

Background: Virtual education has become essential in today's educational systems, particularly during global challenges like the COVID-19 pandemic. This study examines how effective the virtual education model is in improving Arabic language teaching at the secondary school level in Iraq.

Methods: This research employed a sequential mixed-methods design involving two phases: a Delphi study followed by a survey. The study was conducted over nine months in 2023 in Baghdad, Iraq. The Delphi phase aimed to establish consensus among 15 experts in virtual education, specifically focusing on Arabic language instruction, who were purposively selected in Baghdad, Iraq. For the survey phase, 368 participants were chosen using stratified random sampling techniques outlined in the Krejcie and Morgan table. The research utilized a researcher-developed questionnaire designed to assess the efficacy of the virtual education model in Arabic language teaching. Qualitative data were analyzed using inductive content analysis, and a significance level (P-value) of 0.05 was applied to determine statistical significance. Statistical analyses were performed, including Exploratory and Confirmatory Factor Analyses (EFA and CFA) using SPSS version 27 and AMOS version 23.

Results: The results of EFA highlight three key factors influencing the implementation of virtual education: government initiatives aimed at advancing technology, the rising demand for flexible learning options due to political instability, and a global trend toward digitizing educational materials. The results of the CFA demonstrated acceptable factor loadings, all exceeding 0.3, with a chi-square/df ratio of 1.46, an Incremental Fit Index (IFI) of 0.90, a Comparative Fit Index (CFI) of 0.90, and a Root Mean Square Error of Approximation (RMSEA) of 0.0054, indicating a good model fit. Factor loadings for key dimensions ranged from 0.401 to 0.967 ($P<0.001$), confirming strong correlations between the variables and their respective dimensions.

Conclusion: The findings provide insights into optimizing virtual education models tailored to Arabic language teaching, highlighting the influence of government initiatives, the demand for flexible learning options, and global trends in educational digitization. Also, the findings contribute to advancing knowledge on educational practices in Iraq and provide insights into optimizing virtual education models tailored to Arabic language learning contexts.

Keywords: Education, Distance, Arabic Language, Teaching, Schools, Iraq

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Introduction

The integration of technology in education has become increasingly common, significantly impacting teaching, learning, and assessment in higher education (1, 2). As technology transforms educational practices, academic institutions must promote connections between students and educators (3). This digital transformation promotes knowledge sharing and improves access to educational resources, affecting all sectors, especially education (4, 5). This has led to innovative approaches, including virtual education models and new methods for evaluating these models (6, 7).

The shift toward technology-enhanced learning is also evident in Arabic language education (8), where technology plays an increasing role in facilitating communication and enhancing learning outcomes (9, 10). As online learning systems reshape traditional educational methods (11), there is a growing need to adapt and refine these approaches to maximize their effectiveness in specific contexts (12, 13).

Teaching the Arabic language in Iraq, where multiple dialects exist, can be particularly challenging (14). In curriculum planning, the underlying philosophies and perspectives play a significant role, as they affect both content selection and the organization and choice of teaching methods (15). It is essential to clarify the expected outcomes of Arabic lessons and the educational approach used. If teaching aims to convey rules, the focus should be on the content, teaching methods, the teacher's role in the instructional process, and evaluation methods (16).

Two notable issues arise in examining the teaching methods of Arabic lessons: an overreliance on rote memorization and the transmission of information, coupled with a lack of emphasis on fostering independent thinking. The Arabic language is inherently linked to many concepts (17). However, when the teaching approach focuses on compiling a vast array of these concepts in a textbook, requiring students to memorize and recall them during exams, it can lead to negative outcomes in Arabic instruction (18). A paradigm shift in the design of Arabic lesson plans is essential to mitigate the risk of academic frustration and revitalize Arabic language education (19).

While some textbooks provide evidence of innovative planning strategies, such as group activities, discussions, and thematic interpretations, these efforts are insufficient (20). Achieving meaningful outcomes necessitates a deeper change in how Arabic is taught and learned, as well as in the evaluation systems employed. This educational revolution must prioritize a student-centered approach, emphasizing critical thinking, creativity, and effective communication over mere memorization and immediate learning (21).

Another significant issue is the lack of engagement in teaching methods. The primary mode of instruction in Arabic lessons is the outdated lecture or reading method. In this approach, textbooks serve as information repositories, the teacher is a transmitter, and the student is a passive element expected to memorize the information. This method leads to boredom and even aversion to the Arabic language among students, whereas a more dynamic approach is needed to cultivate students' thinking, questioning, processing, and analyzing skills (22). For effective e-learning, a robust infrastructure is required. This infrastructure necessitates not only good technical connectivity but also professional management of courses, programs, and educational wellness. Researchers argue that to achieve a satisfactory e-learning experience, access to more educational materials must be provided. Learner perceptions should be assessed and analyzed to understand the quality of e-learning services (23). The challenges present in online teaching and learning highlight areas needing improvement in infrastructure and organizational support. Organizational support includes training educators to enhance their skills. The challenges in online education indicate areas that require better infrastructure and organizational backing. This support encompasses training educators in IT skills and providing team support to improve course

design and delivery (24).

However, implementing effective virtual education models requires careful consideration of various factors, including the validity and reliability of the instruments used to assess their impact. In the Iraqi context, where unique challenges such as limited resources and infrastructure constraints exist, there is a need for culturally and contextually relevant virtual education solutions that are also appropriately validated (25, 26).

Recognizing the increasing importance of integrating virtual education into Arabic language teaching in Iraqi secondary schools and the aforementioned challenges, this study seeks to validate a virtual education model specifically designed for this context. Employing a sequential mixed-methods design involving a Delphi study to establish expert consensus and a survey to gather data from teachers in Iraqi secondary schools, this research aims to address the gap in empirical studies examining the impact of virtual education models on Arabic language teaching at the secondary level in Iraq. By assessing the validity and reliability of the proposed virtual education model, this study contributes to understanding the potential of virtual education to transform Arabic language instruction in Iraqi secondary schools, offering flexibility, accessibility, and personalized learning experiences.

