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Research Article

Predicting quality of English language teaching through augmented reality competencies and TPACK model components among Kuwaiti undergraduates

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ABSTRACT

Background: Augmented reality is among the emerging technologies that hold greater potential in the context of foreign language learning. No research has been done to date to investigate pre-service teachers' competencies in augmented reality and their association with quality of teaching English and technological and pedagogical content knowledge (TPACK) model components in the state of Kuwait.

Aim: This study aimed to assess the utility of using augmented reality competencies and English as a foreign language (EFL) TPACK model components to predict the quality of English language teaching of pre-service undergraduates.

Method: A total of 317 students enrolled in college of education at Kuwait university were recruited and responded to three online questionnaires measuring EFL TPACK, teachers' augmented reality competencies, and quality of teaching English skills (QELT).

Results: Results indicated a significant positive association among all variables at 0.01 level. Teacher's augmented reality competencies (TARC), TPACK, technological knowledge (TK), and technological content knowledge (TCK) were significant predictors of QELT. One-way ANOVA revealed that there was no significant effect of gender on the TARC, TPACK, TK, TCK, and QELT. The cut-off-criteria of the mean scores indicated that all participants strongly believe that they acquire the essential competencies of augmented reality in EFL classrooms and possess a high level of proficiency in TPACK. Descriptive statistics showed that more than (70%) of pre-service teachers selected "strongly agree" and "agree", 13% or less selected "strongly disagree" and "disagree" while 26% or less selected "neutral" response. Linear regression analysis revealed that TARC, TPACK, TK, and TCK were significant predictors of QELT.

Keywords: augmented reality, quality of English language teaching, TPACK model, Kuwaiti students, pre-service teachers

INTRODUCTION

Technology has made a significant impact on nearly every aspect of human life, education included. The ongoing advancements in technology have introduced novel perspectives and innovations to the realm of education such as augmented reality (AR) and virtual reality (VR). In the domain of language education, augmented reality technology can be applied across various educational levels (Tulgar, 2019). Augmented reality can be a beneficial tool in higher education instruction where the effective teaching of languages preservice student is particularly crucial. However, teaching English to students who speak other languages poses an intriguing challenge for teachers (Dalim et al., 2016).

Augmented reality is a progressively prevalent technology with significant advantages for its implementation in educational settings. Several studies have explored its potential in language learning,

revealing its impact on enhancing motivation among college students studying English (Bonner & Reinders, 2018; Lee et al., 2017; Suryadi, 2021). According to Martínez et al. (2017), augmented reality activities encourage students to practice autonomous learning through exploration and self-evaluation. Billinghurst and Dünser (2012) explored the efficacy of augmented reality in elementary and high school classrooms and found positive attitudes towards using augmented reality applications in education, affirming its potential as a valuable teaching tool in different educational cycles. According to Anderson (2019), the ways in which we facilitate learning are being transformed by augmented reality.

In the present era, teachers are anticipated to create materials aligned with technological advancements to offer students a distinctive learning experience. Augmented reality serves as a valuable resource for fostering this type of experience (Lee et al., 2017; Suryadi, 2021). Recent studies highlighted the effectiveness of using augmented reality in teaching English as a foreign language (TEFL). Augmented reality based on mobile applications allows students to learn English in any place and at any time using a mobile device (Lee et al., 2017).

English is regarded as the language of business and education. In higher education institutions, English language proficiency test is a requirement for admission in most governmental and private colleges and universities in Kuwait. Ministry of Education and Ministry of higher education believe that "*mastering English is an essential step towards guaranteeing better future specialists in all fields*" (Tryzna & Al Sharoufi, 2017). Researchers emphasized the crucial role of effective English language teaching in achieving better performance in different disciplines. Consequently, they highlighted the importance of improving language instruction skills through using innovative materials such as digitalizing language activities (Byram et al., 2023). Digitalization of language materials means making it public for different uses via exploiting modern technology (Akbana, 2023).

