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Teachers' Virtual Education Experiences in Iraq: Insights from a Mixed-Methods Study on Challenges and Consequences

ABBAS TAHER ALLAWI GHRABAT[1], PhD Candidate; NASROLAH GHASHGHAEIZADEH[1*], PhD; JALAL SHANTA JABER[2], PhD; FRANK MOSAVI[3], PhD

[1]*Department of Educational Management, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran;* [2]*Department of Basic Sciences, University of Dhiqar, Dhiqar, Iraq;* [3]*Department of Educational Management, Kermanshah Branch, Islamic Azad University, Kermanshah, Iran*

Introduction: The COVID-19 pandemic has significantly transformed the educational landscape in Iraq, necessitating a rapid shift from traditional classroom settings to virtual education. This study aimed to examine the experiences of Arabic virtual education teachers in Iraq, with a focus on the challenges they faced and the implications of adopting online teaching methodologies.

Methods: A mixed-methods approach was applied, incorporating a qualitative-quantitative approach for tool development. The qualitative section dealt with content analysis, while the quantitative section followed a descriptive survey method. The study was performed in 2023. The qualitative sampling was purposeful, involving 15 experts in virtual education from Iraq, whereas the quantitative samples consisted of 368 teachers from 20 schools in Baghdad, Iraq, selected via cluster sampling. The qualitative tool was a semi-structured interview, whereas the quantitative tool was a researcher-made questionnaire consisting of 10 components and 66 items. For data analysis, exploratory factor analysis was carried out. The data were analyzed using SPSS 22 software.

Results: A total of 15 educational experts contributed to the qualitative analysis, while the opinions of 398 teachers were inspected through exploratory factor analysis for content analysis. The sample's adequacy and the test's suitability were validated using two indicators: Kaiser-Meyer-Olkin (KMO=0.684) and Bartlett's Test of Sphericity, both being significant at >0.001. The quantitative findings presented the extraction of 10 factors, which accounted for 85.823% of the total variance at the eigenvalue point. These factors included Utility (9 items), Implications (8 items), Flexibility and Adaptability (7 items), Equity (7 items), Balanced Infrastructure Development (7 items), Evaluation and Motivation Mechanisms (6 items), Management and Policy Making (8 items), Awareness and Empowerment (6 items), Educational Planning (4 items), and Technology Enhanced Learning (3 items).

Conclusion: The findings highlight the complex challenges encountered by Iraqi educators in virtual learning environments, underscoring the significance of addressing infrastructural gaps, providing adequate training, and fostering equitable access to technology. By focusing on these domains, educational stakeholders can boost the effectiveness of online education in Iraq, ultimately improving educational outcomes for all students.

Keywords: Education; Distance; Virtual; Surveys and Questionnaires; Students

**Corresponding author:*
Nasrolah Ghashghaeizadeh, PhD;
Department of Educational Management,
Isfahan (Khorasgan) Branch,
Islamic Azad University,
Isfahan, Iran.
Tel: +98-9133221628
Email: ghashghaeizadeh@yahoo.com

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Introduction

The transition to virtual education in Iraq has been a profound and transformative experience for educators, especially during the COVID-19 pandemic (1). Before the pandemic, e-learning in Iraq was still developing, characterized by limited adoption and significant skepticism among educators as well as students regarding its effectiveness and usability (2). Nevertheless, the sudden need for online learning prompted a rapid integration of technology into teaching methods, highlighting both the potential benefits and significant shortcomings (3). As educational institutions worldwide were compelled to shift from traditional classroom settings to digital platforms, Iraqi educators encountered unique challenges shaped by the socio-economic landscape of the country, technological infrastructure, and cultural context (4). Before the pandemic, e-learning in Iraq was in its early developmental phase, which led to numerous instructors encountering challenges related to inadequate Internet connectivity and a lack of available devices (5). These infrastructural gaps served as a barrier for them to provide quality online instructions, thus creating great inequities in educational access among students from different socio-economic backgrounds (6). Teachers themselves revealed various levels of adaptability to the new online platforms, often mentioning a lack of training, inadequate resources, and a general lack of technical support as major obstacles to effective instruction (7). The experiences were also shaped by cultural contexts. Most teachers were concerned about the adoption of digital platforms owing to unfamiliarity with technology or its adoption for education (8). This was further compounded by the possibility of loss of academic integrity, as online learning environments can enhance the potential for cheating without proper oversight (9). Furthermore, the absence of face-to-face interactions meant that teachers could not provide immediate feedback or support important aspects of keeping students interested in and comprehending a subject in traditional classrooms (10).

Nevertheless, the rise of online education offered flexibility and engagement, overcoming traditional limitations of time and location (11). This shift not only boosted motivation but also improved language learning outcomes. As Iraqi teachers navigated these changes, they began to recognize the potential of technology-enhanced classrooms to facilitate learning (12). In such scenarios, despite challenges such as poor Internet connectivity and limited access to resources, online platforms enabled numerous educators to deliver content more effectively and engage with students in new ways (7, 13).

In this respect, this mixed-methods study intended to provide a comprehensive analysis of Iraqi teachers' experiences with virtual education, exploring the multifaceted challenges they faced and the implications of adopting online teaching methodologies. By applying both quantitative surveys and qualitative interviews, we sought to capture a holistic view of the pedagogical shifts that occurred during this period. As educational institutions worldwide were compelled to shift from traditional classroom settings to digital platforms, Iraqi educators' encountered unique barriers shaped by the socio-economic landscape of the country, technological infrastructure, and cultural context. The research delved into specific challenges encountered by teachers, ranging from technological difficulties to pedagogical adjustments, and evaluate the broader implications of these challenges on educational outcomes.