Methods

Study Design and Setting

This research employed a sequential mixed-methods (qualitative-quantitative) design involving two phases: a Delphi study followed by a survey. The Delphi phase aimed to establish consensus among experts in virtual education, specifically focusing on Arabic language instruction in secondary schools in Iraq. The survey phase involved teachers and practitioners in secondary Arabic and virtual education settings. The study was conducted in various secondary schools across Iraq over nine months, including stages of questionnaire development, data collection, and analysis.

Participants and Sampling

Qualitative phase: In the Delphi phase, 15 experts were purposively selected based on their virtual education and Arabic language instruction expertise. Experts were selected from among individuals who had at least 10 years of teaching experience in Arabic language education, extensive experience in virtual teaching, and had taught in both face-to-face and virtual methods. They also had educational management experience, worked at the level of senior educational managers, were actively involved in virtual education, and were recognized in their field.

Quantitative phase: The research setting was the public schools in Baghdad, Iraq, where a cluster sampling method was employed. Twenty schools were randomly selected, and approximately 20 teachers from each school were chosen. Ultimately, questionnaires were distributed to 400 secondary school teachers.

Tools/Instruments

The research utilized a researcher-developed questionnaire designed to assess the validity and reliability of the virtual education model in Arabic language teaching. The questionnaire underwent validation processes, including face validity, content validity, construct validity, and internal consistency. The final questionnaire consisted of nine items using a 5-point Likert scale ranging from 1- 5, with a cutoff point of three.

Validity and Reliability - To determine validity, methods of face validity, content validity, and construct validity were used.

Face validity: The opinions of 10 Arabic language teachers were utilized to assess face validity. The items were examined for grammatical issues, writing simplicity, and content clarity. Three questions had grammatical issues and lacked simplicity in expression, which were subsequently corrected. Then, each expert was asked to rate each item's relevance, clarity, and simplicity using a 4-point Likert scale. The minimum expected score was 3. (1= Not relevant, 2= Item needs revision, 3= Relevant but needs minor revision and 4= Highly relevant).

In addition, the impact score for each item was calculated to determine its relevance according to the expert ratings.

Content validity: To determine content validity, the Content Validity Ratio (CVR) and Content Validity Index (CVI) method was used. This method involved reviewing the opinions of 10 specialists in Arabic language education (5 individuals), virtual education (3), and psychometrics experts (2).

Content Validity Ratio: The CVR is a method for assessing the validity of a questionnaire developed by Lawshe (27). To calculate this ratio, experts' opinions in the content area of the test were utilized. First, the objectives of the test were explained to the experts, and the operational definitions related to the content of the questions were presented. Then, they were asked to classify each question based on a 3-point Likert scale: The item is essential, the item is helpful but not essential, and the item is not necessary. After gathering the experts' views, the CVR was calculated using the following formula:

$$CVR = \frac{N_e - \frac{N}{2}}{\frac{N}{2}}$$

In this formula: 'N' is the total number of specialists, and 'N_e' is the number of specialists who selected the 'essential' option. Given that 10 experts were involved in determining the CVR, the value was expected to be around 62%.

Content validity index: The CVI method was also used to determine validity. The CVI is a quantitative approach for evaluating the validity of questionnaire items based on expert opinions. It assesses each item's relevance, clarity, and simplicity, typically using a 4-point Likert scale. The experts rate the items, and the CVI is calculated by dividing the number of experts who rated an item as relevant by the total number of experts. A CVI greater than 0.79 indicates acceptable content validity, while a CVI between 0.70 and 0.79 suggests that the item may need revision. If the CVI is below 0.70, the item is considered unacceptable and should be removed (28).

Construct validity: Exploratory Factor Analysis (EFA) was first used to determine construct validity, followed by Confirmatory Factor Analysis (CFA). Since the instrument was researcher-developed, EFA was conducted first, followed by CFA.

To examine the relationships between the latent variables in the virtual education model, Structural Equation Modeling (SEM) was employed. SEM is a comprehensive statistical technique to test hypotheses about the relationships among observed and latent variables. This method was chosen due to its ability to assess both the measurement and structural models simultaneously. SEM was performed using AMOS 23, an advanced software specifically designed for structural equation modelling. Each latent variable was measured by multiple observed variables (i.e., questionnaire items). The structural model hypothesized these latent variables' direct and indirect effects on the effectiveness of virtual education in teaching Arabic in secondary schools.

Model Fit Indices: To evaluate the goodness-of-fit of the model, several fit indices were used:

Chi-square (χ^2): A non-significant chi-square value indicates a good fit between the model and the data. However, other fit indices were also examined due to their sensitivity to sample size.

Chi-square/df ratio (χ^2/df): A ratio of less than 3.0 indicates a reasonable fit.

Root Mean Square Error of Approximation (RMSEA): RMSEA assesses model fit while accounting for model complexity. An RMSEA value below 0.08 is considered a good fit.

Comparative Fit Index (CFI): The CFI compares the fit of the hypothesized model to a baseline model. A CFI value above 0.90 is generally considered acceptable, with values closer to 1 indicating a better fit.

Incremental Fit Index (IFI): Similar to the CFI, the IFI compares the hypothesized model to a null model.

Normed Fit Index (NFI): The NFI

measures the proportionate improvement in fit when comparing the hypothesized model to a null model. A value above 0.90 is acceptable.

Model Modification: Modifications were performed based on the Modification Indices (MI) provided by AMOS software, improving the model's fit. The covariances between error terms of certain items were added to improve the fit indices without violating theoretical assumptions. After these adjustments, the model fit improved, and all the indices indicated that the model was a good fit for the data.

Final SEM model: The final SEM model demonstrated strong relationships between the latent variables and their observed indicators, supporting the validity and reliability of the virtual education model. The relationships between the latent variables and their effects on the outcome variables were statistically significant ($P<0.05$).