According to Al-Nouri (2019), English language teachers in Kuwait do not receive adequate or proper professional training and students do not benefit from their instruction. As a result, many students find it challenging to understand English terminologies and basic skills, leading to frequent instances of academic failure. To address this concern, some studies suggested to provide professional training opportunities for all English teachers to enhance their skills and guarantee the effective addressing of the new curriculum objectives (Al-Nouri, 2019; Al Rubaie, 2010; Tryzna & Al Sharoufi, 2017). Another trend of research suggested that the utilization of various technology-driven tools, such as computers, podcasts, and chat platforms, has become prevalent in evaluating language proficiency within English as a foreign language (EFL) classrooms (Bahrani, 2011 Koşar, 2023; Tseng et al., 2020). This is because utilizing technology enables teachers to bridge the gap between language assessment and real-world communication (Bahrani, 2011).

According to Tryzna and Al Sharoufi (2017), the level of proficiency of Kuwaiti students at public schools is mediocre. Relatedly, Byram et al. (2023) indicated that the level of teaching the English language was moderately competent. That is why Tryzna and Al Sharoufi (2017) claimed that there is an association between the low level of English language proficiency and English language teachers' preparation programs at universities. As a result, innovative tools focusing on the four language skills are needed in teaching English (Byram et al., 2023). Moreover, English language teachers suffer from weak assessment literacy (Işık & Sarı, 2021). In this context, Technology-based alternative assessments are quite different from the conventional paper-and-pencil evaluation approach. Technology-based assessments employ innovative strategies to gauge improvements in language proficiency. This type of assessment proves effective by providing language learners with opportunities to apply their acquired knowledge (Bahrani, 2011).

While the youth of Kuwaitis acknowledge the significance of English for career prospects, acquiring knowledge, and achieving success in the globalized world, only a small minority actively engage in speaking or reading English outside the classroom (Al Rubaie, 2010). On the other hand, there is a considerable number of Kuwaiti students who believe that English will not benefit them in their future careers, particularly those studying science subjects, others have the reasoning that learning English is just a waste of time (Al-Nouri, 2019).

Despite the Ministry of Education dedicating important resources and effort to curriculum development, teaching materials, and teacher preparation, the present state of English as a Second Language (ESL) pedagogy fails to yield high-level English proficiency among public school graduates. "*Although Kuwait's English*

language policy appears well-designed and coherent, its implementation remains unsatisfactory" (Tryzna & Al Sharoufi, 2017, p. 90). These students join colleges and universities where they are taught courses using English as the main medium of instruction.

Augmented Reality

Technology is omnipresent in the realm of education nowadays. Augmented reality stands out as a burgeoning technology with significant potential in educational settings (Redondo et al., 2020). Augmented reality is a technology that enhances the actual physical environment by integrating computer-generated 3D virtual objects. This allows users to interact with these objects using the screens of their mobile devices (Lee et al., 2017). Augmented reality is at an early stage of integration into the educational domain, yet it offers valuable assets and unprecedented capabilities that enhance the process of learning and teaching (Mohamed & Razali, 2019).

Dalim et al. (2016) compared augmented reality system (TeachAR) to a traditional non-AR system in teaching basic English words (colors, shapes, and prepositions) to children whose native language is not English. The findings suggested a potentially superior learning outcome when utilizing the TeachAR system compared to the traditional approach. Additionally, it revealed that children found enjoyment in employing AR-based methods. Nonetheless, there were some usability issues with the TeachAR interface, which will be addressed and improved upon in future iterations.

Martínez et al. (2017) investigated the effective utilization of augmented reality through a mobile application to enrich vocabulary learning for kindergarten students in an interactive and engaging manner. The results demonstrated the application's satisfactory effectiveness and concluded that employing augmented reality in English education proves beneficial, especially when closely monitoring students' usage time. Martínez et al. (2017) assessed the effectiveness of a didactic unit based on augmented reality to teach vocabulary and grammatical structures in English. Students showed positive attitudes towards augmented reality approach during instruction. Significant improvements were noted in the targeted language domains.