While existing studies (14, 15) have explored the barriers and opportunities of e-learning implementation in Iraq, many have primarily focused on the infrastructural and technical challenges, such as Internet connectivity and access to devices (8, 15). Some studies (16) have inspected student perceptions of online learning in specific regions, like the Kurdistan region.

Nevertheless, there is a relative lack of research comprehensively examining the lived experiences of Iraqi teachers across different educational levels and regions, encompassing both the challenges they faced and the pedagogical adaptations they made. Furthermore, few studies have employed a mixed-methods approach to triangulate quantitative data on adoption rates and access qualitative insights into the nuances of teacher experiences and perspectives. Accordingly, this research aimed to address this gap by providing a more holistic and in-depth understanding of Iraqi teachers' experiences with virtual education. By combining quantitative surveys with qualitative interviews, we sought to capture a richer snapshot of the pedagogical shifts, challenges, and consequences of adopting online teaching methodologies in the Iraqi context. This study steps beyond identifying barriers to explore how teachers adapted their practices, the influence of these adaptations on student outcomes, as well as the long-term implications for the future of education in Iraq. Understanding these multifaceted experiences is crucial for informing policy decisions, designing effective professional development programs, and ultimately, improving the quality as well as accessibility of education in Iraq.

Methods

Study design

This research utilized a sequential mixed-methods (qualitative-quantitative) design involving two phases: a Delphi study followed by a survey. As mentioned in several studies, the Delphi method was applied as a qualitative method (17, 18). The Delphi phase sought to achieve expert consensus regarding virtual education, with a particular emphasis on Arabic language instruction at the secondary school level in Iraq. The subsequent survey phase engaged teachers and practitioners who work in secondary Arabic language and virtual education environments. The study was undertaken in various secondary schools across Iraq over nine months, covering phases of questionnaire development, data collection, and analysis.

Participants and Sampling

Qualitative stage: In the Delphi phase, 15 experts were purposively selected based on their expertise in virtual education and Arabic language instruction. Experts were chosen from among individuals with at least 10 years of teaching experience in Arabic language education, extensive experience in virtual teaching, and teaching experience in both face-to-face and virtual methods. They possessed experience in educational management, held positions as senior educational administrators, actively participated in virtual education, and were acknowledged experts in their field.

Quantitative stage: The research setting was the public schools in Baghdad, Iraq, where a cluster sampling method was applied. A total of 20 schools were randomly selected, and approximately 20 teachers from each school were chosen. Ultimately, the questionnaires were distributed among 400 secondary school teachers.

The Delphi method

The Delphi method in this study used multiple rounds of questionnaires to collect expert opinions, often involving averaging responses and applying statistical tests such as the Kendall test to evaluate consensus. In this study, following each round of questionnaires, the experts received an aggregated summary of the previous round findings, allowing them to adjust their answers based on the group's response. This iterative process aimed to achieve a consensus among the experts. The number of rounds in this study was four.

Content Analysis Stages based on the Virginia Braun and Victoria Clarke (2006) Model

Virginia Braun and Victoria Clarke's (2006) model for qualitative content analysis involves six phases:

Familiarizing with data: This involved immersion in the data through repeated reading and identifying initial ideas.

Generating initial codes: This phase involved creating concise labels that highlight significant aspects of the data potentially pertinent to the research question.

Searching for themes: Here, the researcher started to categorize the codes into broader patterns of meaning, or themes.

Reviewing themes: This stage involved refining the themes, ensuring they formed a coherent pattern, and checking them against the data.

Defining and naming themes: In this phase, the researcher identified the 'essence' of each theme and decided on a concise as well as informative name.

Generating the report: The final stage involved writing up the analysis, providing sufficient evidence of the themes within the data, and relating the analysis to the research question as well as existing literature.

Tools/Instruments

This research utilized a questionnaire developed by the researchers to assess the validity and reliability of a virtual education model, specifically for teaching Arabic. This questionnaire underwent several validation processes, including assessments of face validity, content validity, construct validity, and internal consistency. The final version of the questionnaire consisted of 9 items rated on a 5-point Likert scale, ranging from 1 to 5, with a cutoff score of 3.

Validity and Reliability

To establish validity, the study utilized methods such as face validity, content validity, and construct validity.

Face Validity: To evaluate face validity, feedback was collected from 10 Arabic language teachers. They reviewed the items for grammatical accuracy, clarity of expression, and overall simplicity. Three items were identified as having grammatical errors and lacking clarity, resulting in necessary revisions. Each expert rated the relevance, clarity, and simplicity of each item using a 4-point Likert scale (1=Not relevant, 2=Needs revision, 3=Relevant but needs minor revision, 4=Highly relevant). Additionally, an impact score for each item was calculated according to expert ratings to assess its relevance.

Content Validity: Content validity was determined via the Content Validity Ratio (CVR)

and Content Validity Index (CVI) methods. This involved consultation with 10 specialists in Arabic language education [5], virtual education [3], and psychometrics [2].

Content Validity Ratio: The CVR is a technique for assessing questionnaire validity developed by Lawshe in 1975 (14). To compute this ratio, we consulted experts in the relevant content area. The objectives of the test were explained to these experts, together with operational definitions associated with the questionnaire items. They were then asked to rate each item on a three-point Likert scale: essential, useful but not essential, or not necessary. Since 10 experts participated in determining the CVR, a value of around 62% was anticipated.