Reliability: To determine the instrument's reliability, the items' internal consistency was assessed using Cronbach's alpha.

Data Collection

The data was collected through an electronic questionnaire sent via email to the teachers. Initially, access to the schools was obtained with permission from the education department, and after acquiring the teachers' email addresses, the research objectives were communicated to them. They were asked to respond to the questions if they consented willingly. The questionnaires were designed on the Google Forms platform and emailed to individuals, ensuring that all process stages were conducted anonymously. Two reminders were also sent to prevent sample attrition.

Data Analysis

In the qualitative phase, the data were analyzed using an inductive content analysis method. The data were examined at open, axial, and selective coding levels. Initially, the audio interviews were transcribed into text and then analyzed through a repeated iterative process.

In the quantitative phase, descriptive statistics, such as means, standard deviations, and frequency distributions, were employed to summarize survey responses. In the first phase, EFA was used, followed by CFA. A significance level (p-value) 0.05 was applied to determine statistical significance. Statistical analyses were performed using SPSS version 27 and AMOS23, with detailed procedures and interpretations outlined to facilitate transparency and reproducibility.

Ethics - The study adhered to several ethical guidelines. Researchers obtained informed consent from every participant, ensuring that each understood the study's purpose, procedures, and potential risks. Participant data remained confidential throughout the collection and analysis phases. The research was approved by the research deputy of Islamic Azad University, Khorasgan Branch.

Results

Demographic Characteristics

In total, 15 experts (E1-E15) participated in the qualitative Delphi section, while 368 Arabic language teachers participated in the quantitative section. The characteristics of the research samples are detailed in Table 1.

Qualitative phase: By analyzing the content of the interview texts, nine main components and three concepts or main categories were extracted. Three researchers conducted the content analysis, which was reviewed by two others. The details of the content analysis are presented in Table 2.

Quantitative phase: In the quantitative section, face and content validity results are presented first, followed by construct validity and structural equation modelling.

Face validity: The results of the face validity showed that all items had impact scores above 1.5, indicating that they were deemed relevant by the experts. Table 3 summarizes the impact scores for each item.

Content Validity

The CVR was confirmed with a value of 0.905, and the CVI was confirmed with a value of 0.830. The content validity levels for each item are displayed in Table 4.

Reliability: The instrument's reliability

Table 1: Demographic characteristics of the participants

Experts in virtual education and Arabic language				
No.	**Level of education**	**Age**	**Work Experience**	**Position**
E1	PhD	51	27	Professor
E2	Master's Degree	42	15	Teacher
E3	PhD	47	21	Professor
E4	Master's Degree	43	22	Teacher
E5	Master's Degree	39	11	Teacher
E6	PhD	38	11	Professor
E7	PhD	54	20	Teacher
E8	Master's Degree	55	18	Teacher
E9	PhD	57	19	Professor
E10	PhD	47	16	Professor
E11	Master's Degree	43	14	Teacher
E12	PhD	40	15	Professor
E13	Master's Degree	41	17	Teacher
E14	Master's Degree	38	10	Teacher
E15	PhD	39	10	Teacher
Participants in quantitative phase				
Category		**Subcategory**	**Percentage**	
Gender Distribution		Female	57/1%	
		Male	42.9%	
Age Distribution		35 years old and younger	23.9%	
		36 to 45 years old	67.9%	
		Over 45 years old	8.2%	
Years of Service		1 to 10 years	27.7%	
		11 to 20 years	41%	
		More than 20 years	31.3 %	
Education Level		Associate degree	10.9%	
		Bachelor's degree	48.9 %	
		Master's degree or higher	40.2 %	

Table2 : Main Category and the related sub-categories

Main Categories (M) / Components (C)
M1 - Government Initiatives to Promote Technological Advances
C1. Establish infrastructure (Broadband Penetration, Rural Broadband Coverage, Public-Private Partnership)
C2. Delivery of Electronic services (E-Services, Electronic Payments, Citizen Participation Portals)
C3. Government Support Competitive (Grant, subsidy, free Internet)
M2 - Increased Demand for Flexible Learning Options Due to Political Instability
C4. Critical situation (Conflict Zones, Temporary Displacement Camps, Safety Exercises)
C5. Give access (Refugee Population, International Humanitarian Aid, Mobile Classrooms)
C6. Disasters (Epidemic Diseases, Natural Disasters, Emergency Evacuation)
M3 - Global Trends Toward Digitization of Educational Materials
C7. Open learning (License Agreements, Creative Commons, Repositories, MOOCS*)
C8. Hardware supply (Smartphone Price Index, Tablet Market Share, Laptop Pricing Trend)
C9. New technologies (Machine Learning Algorithms, Intelligent Educational Systems, Adaptive Testing)

*MOOCs: Massive Open Online Courses

Table 3: Results of the face validity assessment of the questionnaire

Item	Relevant Ratings Frequency (%)	Mean Importance Rating	Impact Score
Item 1	90%	3.8	3.42
Item 2	85%	3.6	3.06
Item 3	95%	3.9	3.71
Item 4	88%	3.7	3.25
Item 5	92%	3.8	3.50
Item 6	87%	3.7	3.22
Item 7	89%	3.8	3.38
Item 8	91%	3.9	3.55
Item 9	86%	3.6	3.10
Item 10	93%	3.9	3.63

Table 4: Results of the content validity and reliability of the questionnaire

Item	CVR	CVI	Reliability (If item deleted)
Item 1	0.90	0.80	0.788
Item 2	0.80	0.80	0.810
Item 3	0.90	0.80	0.801
Item 4	0.85	0.80	0.807
Item 5	0.90	0.90	0.788
Item 6	0.90	0.80	0.793
Item 7	0.90	0.70	0.811
Item 8	0.90	0.80	0.825
Item 9	0.90	0.70	0.811
Total	0.905	0.830	0.826

Table 5: Results of KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.788
Bartlett's Test of Sphericity	Approx. Chi-Square	1378.146
	df	36
	P-Value	<0.001

*df: degree of freedom

was assessed through the internal consistency of the items. The overall Cronbach's alpha was found to be 0.826. Each question was removed from the questionnaire's analysis one by one, and the reliability of the remaining items (if the item was deleted) was examined. The results showed that deleting any item led to a decrease in the reliability of the remaining items, indicating a positive impact of each item on the overall reliability (Table 4).