Tulgar (2019) assessed the utility of augmented reality in teaching English to young learners. Results delineated various benefits of augmented reality in language education, including the potential utilization of multiple intelligences in teaching, learning English through observation and exploration, interaction with teachers and peers, improvement in language performance, support for self-directed learning, and increased motivation. Redondo et al. (2020) assessed the application of augmented reality in teaching English as a foreign language to preschool children. The study also investigated the impact of augmented reality on enhancing students' motivation and socio-emotional connections. In comparison to the control group, students in the treatment group demonstrated significant improvement in motivation, learning outcomes, and socio-affective relationships.

Karacan and Akoglu (2021) reviewed studies that employed augmented reality technology as a teaching tool for foreign languages. The findings indicated that augmented reality offers many opportunities and benefits for learning foreign languages; however, its complete integration into foreign language classrooms is currently unachievable

English Language Teaching in Kuwait

English language plays a pivotal role in most Kuwaiti institutions. The position of English as the language of international relations was reinforced when Kuwait joined the United Nations as a member state in 1963. English is taught as a compulsory subject at all levels of the public school system in Kuwait. Most Kuwaitis are bilingual because they use Arabic at homes with their families and English in dealing with foreign expats. An important indicator for the gradual increase in the significance of English language in Kuwait is that identity cards are now being issued using both languages English and Arabic (Tryzna & Al Sharoufi, 2017).

In the government schools, English language instruction is provided from the 1st to the 12th grade, offering each student a total of 12 years of formal instruction which is delivered through 45-minute lessons five times a week. General supervision department of English language teaching in the Kuwaiti the Ministry of Education is responsible for English language instruction, standards, curriculum, pedagogical materials, and exams at the national level. Its duties include upgrading the curricula, raising teachers' efficiency, and improving the

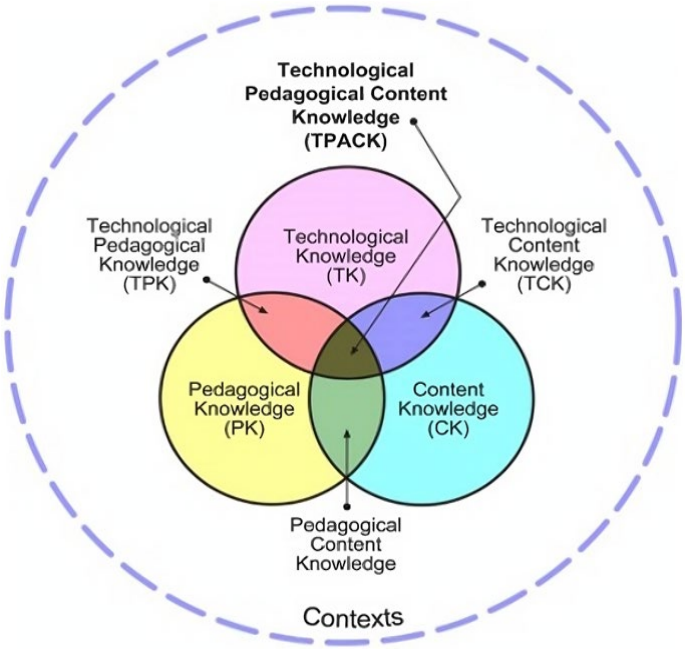

Figure 1. Interrelations among TPK, TCK, and PCK (Source: http://tpack.org)

learning environment, and professional training of ESL teachers. One of the most important solution of language problems in Kuwait is to use modern technology in language teaching. The incorporation of technology resulted in the formalization of the education system and further strengthened English's status in Kuwait as a medium for international communication, which might be challenging to grasp. Currently, technological advancements contribute to the consolidation of English as the second language in Kuwait (Tryzna & Al Sharoufi, 2017).

Quality of English Language Teaching

According to Farrell and Jacobs (2010), there are eight essentials for the successful teaching of English as a foreign language:

(1) learner autonomy,

(2) the social nature of learning,

(3) integrated curriculum,

(4) focus on meaning,

(5) students diversity,

(6) critical and creative thinking skills,

(7) alternative assessment, and

(8) teachers as co-learners.