Content Validity Index: In addition to the Content Validity Ratio (CVR), the Content Validity Index (CVI) method was utilized to assess the validity of the questionnaire items. The CVI is a quantitative method assessing the relevance, clarity, and simplicity of each item according to expert feedback. Experts rate the items using a four-point Likert scale, with the CVI calculated through dividing the number of experts who deemed an item relevant by the total number of experts consulted. A CVI score greater than 0.79 shows that the content validity is acceptable, while a CVI score between 0.70 and 0.79 suggests that the item may require revisions. If an item receives a CVI below 0.70, it is regarded as unacceptable and should be omitted from the questionnaire (15).

Construct Validity

To assess construct validity, we employed exploratory factor analysis (EFA).

Reliability

The reliability of the instrument was evaluated through measuring the internal consistency of the items using Cronbach's alpha coefficient. Table 1 outlines the reliability results of the instrument.

Data Collection

Data were collected through an electronic questionnaire distributed via email among teachers. Initially, permission was obtained from the education department to gain access to the schools. Then, after acquiring the email addresses of the teachers, the research objectives were explained to them. Teachers were invited to participate and fill out the questionnaire voluntarily. The questionnaires were developed using Google Forms and sent out via email, ensuring that every element of the process remained anonymous. To minimize the sample attrition, we sent two reminders to participants.

Data Analysis

For the qualitative component, an inductive content analysis approach was utilized to analyze the data. This involved examining data at various levels, including open codes (items) and components. Initially, audio recordings of interviews were transcribed into text format, which were then analyzed through a repetitive iterative process. In the quantitative phase, descriptive statistics—such as means, standard deviations, and frequency distributions—were used to summarize survey responses. This was followed by conducting an exploratory factor analysis. A significance level (p-value) of 0.05 was set to determine the statistical significance. All statistical analyses were carried out using SPSS version 22.

Ethical consideration

This study was approved by the Ethics Committee of Iraq University and the research deputy of Islamic Azad University, Khorasgan Branch. The research adhered to ethical principles, ensuring rigorous attention to participants' privacy and confidentiality throughout both the development and implementation phases. All surveys and interviews underwent thorough validation through established review procedures and received approval from seasoned nursing administrators and experts in the nursing field.

Results

Demographic characteristics

A total of 15 experts (designated as Ex1 through Ex15) took part in the qualitative Delphi phase, while 368 Arabic language teachers contributed to the quantitative phase of the study. Tables 2 and 3 report the characteristics of the research samples.

Table 1: Reliability of the Questionnaire Components

Components	R	Components	R
Utility	0.929	Evaluation and Motivation Mechanisms	0.892
Implications	0.919	Management and Policy Making	0.814
Flexibility and Adaptability	0.859	Awareness Raising and Empowerment	0.864
Equity	0.896	Educational Planning	0.760
Balanced Infrastructure Development	0.875	TEL: Technology Enhanced Learning	0.701

Table 2: Demographic characteristics of the participants in the qualitative phase

No.	Degree	Age	Work Experience	Job Title
Ex01	PhD	51	27	Professor
Ex02	MSc	42	15	Teacher
Ex03	PhD	47	21	Professor
Ex04	MSc	43	22	Teacher
Ex05	MSc	39	11	Teacher
Ex06	PhD	38	11	Professor
Ex07	PhD	54	20	Teacher
Ex08	MSc	55	18	Teacher
Ex09	PhD	57	19	Professor
Ex10	PhD	47	16	Professor
Ex11	MSc	43	14	Teacher
Ex12	PhD	40	15	Professor
Ex13	MSc	41	17	Teacher
Ex14	MSc	38	10	Teacher
Ex15	PhD	39	10	Teacher

Table 3: Demographic characteristics of the participants in the 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%

Main finding

Qualitative stages: In the qualitative phase, the 15 interview transcripts were carefully converted into texts. Based on the content of these interviews, raw codes were extracted through an inductive and exploratory approach. After removing duplicate entries, open codes were identified, resulting in a total of 66 open codes.

The next phase involved extracting items, components or themes, and categories or concepts, culminating in the identification of 11 components/themes and 5 overarching categories. Table 4 of Appendix 1 presents the findings from the content analysis of the qualitative interviews as well as the corresponding coding.

Excerpts from the interviews with participants and themes extracted from them:

Expert Number 2:

"…The virtual space and electronic infrastructure, particularly during the COVID-19 pandemic, would provide a uniform access for all students to education. Of course, the conditions of students vary, and they may have different hardware capabilities. Nevertheless, the virtual infrastructure and access to mobile devices as an accessible tool for everyone created a situation during the pandemic where the minimum educational requirements were met for all students, even in deprived areas …" ***(Equity/ Balanced Infrastructure Development).***

Expert Number 7:

"Although we feel the significance of virtual education more along the pandemic and at times of war and hardship, this instrument can always be a good option and is not solely dependent on difficult circumstances. Students have different conditions, and virtual education, by decreasing spatial and temporal limitations, is more adaptable to various individuals' situations" *(Flexibility and Adaptation).*