Exploratory Factor Analysis (EFA)

Before conducting factor analysis on the questionnaire items, the Kaiser-Meyer-Olkin (KMO) and Bartlett's test index were calculated to assess the sample adequacy and sphericity. Table 5 indicates the KMO and Bartlett's test values (KMO=0.788). This value indicates a good level of sampling adequacy. Generally, KMO values above 0.7 are considered acceptable for factor analysis, while values above 0.8 are considered excellent. A KMO value of 0.788 suggests that the data are appropriate for identifying underlying factors. For Bartlett's Test of Sphericity, the results showed that the chi-square value is relatively high, and the significance level (P-value) is less than 0.001, indicating that the null hypothesis can be rejected. This means there are significant correlations among the variables,

Table 6: Total variance explained based on EFA

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.036	44.847	44.847	4.036	44.847	44.847	2.930	32.551	32.551
2	1.271	14.120	58.967	1.271	14.120	58.967	2.030	22.560	55.111
3	1.086	12.072	**71.039**	1.086	12.072	71.039	1.433	15.927	71.039
4	0.778	8.639	79.678						
5	0.562	6.239	85.917						
6	0.400	4.445	90.362						
7	0.356	3.951	94.313						
8	0.279	3.096	97.409						
9	0.233	2.591	100.000						

Extraction Method: Principal Component Analysis.

further supporting the appropriateness of conducting factor analysis (Table 5).

In the next stage, the EFA indices were examined. First, the communalities of the items were assessed (Table 6), and then the Total Variance Explained was analyzed, which indicates the number of factors extracted from the questionnaire and also shows the eigenvalues. Additionally, a scree plot is presented (Table 6, Figure 1).

Another index examined in EFA is the Rotated Component Matrix, which not only differentiates the factors but also shows the factor loadings and the correlations among the items. The number and magnitude of the factor loadings for each item are displayed in Table 6. According to the results obtained from Table 6, all items have factor loadings greater than 0.5, which are considered in acceptable to good range.

Based on Table 6, factor 1 includes items related to government initiatives and technological advancements in virtual education. Factor 2 includes items related to the demand for flexible learning options due to political instability, and factor 3 includes items related to global trends toward digitization of educational materials.

Confirmatory Factor Analysis (CFA)

To assess the construct validity of the research questionnaire, the software AMOS 23 was utilized. As shown in the software output, the main model of the CFA is presented