Daif-Allah and Aljumah (2020) explored the impact of a program on enhancing the English language teaching skills of 70 pre-service English teachers in Qassim University. Results indicated the program's effectiveness in developing essential English language teaching skills. Hence, the study recommended incorporating suitable teaching practices in elementary school settings.

EFL TPACK Model

Technological pedagogical content knowledge (TPACK) addresses the complex, multifaceted, and situated nature of teacher knowledge while also attempting to identify the nature of knowledge that teachers require for technology integration in their teaching (Koehler & Mishra, 2009). **Figure 1** depicts the interrelations among TPK, TCK, and PCK that produce TPACK. Technological knowledge (TK) means *"Knowledge about how to use information communication technology (ICT) hardware and software and associated peripherals"* while TCK

means *"Knowledge about how to use technology to represent/research and create the content in different ways without consideration about teaching" (*Koşar, 2023, p. 4*).*

TPACK stands for technological pedagogical and content knowledge. In teaching EFL, TPACK is defined as the use of modern technology to improve instructional quality and effectiveness. TPACK implies "*Knowledge of using various technologies to teach, represent, and facilitate knowledge creation in specific subject content*" (Koşar, 2023).

Teaching English using this approach (TPACK) is useful for both students and teachers (Tseng et al., 2020). According to the qualitative findings reported by Koşar (2023), participants stressed the importance of expanding the TPACK program to include additional courses focused on incorporating educational technology into EFL teaching. They highlighted that the existing curriculum for pre-service English language teacher education is insufficient in enhancing their TPACK level. Therefore, they recommended enriching the curriculum to effectively address this need.

Bahrani (2011) investigated the use of diverse technology-driven tools for evaluating and monitoring students' language proficiency in EFL classrooms. Furthermore, the study highlighted tasks that teachers can utilize with technological support to assess students' achievements in language acquisition. The findings revealed that podcasts, social networking sites, free chat services, and mobile applications were widely adopted in language education practices. As a result, Koşar (2023) suggested to add a course to the TPACK on the use of technology in teaching English as a foreign language.

The Present Study

To the author's knowledge, this is the first study that investigated the prediction English language teaching quality through augmented reality competencies and TPACK model components among Kuwaiti undergraduates.

Through revising the literature of English language teaching, the author did not find a single study in the Kuwaiti environment that addressed these variables collectively. This is the research gap that the current study aims to address. For example, some studies in the Kuwaiti environment have shown that students' proficiency in English is not satisfactory (Al-Nouri, 2019; Tryzna & Al Sharoufi, 2017) and that there is an urgent need to employ modern technology in teaching and learning English. According to Tryzna and Al Sharoufi (2017), technological advancements contribute to the consolidation of English as the second language in Kuwait.

Arabic is the mother tongue in Kuwait that is why students might find it challenging to attain high English fluency. Limited English exposure outside the classroom and insufficient authentic language input can impede their development the four skills of English language (Alenezi, 2022). Moreover, Kuwaiti learners have weak oral skills in English (Almutairi, 2021).

Assaf (2023) concluded that the absence of technology is a key factor, highlighting the need to integrate various technological methods, including AI, into English Language Teaching. This approach would better suit modern generations who have grown up surrounded by technology.

In Kuwait, there is currently widespread interest in technology integration in Kuwait University and the Public Authority of Applied Education and Training in Kuwait. However, these institutions are currently experiencing difficulties in successfully implementing and integrating technology into classrooms and lecture halls (Alfelaij, 2016).

Alenezi et al. (2021) argued that over reliance on traditional teaching methods and limited access to computers or the internet as major factors contributing to language delays among EFL learners in Kuwait. Almutairi (2021) highlighted that absence of technology as one of the issues that negatively affected English language teaching in Kuwait (see Alfelaij, 2016, for a thorough analysis of the cultural, technical and contextual challenges that hinder ICT integration in Kuwait).

Buhamad et al. (2024) found poor performance of teachers in public education schools in Kuwait using educational technology.