Table 4: Content analysis of the interviews in the qualitative section

Categories (Concepts)	Themes (Components)	Open codes (Numbers)
Consequences	• Utility (9)	4, 14, 15, 18, 43, 52, 54, 55, 59
	• Flexibility and Adaptability (7)	5, 37, 38, 39, 47, 49, 53
	• Equity (7)	6, 7, 35 ,57, 62, 63, 66
Preparation	• Implications (8)	1, 19, 21 ,22, 25, 40, 50, 56
	• Balanced Infrastructure Development (7)	3, 10, 11, 34, 44, 45, 61, 64
Education	• Awareness Raising and Empowerment (6)	16, 28, 29, 31, 36, 51
	• Educational Planning (4)	13, 42, 20, 30
Evaluation	• Evaluation Mechanisms (3)	23, 26, 27
	• Motivation Mechanisms (3)	24, 33, 36
Management	• Management and Policy Making (8)	2, 12, 32, 41, 48, 58, 60, 65
	• Technology Enhanced Learning (3)	8, 9, 17

Table 5: Results of KMO and Bartlett's Test of the questionnaire

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.684
Bartlett's Test of Sphericity	Approx. Chi-Square	54619.251
	df	2145
	Sig.	<0.001

Expert Number 5:

"…Education policymakers must adopt a new perspective on virtual education, and we will see fundamental changes in education in the future. These changes can occur at the level of a classroom, schools, universities, or the entire educational system of the country (*Management and Policy Making*); this necessitates the provision of modern and up-to-date infrastructure. In particular, since these changes are taking place all over the world (*Technology Enhanced Learning*), we cannot ignore these transformations (*Educational Planning*). We should also consider that as a concept or paradigm changes in society, so do the tools. For example, with the development of virtual education, our assessment methods will also change, and we should expect significant changes in educational programs" (*Evaluation Mechanisms*).

Quantitative stages: Once the items were extracted from the questionnaire based on content analysis and coding, the questionnaire was administered to 389 teachers in Baghdad, Iraq. The findings were then inspected through exploratory factor analysis. In exploratory factor analysis (EFA), certain criteria need to be assessed both before and after conducting the analysis, which will be further explained:

Criteria before conducting EFA

When dealing with exploratory factor analysis, some tests are conducted before factor analysis, revealing the suitability of the test and the adequacy of the sample. These two tests include the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity; thevalues are presented in Table 5.

Table 5 outlines the results of the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity, which are commonly employed in factor analysis to assess the suitability of data for this type of analysis.

1. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy: The KMO statistic ranges between 0 and 1, with values closer to 1 indicating that the data are suitable for factor analysis. A KMO value of 0.684 reveals that the sampling adequacy is not excellent but falls within the acceptable range. Generally, a KMO value above 0.6 is regarded as acceptable, while values above 0.8 are considered good, and those above 0.9 are excellent.

2. Bartlett's Test of Sphericity: Bartlett's Test evaluates whether the correlation matrix is significantly different from an identity matrix (which would reveal that variables are unrelated). The Chi-Square value is very large (54619.251), and the significance level (p-value) is <0.001, which is well below the common alpha level of 0.05. This demonstrates significant correlations among the variables, suggesting that factor analysis is appropriate. Overall, the results suggest that the data have a moderate level of sampling adequacy for factor analysis (KMO=0.684). There are significant correlations among the variables, as indicated by Bartlett's Test ($p<0.001$), confirming that factor analysis can be undertaken on this dataset.

Criteria after conducting EFA

Communalities: Communalities are a key

concept in factor analysis, representing the proportion of variance in each variable that can be explained by the common factors extracted during the analysis. It demonstrates the extent to which the variance of a variable is correlated with other variables via the underlying factors. Communality is calculated as the sum of squared loadings for a variable across all factors. The communality value ranges from 0 to 1. Higher communalities (closer to 1) indicate that a significant portion of the variance is accounted for by the factors, demonstrating a strong relationship with those factors. Lower communalities (less than 0.40) may imply that a variable does not correlate well with others or might suggest the presence of additional factors not yet identified.

According to the results shown in Table 4, the level of communalities for all items in the questionnaire is at good to very good level. The highest communality is linked to item number 11, while the lowest is related to item number 64 (Table 6).

Total Variance Explained and scree plot: After the factor analysis test is conducted, one of the important criteria for determining the number of extracted factors is the *Total Variance Explained* table, which is outlined in Table 6. Total Variance Explained, shown in Table 5, is a key output from Exploratory Factor Analysis (EFA), providing insights into how many factors are extracted from the data and how much variance each factor explains. Table 7 offers a detailed interpretation of the total variance explained.

As observed in Table 7, at the point of Initial Eigenvalues, the 12 factors extracted from the factor analysis explained approximately 85.423% of the construct of virtual Arabic language education, demonstrating a good fit for this tool. The highest factor loading corresponded to the first factor, which was 11.729, while the second factor had a loading of 11.719. Figure 1 visually represents the factor analysis, along with the scree plot.

Varimax rotation analysis: In the Varimax rotation analysis, 12 factors were extracted; however, based on the correlations between the

Table 6: Communalities criteria for each item of the questionnaire

Item	Extract	Item	Extract	Item	Extract	Item	Extract	Item	Extract	Item	Extract
A1	0.900	A12	0.829	A23	0.878	A34	0.918	A45	0.753	A56	0.886
A2	0.800	A13	0.577	A24	0.876	A35	0.924	A46	0.820	A57	0.853
A3	0.916	A14	0.898	A25	0.834	A36	0.830	A47	0.855	A58	0.887
A4	0.908	A15	0.825	A26	0.873	A37	0.826	A48	0.836	A59	0.842
A5	0.873	A16	0.922	A27	0.770	A38	0.852	A49	0.858	A60	0.859
A6	0.915	A17	0.782	A28	0.933	A39	0.924	A50	0.817	A61	0.884
A7	0.837	A18	0.900	A29	0.928	A40	0.926	A51	0.798	A62	0.866
A8	0.733	A19	0.876	A30	0.816	A41	0.895	A52	0.921	A63	0.911
A9	0.889	A20	0.899	A31	0.885	A42	0.911	A53	0.801	A64	0.588
A10	0.882	A21	0.916	A32	0.872	A43	0.859	A54	0.873	A65	0.898
A11	0.838	A22	0.944	A33	0.857	A44	0.792	A55	0.898	A66	0.900