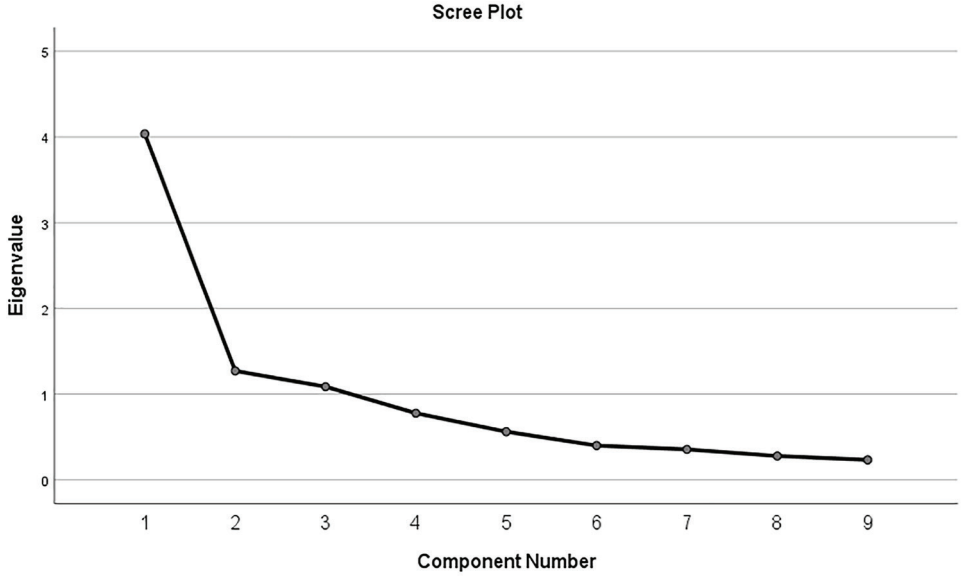

Figure 1: Scree Plot based on the EFA

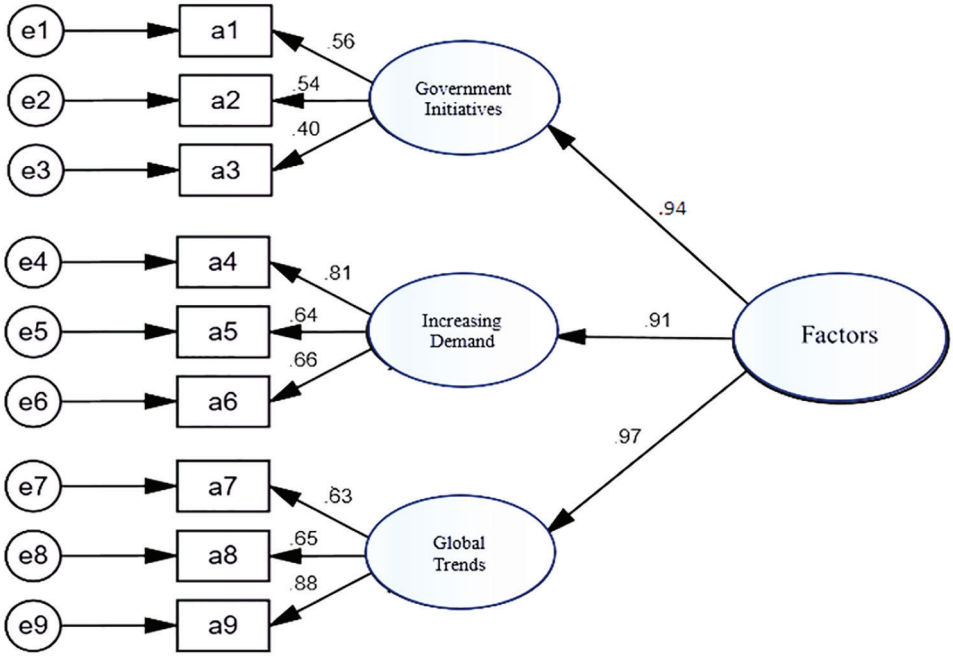

Figure 2: Confirmatory Factor Analysis model of the main category of factors.

Table 7: The fit index of the Confirmatory Factor Analysis model of the main factors

Indicator	Standardized Indicator Value	Indicator Value in the Proposed Model
x^2/df	Less than 5	1.46
IFI (Incremental Fit Index)	>0.90	0.902
NFI (Normed Fit Index)	>0.90	0.890
TLI (Tucker-Lewis Index)	>0.90	0.960
CFI (Comparative Fit Index)	>0.90	0.901
RMSEA (Root Mean Square Error of Approximation)	<0.01	0.005

*X^2: Chi-square; df: degree of freedom

in Figure 2, which illustrates the relationships between observed variables (items) and latent variables (main factors), along with the standardized coefficients (factor loadings) for each question. As indicated in Figure 2, all factor loadings for the dimensions of the questionnaire were found to be above 0.3 and were confirmed. The factor loadings represent the correlations of the variables with the factors. If these correlations exceed 0.6 (regardless of whether they are negative or positive), they are considered high factor loadings. Loadings greater than 0.3 are regarded as relatively high, while loadings below 0.3 can be disregarded.

The fundamental question raised is whether this model is suitable. The chi-square statistic and other fit indices must be examined to answer this question. Table 7 presents the fit indices for the second-order CFA of the main constructs.

In the AMOS 23 software, five indices (NFI, RFI, IFI, GFI, and CFI) are reported based on the comparison of the chi-square of the model with the chi-square of the baseline model (Figure 2).

Suitability of the Model

The main question concerns the suitability of the structural model used, which is evaluated using fit indicators like the chi-square statistic and other measures from second-order CFA. The adequacy and appropriateness of the model are determined by assessing these fit indicators, ensuring they meet predefined thresholds for goodness-

of-fit. Overall, the results indicate a robust relationship between the surveyed factors and their respective dimensions, validating the questionnaire structure used in the study.

Discussion

This study employed a sequential mixed-methods design to investigate the validity and reliability of a virtual education model for teaching Arabic in Iraqi secondary schools. The two-phased approach, involving a Delphi study followed by a quantitative survey, allowed for a comprehensive understanding of the factors influencing the effectiveness of virtual education in this specific context. The findings of this study highlight the vital role of government initiatives, the demand for flexible learning options, and global trends toward digitization in improving Arabic language education through virtual learning in Iraqi secondary schools. The results of the data analysis suggest that government support and infrastructure development are important factors in the effective implementation of virtual education.

The researcher-developed questionnaire underwent rigorous validation processes to ensure its suitability for measuring the effectiveness of virtual education in Arabic language teaching. The CVR was confirmed at 0.905, and the CVI at 0.830. Polit and Beck (2006) state that a CVI of 0.79 or higher is considered evidence of good content validity (29). The obtained CVI of 0.830 exceeds this benchmark, indicating that the questionnaire items adequately represent the domain of virtual education in Arabic language instruction. The CVR value also surpasses the acceptable threshold, further supporting the instrument's content validity. These values are consistent with studies that have successfully implemented CVI and CVR for validating educational instruments (28, 30, 31).

Construct validity was assessed, and the EFA extracted three factors that aligned with the themes identified in the qualitative phase. The CFA results, with all factor loadings above 0.3, provided further evidence for the construct validity of the instrument. The good fit indices indicated that the proposed model provides a good fit to the data. As suggested by Hu and Bentler (1999), the CFI, Tucker-Lewis Index (TLI), and RMSEA values are indicative of a good model fit (32). The obtained fit indices meet these criteria, supporting the conclusion that the questionnaire has good construct validity and that the hypothesized relationships between the items and the underlying constructs are supported by the data. The model fit indices in this study are comparable to those reported in other SEM studies evaluating technology integration in education (33-35). These validity measures confirm that the instrument is well-suited to measure the intended constructs within the specific context of this study. The demonstrated content and construct validity provide confidence in the questionnaire's ability to accurately assess the effectiveness of virtual education.

The Delphi study emphasized the critical role of government initiatives. Experts highlighted the need for infrastructure development (broadband penetration, rural coverage), effective e-service delivery, and competitive support mechanisms (grants, subsidies, free internet access). Items related to government support loaded strongly onto Factor 1 in the EFA. This alignment reinforces the Delphi experts' view that governmental support is a primary component of the virtual education framework. The high correlations and factor loadings associated with establishing infrastructure (C1), providing electronic services (C2), and government competitive support (C3) emphasize the necessity of robust government frameworks. Effective government policies can facilitate technology integration in education, thereby improving learning outcomes (36). Broadband infrastructure and e-services are essential to ensure equal access to educational resources, especially in rural and underserved areas (37).

Recent developments in Iraq align with these findings. For instance, the Ministry of Education has launched initiatives to enhance digital learning capabilities, such as collaborating with UNESCO to provide

internet connectivity to over 3,000 schools across various governorates, aiming to improve educational data systems and service delivery (38). This commitment reflects a broader strategy to modernize Iraq's education system and underscores the importance of government support in implementing effective virtual education. The UNESCO report supports these findings, demonstrating a positive correlation between government investment in technology infrastructure and the successful implementation of e-learning programs.