Table 7: Total Variance Explained of EFA of Questionnaire

Factors	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	28.077	42.540	42.540	28.077	42.540	42.540	7.741	11.729	11.729
2	4.916	7.448	49.989	4.916	7.448	49.989	7.734	11.719	23.447
3	4.031	6.107	56.096	4.031	6.107	56.096	5.824	8.825	32.272
4	3.387	5.131	61.227	3.387	5.131	61.227	5.300	8.030	40.302
5	3.238	4.906	66.133	3.238	4.906	66.133	5.180	7.848	48.150
6	2.590	3.924	70.057	2.590	3.924	70.057	5.161	7.819	55.969
7	2.303	3.489	73.546	2.303	3.489	73.546	4.944	7.491	63.460
8	1.937	2.935	76.481	1.937	2.935	76.481	4.425	6.705	70.165
9	1.793	2.716	79.197	1.793	2.716	79.197	3.428	5.194	75.359
10	1.626	2.464	81.661	1.626	2.464	81.661	2.651	4.017	79.376
11	1.525	2.311	83.972	1.525	2.311	83.972	2.467	3.738	83.113
12	1.222	1.851	85.823	1.222	1.851	85.823	1.788	2.710	85.823
13	.999	1.513	87.336						
14	.902	1.367	88.703						

Extraction Method: Principal Component Analysis.

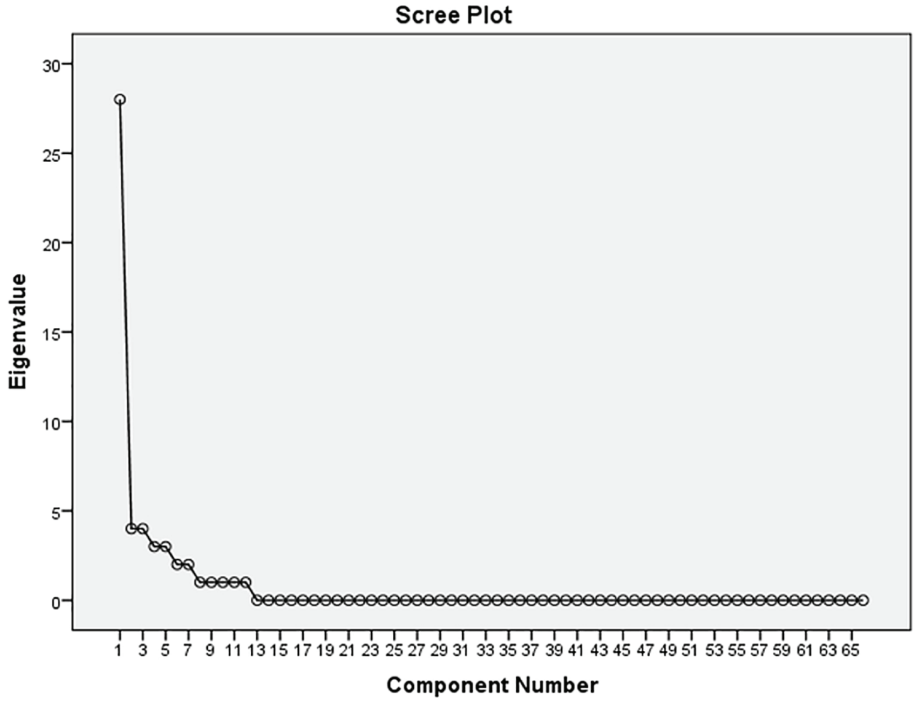

Figure 1: Scree plot of the factor analysis of the questionnaire at the eigenvalue point

Table 8: The construct extracted from the EFA of the questionnaire

Components or Factors	Item number in the questionnaire
1. Utility	4, 14, 15, 18, 43, 52, 54, 55, 59
2. Implications	1, 19, 21 ,22, 25, 40, 50, 56
3. Flexibility and Adaptability	5, 37, 38, 39, 47, 49, 53
4. Equity	6, 7, 35 ,57, 62, 63, 66
5. Balanced Infrastructure Development	3, 10, 11, 34, 44, 45, 61
6. Evaluation and Motivation Mechanisms	23, 24, 26, 27,33, 46
7. Management and Policy Making	2, 12, 32, 41, 48, 58, 60, 65
8. Awareness Raising and Empowerment	16, 28, 29, 31, 36, 51
9. Educational Planning	13, 42, 20, 30
10. TEL: Technology Enhanced Learning	8, 9, 17

items and the number of items included in each component (factor), a total of 10 factors were ultimately extracted. According to the Varimax rotation, 12 factors were initially extracted at the Eigenvalue point. Nevertheless, since only one item was associated with two of these factors, the researcher decided to reassign these items to their respective factors based on their semantic similarities. As a result, the analysis was refined, resulting in a final reduction to 10 factors. Additionally, item 64 had a factor loading of less than 4, which led to its elimination from the questionnaire. Finally, the factor loadings and the number of factors in the questionnaire are reported in Tables 7 and 8.

According to psychometric analysis and the extraction of concepts from the perspective of Arabic virtual education teachers in Iraq, the most important factors were identified and allocated as follows: Utility (9 items), Implications (8 items), Flexibility and Adaptability (7 items), Equity (7 items), Balanced Infrastructure Development (7 items), Evaluation and Motivation Mechanisms (6 items), Management and Policy Making (8 items), Awareness and Empowerment (6 items), Educational Planning (4 items), and Technology Enhanced Learning (3 items) (Table 9).

Discussion

The present research was conducted based on a mixed qualitative-quantitative approach, with a summary of its stages illustrated in Figure 2.

The results of the psychometric analysis and concept extraction from the perspectives of Arabic virtual education teachers in Iraq revealed a nuanced understanding of the factors affecting their experiences in online teaching. The allocation of importance to various components highlights key domains that require attention for boosting the effectiveness of virtual education in the country.

Table 9: Rotated Component Matrix

Items	The priority of the constructs extracted from EFA				
	F1	F2	F3	F4	F5
Overcoming security and military constraints has alleviated access to education.	0.534				
Enhancement of student learning.	0.602				
Positive effects of multilingual content in Arabic language education.	0.782				
Formative and summative assessments are performed in virtual education.	0.539				
Extraction of educational laws and protocols.	0.719				
Increase in enrollment rates for Arabic virtual language courses.	0.728				
Fostering positive attitudes towards Arabic virtual education.	0.424				
Expansion of geographic coverage beyond urban centers in education.	0.617				
Facilitation of survey research regarding Arabic virtual language education.	0.594				
Development of national network and broadband expansion plans.		0.830			
Strengthening the motivation of participating students.		0.597			
Involvement of school administrators.		0.690			
Data privacy laws are essential for protecting users in Arabic virtual education.		0.765			
Periodic self-assessment surveys are beneficial for improving virtual education.		0.550			
Phased planning for introducing new features in virtual education.		0.666			
Documented protocols for Arabic virtual language education are crucial.		0.734			
Various options for sudden and critical situations should be considered.		0.524			
Flexibility in virtual education promotes the adoption of language instruction.			0.541		
Regular feedback from users is collected to update the education system.			0.676		
Device compatibility is ensured in Arabic virtual language education.			0.813		
Observational studies in Arabic virtual classrooms have become more feasible.			0.690		
Timely resolution of network and security issues enhances the education.			0.811		
Modeling exercises and simulations prepare us for cybersecurity threats.			0.596		
Overcoming spatial and temporal limitations accelerates educational progress.			0.561		
Distance learning serves as a solution to crises affecting traditional classroom.				0.763	
Open educational resources produced for all students contribute to equity.				0.503	
Internet subsidies and satellite connectivity benefit students in virtual education.				0.924	
Alleviating spatial limitations and transportation costs results in materials availability.				0.536	
Creating equal opportunities despite socio-economic differences is essential.				0.645	
The potential for disseminating important knowledge and information.				0.659	
Fair access to additional educational materials is improved in virtual education.				0.513	
Access to appropriate hardware supports virtual education.					0.476
Accessible software is necessary for effective virtual teaching-learning processes.					0.783
Inter-sector collaborations promote innovation in virtual education initiatives.					0.839
Development of collaborative learning communities is essential.					0.504
Disparities in devices and connections create challenges for virtual education.					0.497
Expansion of fiber optic networks contributes positively to virtual education.					0.659
Educational technology grants support advancements in teaching methodologies.					0.888
1. Utility 2. Implications 3. Flexibility and Adaptability 4. Equity 5. Balanced Infrastructure Development	6. Evaluation and Motivation Mechanisms 7. Management and Policy Making 8. Awareness Raising and Empowerment 9. Educational Planning 10. TEL: Technology Enhanced Learning				

Items	The priority of the constructs extracted from EFA				
	F6	F7	F8	F9	F10
Financial incentive mechanisms for innovation in virtual education.	0.435				
Clear guidelines for accrediting virtual courses.	0.810				
External audits results in enhanced effectiveness of virtual education.	0.509				
Evidence-based decision-making in Arabic virtual language education.	0.623				
Continuous monitoring of student satisfaction and success in virtual education.	0.453				
Accreditation of educational content in the development of virtual education.	0.456				
E-government projects contribute to the development of virtual education.		0.794			
Development of social media campaigns for virtual education.		0.484			
Strategic planning for efficient resource allocation.		0.898			
Evidence-based and research-driven development in virtual education.		0.556			

Management of usage of digital communication tools in virtual education.	0.450			
Development of innovative technologies in virtual education.	0.552			
Attention to individuals' privacy in governmental monitoring.	0.456			
Internet speed and security are essential for virtual education development.	0.503			
Implementation of active learning techniques in virtual education.		0.572		
Sharing best teaching practices and experiences in virtual education.		0.600		
Technology training programs for empowering educators.		0.521		
Community awareness regarding virtual education is essential.		0.544		
Development of free public Wi-Fi in underserved areas.		0.798		
Necessary training to maintain information security in virtual education.		0.453		
The curriculum for Arabic virtual education aligns with national standards.			0.426	
Enhanced planned capacity in virtual education.			0.515	
The important role of trained teachers in the educational process.			0.533	
Action research projects contribute to the development of virtual education.			0.635	
The availability of digital devices supports blended learning development.				0.720
Integration of artificial intelligence in virtual education enhances learning.				0.510
Personalization of virtual education based on new technologies is critical.				0.507
Eagen Value (Rotation Sums of Squared Loadings).	85.823 %			
The number of initial factors after EFA (before merging items).	12			
The number of factors after EFA and merging some items.	10			
1. Utility 2. Implications 3. Flexibility and Adaptability 4. Equity 5. Balanced Infrastructure Development	6. Evaluation and Motivation Mechanisms 7. Management and Policy Making 8. Awareness Raising and Empowerment 9. Educational Planning 10. TEL: Technology Enhanced Learning			