The Delphi study identified that political instability and disasters create a strong demand for flexible learning. Access to education in conflict zones, refugee camps, and emergencies was highlighted as a necessity. Items related to flexible learning in the face of crises loaded significantly onto Factor 2. This further validates the component and its relevance in the specific context of Iraq. The findings also indicate an urgent need for flexible learning options in situations of political instability (M2). The critical situations identified (C4), such as conflict zones and temporary displacement camps, require innovative educational solutions. According to a UNESCO report in 2019, educational continuity in crises is critical to maintaining the learning process, and mobile classrooms can act as a viable option for displaced populations (39). Additionally, the ability to provide access to education during natural disasters (C6) aligns with the findings of Mendenhall and colleagues, who emphasize the importance of adaptable learning environments in emergency contexts (40).

The COVID-19 pandemic has further accelerated the need for flexible learning solutions in Iraq. Initiatives like SPARK's online education programs have demonstrated that despite challenges such as unreliable internet access and power cuts, there is a growing acceptance of online learning styles among traditional institutions (41). This shift indicates a positive trend toward embracing flexible learning options as a response to ongoing political and social challenges.

Several studies have documented the role of technology in providing education during conflicts and crises (42-44). Our findings are consistent with this body of work, highlighting the importance of adaptable and accessible learning solutions.

The Delphi study emphasized the importance of open learning resources (license agreements, creative commons, and Massive Open Online Courses (MOOCs)), hardware accessibility (affordable smartphones, tablets, and laptops), and new technologies (machine learning, intelligent educational systems, and adaptive testing). Items measuring the adoption of digital resources and technologies in education loaded highly onto Factor 3. This result reinforces the importance of considering the global trends in digitization.

The results related to global trends towards digitization (M3) reflect the growing importance of open learning platforms (C7) and new technologies (C9). The expansion of MOOCs and Creative Commons licenses can democratize access to high-quality educational materials, as McAuley and colleagues point out (45).

Furthermore, the emphasis on hardware supply (C8) indicates that the availability of affordable technologies is essential for the successful implementation of virtual education. As Warschauer stated, inequalities in access to technology can exacerbate educational inequalities, and therefore it is necessary to address these challenges (46).

In Iraq, initiatives such as the Jousour program by WFP aim to equip youth with digital skills necessary for employability in a rapidly digitizing world (47). This program reflects a broader recognition of the need for digital literacy as part of educational reform efforts aimed at improving job prospects for young people. The growing adoption of open educational resources and mobile learning is widely documented in the literature. A report highlights that 64% of faculty were familiar with Open Educational Resources (OER) in 2023, reflecting a growing awareness of the financial burden that traditional textbooks place on students. It also discusses the

impact of OER on student learning outcomes (48). Also a meta-analysis examines the effectiveness of OER in enhancing learning outcomes, finding no negative impact on student achievement and highlighting the benefits of using these resources (49). Otto critically reviewed 25 state-funded OER projects in Germany and discusses the adoption and diffusion of OER across various educational contexts (50). Our findings are consistent with these trends, suggesting that the digitization of educational materials is a key driver of virtual education effectiveness.

Limitations and Suggestions

This study is subject to limitations. The sample size for the Delphi study may limit the generalizability of qualitative findings. The reliance on teachers from Baghdad may not fully represent the diverse experiences across Iraq.

The findings have significant implications for policymakers, educators, and researchers.

Policymakers should prioritize infrastructure development, e-service delivery, and competitive support mechanisms to foster technological advancements in education. Addressing the specific needs of students in conflict zones and emergencies is crucial. Practice: Educators should leverage open learning resources and integrate new technologies to enhance the effectiveness of virtual education.

Future research should investigate the long-term impact of virtual education on student learning outcomes and teacher development.

Conclusion

This study provides robust evidence for the validity and reliability of a virtual education model in the context of Iraqi secondary schools. The findings emphasize the significance of government initiatives, flexible learning options, and the adoption of global trends in digitization. The validated questionnaire serves as a valuable tool for future research and program evaluation. The results confirm that the questionnaire has good construct validity and that the data support the hypothesized relationships between the items and the underlying constructs.

Abbreviations

CVI: Content Validity Index
CVR: Content Validity Ratio
CFA: Confirmatory Factor Analyses
CFI: Comparative Fit Index
EFA: Exploratory Factor Analyses
IFI: Incremental Fit Index
NFI: Normed Fit Index
OER: Open Educational Resources
RMSEA: Root Mean Square Error of Approximation
TLI: Tucker-Lewis Index

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Authors' Contribution

AT. AG. performed the experiments and collected the data. N.GH, JSh. J, and F.M. conceptualized the study design and drafted the manuscript, incorporating feedback from all contributors. N.GH led data analysis and oversaw manuscript revisions. All authors reviewed and approved the final document.

Conflicts of Interest

There are no conflicts of interest.

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None to declare.

Ethical Considerations

The research followed rigorous ethical standards. Participants provided informed consent after receiving clear explanations of the study's objectives, methods, and potential risks. All collected data was anonymized and maintained confidentiality during both data collection and analysis stages. The research

received approval from the Research Deputy of the Islamic Azad University, Khorasgan Branch, under the code 1403/04/14/14505.

Availability of Data and Materials

Requests for the study's supporting data should be directed to the corresponding author.

References

1 Akram H, Yingxiu Y, Al-Adwan AS, Alkhalifah A. Technology Integration in Higher Education During COVID-19: An Assessment of Online Teaching Competencies Through Technological Pedagogical Content Knowledge Model. Front Psychol. 2021;12:736522. doi: 10.3389/fpsyg.2021.736522. PubMed PMID: 34512488; PubMed Central PMCID: PMC8426343.