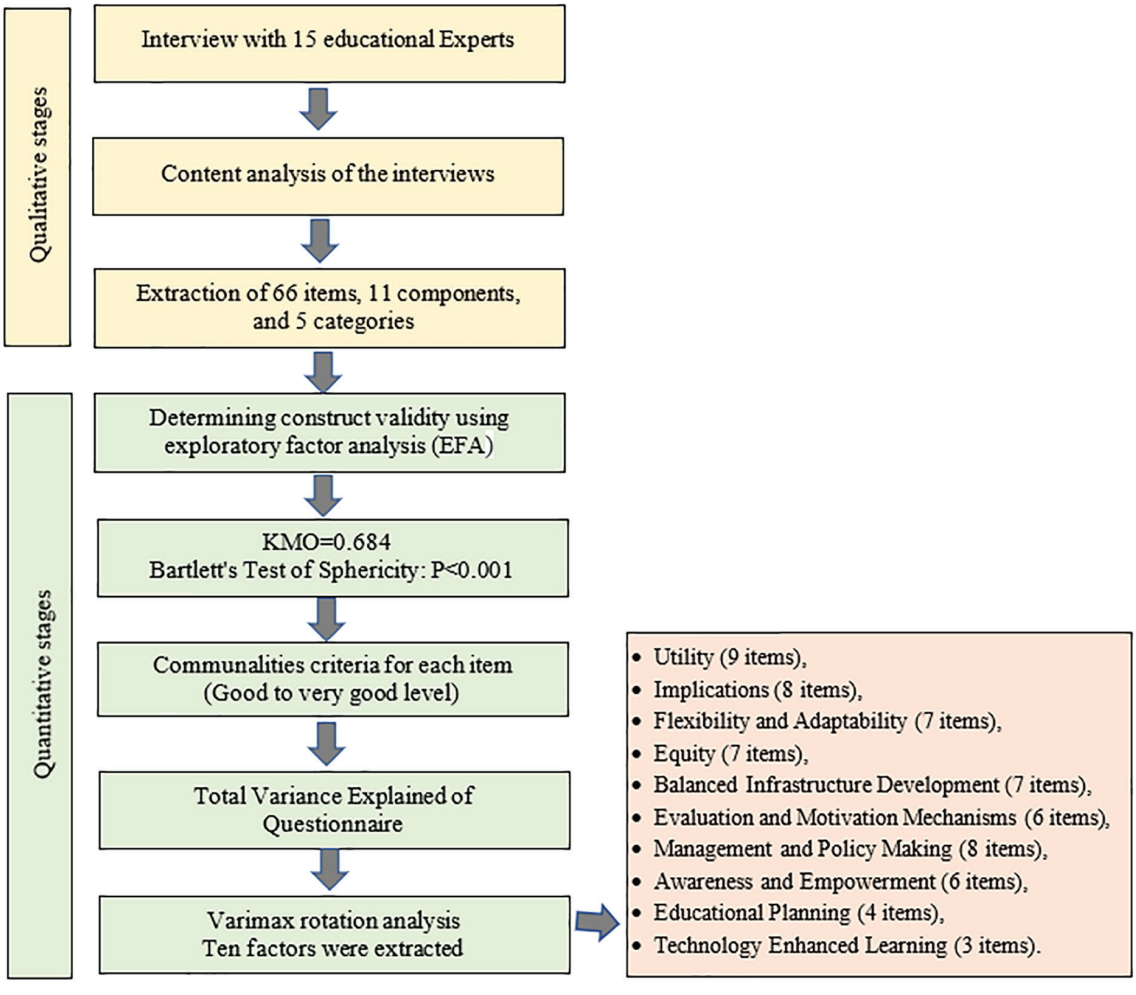

Figure 2: The stages of the research

The utility factor was identified as the strongest factor of the teachers' experiences, with nine items. This demonstrates that online teaching tools and platforms should be useful and efficient toward their objective and aims within a classroom setting (19, 20). They require tools that not only assist them in teaching lessons but also capture the students' interest, ultimately yielding better learning results (21). The emphasis on utility here suggests a desire for technologies that can be seamlessly integrated into the practice of educators, serving useful purposes for students (22).

Closely following utility, the implications factor, with eight items, indicates teachers' understanding of the wider effects of implementing online education (23). This includes considerations of how virtual learning affects student performance, engagement, and overall educational equity (24). The recognition of these implications reflects a progressive understanding among educators of their role in shaping educational outcomes through effective online practices (24, 25). The importance placed on Flexibility and Adaptability highlights the dynamic nature of online education (26, 27). Teachers should be able to modify and diversify their teaching strategies to accommodate a range of learning styles and needs (28); in this case, students might experience varying levels of technology and resource access. It is a vital characteristic that helps nurture an inclusive learning environment (29).

This focus on Equity is particularly pertinent in the Iraqi context, given that socioeconomic disparities can have profound effects on students' access to education (30). The acknowledgment of equity as a critical factor suggests that teachers recognize the challenges marginalized groups have to go through and are committed to finding ways to bridge these gaps through their online teaching practices (31, 32).