2 Asad MM, Hussain N, Wadho M, Khand ZH, Churi PP. Integration of e-learning technologies for interactive teaching and learning process: an empirical study on higher education institutes of Pakistan. Journal of Applied Research in Higher Education. 2021;13(3):649-63. doi: 10.1108/JARHE-04-2020-0103.

3 McDiarmid GW, Zhao Y. Time to rethink: Educating for a technology-transformed world. ECNU Review of Education. 2023;6(2):189-214. doi: 10.1177/20965311221076.

4 Mohamed Hashim MA, Tlemsani I, Matthews R. Higher education strategy in digital transformation. Educ Inf Technol (Dordr). 2022;27(3):3171-3195. doi: 10.1007/s10639-021-10739-1. PubMed PMID: 34539217; PubMed Central PMCID: PMC8438547.

5 Timotheou S, Miliou O, Dimitriadis Y, Sobrino SV, Giannoutsou N, Cachia R, Monés AM, Ioannou A. Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. Educ Inf Technol (Dordr). 2023;28(6):6695-6726. doi: 10.1007/s10639-022-11431-8. PubMed PMID: 36465416; PubMed Central PMCID: PMC9684747.

6 Zolfaghari Z, Karimian Z, Mehrfar A. Implications of Major Learning Theories for Online Medical Education: A Narrative Review. Interdiscip J Virtual Learn Med Sci. 2024;15(1):1-17. doi: 10.30476/ijvlms.2024.101714.1291.

7 Burns M. Distance Education for Teacher Training: Modes, Models and Methods. (2nd Edition). Washington, DC: Education Development Center; 2023. Available from: https://edc.org/resources/distance-education-for-teacher-training-modes-models-and-methods.

8 Miles R, Al-Ali S, Charles T, Hill C, Bligh B. Technology enhanced learning in the MENA region: Introduction to the Special Issue. Studies in Technology Enhanced Learning. 2021;1(2). doi:10.21428/8c225f6e.364578e9.

9 Wekerle C, Daumiller M, Kollar I. Using digital technology to promote higher education learning: The importance of different learning activities and their relations to learning outcomes. Journal of Research on Technology in Education. 2022;54(1):1-17. doi:10.1080/15391523.2020.1799455.

10 Akintayo OT, Eden CA, Ayeni OO, Onyebuchi N. Evaluating the impact of educational technology on learning outcomes in the higher education sector: A systematic review. International Journal of Management & Entrepreneurship Research. 2024;6(5):1395-422. doi: 10.51594/ijmer.v6i5.1091.

11 Saufi S. From Traditional Classrooms to Digital Learning: Exploring Research Trends in Contemporary E-Learning Challenges Education. 2025;6(1). doi: 10.51737/2766-4600.2025.086.

12 Gligorea I, Cioca M, Oancea R, Gorski A-T, Gorski H, Tudorache P. Adaptive learning using artificial intelligence in e-learning: A literature review. Educ. Sci. 2023;13(12):1216. doi: 10.3390/educsci13121216.

13 Major L, Francis GA, Tsapali M. The effectiveness of technology-supported

personalised learning in low-and middle-income countries: A meta-analysis. British Journal of Educational Technology. 2021;52(5):1935-64. doi: 10.1111/bjet.13116.
14 Makki A, Bali AO. The use of social media as a platform in education: Ramifications of COVID-19 in Iraq. Academic Journal of Interdisciplinary Studies. 2021;10(3):394-408. doi:10.36941/ajis-2021-0093.
15 Ali ER. Teachers' Attitudes towards the Use of Arabic (L1) in primary EFL Classrooms in Iraq. Al-Adab Journal. 2022(143):13-36. doi: 10.31973/aj.v1i143.3667.
16 Al-Amery A. Attitudes of the students at the institutes of fine arts in Iraq towards implementing active learning strategies in Arabic language courses and the associated challenges. Journal of Education and Practice. 2020;11(13):73-81. doi: 10.7176/JEP/11-13-08.
17 Jaber RS. Language and Identity in Iraqi Arabic: A Gender-Based Study. International Journal of Linguistics, Literature & Translation. 2022;5(2). doi: 10.32996/ijllt.2022.5.2.11.
18 Soliman R, Khalil S. The teaching of Arabic as a community language in the UK. International Journal of Bilingual Education and Bilingualism. 2024;27(9):1246-57. doi: 10.1080/13670050.2022.2063686.
19 Hussain KH. Iraqi Preparatory Schools Teachers' Attitudes toward Using Communicative Approach as A Teaching Method For Iraq Opportunities Textbook. International Journal of Research in Social Sciences and Humanities. 2016;4(4):95-108. Available from: https://oaji.net/articles/2016/488-1465204770.pdf.
20 Al-Qatawneh S, Eltahir ME, Alsalhi NR. The effect of blended learning on the achievement of HDE students in the methods of teaching Arabic language course and their attitudes towards its use at Ajman University: A case study. Education and Information Technologies. 2020;25(3):2101-27. doi: 10.1007/s10639-019-10046-w.
21 Mukhametshina E, Morozova T, Shigapova F. Teaching Arabic language via English. 14th International Technology, Education and Development Conference; 2020 March 2-4; Valencia, Spain. Valencia: IATED; 2020. doi: 10.21125/inted.2020.1803.
22 Hudzaifah Y, Ulfah N, Pamungkas MI. Child-Friendly Teaching Approach for Arabic Language in Indonesian Islamic Boarding School. International Journal of Language Education. 2021;5(1):501-14. doi: 10.26858/ijole.v5i1.15297.
23 zead Khalif R, Alhamdwee NO. Online University Teaching during and after the Covid-19 Crisis in Iraq: Teacher's Presence and Learning Activity. Eastern Journal of Languages, Linguistics and Literatures. 2022;3(1):36-72. doi: 10.53906/ejlll.v3i1.72.
24 Alsayed R, Ali A, Makia R, Kadhom M, Raheem R, Al-Obaidi O, et al. Challenges facing Iraq to tackle the spread of COVID-19: An overview. Journal of university of Anbar for Pure science. 2020;14(2):22-7. doi: 10.37652/JUAPS.2020.14.2.5.
25 Al-Azawei A, Parslow P, Lundqvist K. Barriers and opportunities of e-learning implementation in Iraq: A case of public universities. The International Review of Research in Open and Distributed Learning. 2016;17(5). doi:10.19173/irrodl.v17i5.2501.
26 Radif M. A learning management system adoption framework for higher education: the case of Iraq [Dissertation]. Iraq: University of Al-Qadisiyah; 2016. Available from: https://dspace.lib.cranfield.ac.uk/items/b8173e1c-34bf-4dbf-91e3-5de5cbee575d.
27 Lawshe CH. A quantitative approach to content validity. Personnel psychology. 1975;28(4):563–75. doi: 10.1111/j.1744-6570.1975.tb01393.x.
28 Waltz CF, Bausell BR. Nursing research: design statistics and computer analysis. Pennsylvania: Davis Fa; 1981.
29 Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Res Nurs Health. 2006;29(5):489-97.

doi: 10.1002/nur.20147. PubMed PMID: 16977646.
30 Romero Jeldres M, Díaz Costa E, Faouzi Nadim T, editors. A review of Lawshe's method for calculating content validity in the social sciences. Front. Educ. 2023;8. doi: 10.3389/feduc.2023.1271335.
31 Masuwai A, Zulkifli H, Hamzah MI. Evaluation of content validity and face validity of secondary school Islamic education teacher self-assessment instrument. Cogent Education. 2024;11(1):2308410. doi:10.1080/2331186X.2024.2308410.
32 Hu Lt, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural equation modeling: a multidisciplinary journal. 1999;6(1):1-55. doi: 10.1080/10705519909540118.
33 Ngemba HR, Hendra S, editors. Factors affecting student adoption of e-learning systems in Indonesia. Proceedings of the 1st International Conference on Education and Multimedia Technology; ICEMT'17, 2017 July 9-11; Singapore, Singapore. Association for Computing Machinery; 2017. doi: 10.1145/3124116.3124125.
34 Carvajal-Morales JM, León-Plúas EE, Valenzuela-Cobos JD, Guevara-Viejó F. Educational Design in the Adoption of ICT for Sustainable Digital Learning in Social and Business Sciences: A Structural Equation Model. Sustainability. 2024;16(23):10674. doi: 10.3390/su162310674.
35 Yakubu MN, Dasuki SI. Factors affecting the adoption of e-learning technologies among higher education students in Nigeria: A structural equation modelling approach. Information Development. 2019;35(3):492-502. doi: 10.1177/0266666918765907.
36 Selwyn N. Education and technology: Key issues and debates. International Review of Education. 2022. doi: 10.1007/s11159-022-09971-9.
37 OECD. Education at a Glance 2020: OECD Indicators. Paris: OECD Publishing; 2020. doi: 10.1787/69096873-en.
38 UNESCO. Global Education Monitoring Report 2023: Technology in education – A tool on whose terms? Paris: UNESCO; 2023. doi: 10.54676/UZQV8501.
39 Bridges B, Walls N. Migration, displacement and education. United Nation: UNESCO Publishing; 2018. doi: 10.54675/TBOP7834.
40 Mendenhall M, Dryden-Peterson S, Bartlett L, Ndirangu C, Imonje R, Gakunga D, Gichuhi L, Nyagah G, Okoth U, and Tangelde M. Journal on Education in Emergencies. 2015;1(1):92-130. doi: 10.17609/N8D08K.
41 Dion ML, Van A. Spark Annual Report, 2022-23. Netherlands: SPARK; 2023.
42 Salisu MA, Samuel IR. Utilizing artificial intelligence in peace, conflict, and security education for skill development and economic empowerment. International Journal of African Innovation and Multidisciplinary Research. 2025;7(2):271-283. doi:10.70382/mejaimr.v7i2.034.
43 Badrasawi KJ, Ahmed IO, Eid IM. Exploring ways to provide education in conflict zones: Implementation and challenges. Intellectual Discourse. 2018;26(2):567–94. doi: 10.31436/id.v26i2.1221.
44 Harris S, Lewer N. Peace education in conflict zones–experience from northern Sri Lanka. Journal of Peace Education. 2008;5(2):127-40. doi: 10.1080/17400200802264321.
45 McAuley A, Stewart B, Siemens G, Cormier D. The MOOC model for digital practice. Computer Science; 2010.
46 Warschauer M, Tate T. Digital divides and social inclusion. Handbook of writing, literacies, and education in digital cultures. UK: Routledge; 2017. p. 63-75.
47 Achilli L, Hanafi S. Migration trends of Palestinian refugees registered with UNRWA. In: UNRWA and the Palestine Refugees: Challenges for Developing a Strategic Vision. Geneva: The Graduate Institute; 2022. P. 142-174.
48 Abdous Mh. Unlocking the Potential of

Open Educational Resources: Trends, Benefits, and Challenges in US Higher Education. 2024. Available from: https://www.odu.edu/facultydevelopment/article/unlocking-the-potential-of-open-educational-resources-trends-benefits.

49 Tlili A, Garzón J, Salha S, Huang R, Xu L, Burgos D, Denden M, Farrell O, Farrow R, Bozkurt A, Amiel T, McGreal R, López-Serrano A, and Wiley D. Are open educational resources (OER) and practices (OEP) effective in improving learning achievement? A meta-analysis and research synthesis. Int J Educ Technol High Educ. 2023;20:54. doi: 10.1186/s41239-023-00424-3.

50 Otto D. Adoption and Diffusion of Open Educational Resources (OER) in Education: A Meta-Analysis of 25 OER-Projects. The International Review of Research in Open and Distributed Learning. 2019;20(5):122–140. doi: 10.19173/irrodl.v20i5.4472.