The recognition of Development as a crucial element highlights the necessity for comprehensive enhancements in Iraq's educational framework (33). Teachers are acutely aware that without reliable Internet connectivity and access to devices, the potential advantages of virtual education cannot be fully realized (34). This calls for urgent investment in technological infrastructure to support effective online learning (35).

The factor of Evaluation and Motivation Mechanisms points to the challenges teachers encounter in assessing student performance in an online environment (36). Although effective evaluation methods are generally identified as a key component of giving feedback and motivating students, many educators state that it is difficult to adapt traditional assessment techniques to digital formats (37). This domain needs further exploration to develop novel assessment strategies that fit well online learning environments (38).

With eight items allocated to Management and Policy Making, it is clear that teachers recognize the significance of supportive institutional frameworks in facilitating successful online education (23). Effective management practices and clear policies can empower educators, equipping them with the guidance and resources required to navigate the complexities of virtual teaching (39).

Another important aspect highlighting the necessity for ongoing professional development opportunities for teachers is the concept of Awareness and Empowerment (40). With the growth of new technologies, educators should be appraised of what they can offer so that educators know how to maximize these resources. These will give more confidence and competence to them when instructed online through training (41).

Even though Educational Planning received less emphasis, its inclusion highlights the importance of thoughtful curriculum design tailored for virtual environments. Effective planning is necessary for ensuring that educational content is relevant, engaging, and accessible to all students (42).

Finally, although Technology-Enhanced Learning represents a critical component, it has received comparatively less emphasis than other factors (43). This may suggest that while teachers recognize the potential benefits of integrating technology into their teaching, there may still be challenges or constraints in fully realizing this potential within their current contexts (44).

For contextualizing these findings, it is useful to compare them with similar studies performed in other developing countries. For example, a study by Badia A (45) found that "Accessibility" was the most significant factor affecting online teaching experiences. This is not in line with our findings, where Utility was prioritized. The difference might be attributed to the stage of development of virtual education in the respective countries. In Iraq, the focus may have shifted towards optimizing the tools and strategies already in place, whereas in countries where online education is less established, accessibility remains the primary concern. In contrast, the emphasis on "Equity" in our study aligns with the results obtained by Tate and colleagues (46); they also highlighted the critical importance of addressing socioeconomic disparities in online learning. This similarity suggests that concerns about

equity are universal across diverse educational contexts, especially in regions grappling with socioeconomic inequalities. The relatively lower emphasis on "Technology Enhanced Learning" in our study, compared to the stronger emphasis on "Utility" and "Implications", might reveal a need for tailored professional development programs that deal with pedagogical integration of technology. This observation is in the same line with the findings of Rodrigues's study (47); it was reported that teachers often struggle to effectively integrate technology into their teaching practices without sufficient training and support. The high importance given to "Management and Policy Making" has been mirrored in several studies (48, 49), underscoring the critical role of institutional frameworks in facilitating successful online education initiatives. This finding suggests that supportive policies and effective management practices are critical for establishing an empowering environment for teachers to thrive in virtual settings.

Limitations and suggestions

While this study provided a valuable overview of Arabic virtual education teachers' experiences in Iraq, several limitations should be acknowledged, which directly impact the interpretation and generalizability of the findings. First, the focus on specific, potentially more accessible areas within Iraq may limit the scope of the research. Further, the experiences and challenges of teachers in rural or less privileged regions, where technological and resource accessibility may be significantly different, could be underrepresented. This limitation would directly affect the generalizability of the findings, as the reported levels of utility, implications, flexibility, and other factors may not accurately reflect the experiences of teachers confronting more severe infrastructural deficits. The relative significance assigned to "Development" as a key factor, for example, might be even higher in such regions, potentially overshadowing other factors identified in this study. In addition, the exclusive focus on teachers' perspectives, without incorporating the views of students or parents, may present an incomplete picture of the virtual education ecosystem. This lack of triangulation limits the ability to fully understand the influence of teachers' experiences on student outcomes and the overall effectiveness of virtual education. For instance, while teachers may prioritize "Utility" of tools, student feedback on engagement and accessibility could indicate a different set of priorities, impacting how these tools are effectively integrated into the learning process. Similarly, parents' perspectives on equity and access could further clarify the challenges faced by marginalized students. These limitations highlight the need for future research to cover a broader geographical scope and incorporate the perspectives of students as well as parents to provide a more comprehensive understanding of the virtual education landscape in Iraq. Also, this study was performed in Baghdad; thus, the generalization of the findings to less privileged regions of Iraq should be approached with caution.

Conclusion

This study presented some insights into the Arabic virtual education teachers of Iraq and pointed to several key factors that would influence their effectiveness in virtual teaching. These factors, particularly utility, implications, flexibility, equity, infrastructure development, mechanisms for evaluation, management support, awareness, educational planning, and technology integration, would constitute an integral part of enhancing virtual education in Iraq. By focusing on these aspects, the policymakers and educational leadership could create a more supportive environment to help empower the teachers, thus improving the students' performance in this progressively digitized learning environment.

Recommendations

Investments in online teaching tools and platforms should prioritize user-friendliness and direct applicability to classroom settings. Needs assessments should be performed by teachers to identify specific functionalities that can streamline their workflow and ameliorate student learning outcomes. Research should focus on acquiring and adapting tools that not only deliver content effectively but also actively engage students and promote a positive learning experience.

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Authors' Contribution

AT. AG. performed the experiments and Data collection. N.GH AND JSh. J AND F.M. designed the study. Wrote the paper with input from all authors.

Conflicts of interest

There are no conflicts of interest.

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