Questions

1. What is the level of the augmented reality competencies of pre-service teachers of English?
2. What is the level of the self-perceived technological-pedagogical-content knowledge (TPACK, TK, and TCK) of pre-service teachers of English?
3. Are there significant gender differences in teacher's augmented reality competencies (TARC), TPACK, TK, TCK, and quality of teaching English skills (QTES)?
4. Can TARC, TPACK, TK, TCK, and QTES predict quality of teaching English?

METHOD

The descriptive research method was utilized in this study. To address the first and second questions, means and percentages were employed. Analysis of variance was applied to the third question, while multiple linear regression analysis was used to tackle the fourth question.

Participants

A total of 317 preservice teachers were recruited using convenient sampling techniques to participate in this study. They were enrolled in English department, college of education, Kuwait university. The author teaches most of the college of education students and inquired about their willingness to participate in the data collection during lectures. During these sessions, links to Google Forms were distributed via email and WhatsApp to students who were readily available and willing to respond. While the completed questionnaires may not represent the entire population, this limitation will be noted in the manuscript's limitations section. Potential biases in participant recruitment will be addressed in the statement regarding the generalization of findings. Demographic data is detailed in **Table 1**.

Table 1. Demographics of the participants

#	Number	Percentage
Freshmen	20	6.3%
Sophomores	79	24.9%
Juniors	90	28.4%
Seniors	128	40.4%
Males	66	20.8%
Females	251	79.2%
Total	317	
Age, *M (SD)*	22.48 (4.43)	
CGPA, *M (SD)*	3.17 (0.49)	

Instruments

The participants were English majors so they can read and understand the intended meanings of the items. The questionnaires were administered in their original English versions, without translation or modification, as the items and wording were deemed comprehensible. Reliability for all questionnaires was assessed prior to utilization. Furthermore, the method section included the names of the original authors of the questionnaires. No modifications were made to the instruments by the authors of the present manuscript; they were utilized in their original form.

Teachers' augmented reality competencies scale (TARC)

Teachers' Augmented Reality Competencies Scale (Nikou et al., 2023) consisted of 11 items assessing pre-service teachers' competencies in using augmented reality in teaching EFL. This scale was constructed based on the TARC framework suggested by Nikou et al. (2022). Composite reliability was greater than 0.70 indicating adequate construct reliability (Gefen et al., 2000). Internal consistency reliability in the current study using alpha and omega coefficients were reported in **Table 2**.

Table 2. Alpha and omega reliability coefficients, standard errors, and confidence intervals

Measure		Number of items	Coefficient	Standard error	95% CI lower	95% CI upper
TARC	Omega	11	.855	.016	.819	.883
	Alpha		.857	.015	.821	.882
TPACK	Omega	6	.796	.029	.733	.844
	Alpha		.804	.026	.749	.850
TK	Omega	6	.819	.022	.772	.858
	Alpha		.822	.022	.775	.862
TCK	Omega	6	.881	.015	.848	.907
	Alpha		.882	.015	.851	.908
QTESQ	Omega	10	.879	.014	.847	.904
	Alpha		.881	.013	.852	.904

Note. TARC: Teachers' augmented reality competencies scale; TPACK: Self-perceived technological-pedagogical-content knowledge; QTESQ: Quality of teaching English skills questionnaire; CI: Confidence interval.

EFL TPACK questionnaire

TPACK, TK, and technological content knowledge (TCK) are three subscales extracted from EFL TPACK questionnaire comprising 36 items developed by Bostancıoglu and Handley (2018). TPACK subscale consisted of 6 items assessing *TPACK (alpha, .89)*, TK subscale consisted of 6 items assessing *TK (Alpha, .78),* while TCK comprising 6 items measuring *TCK (alpha, .86).* Additionally, composite reliability indicated adequate values. Participants rated their responses using a five-point Likert scale ranging from strongly disagree to strongly agree. In this study, values of alpha and omega indicated adequate reliability (**Table 2**).

Quality of teaching English skills questionnaire

Teaching and management skills subscale consisted of 10 items. It is a part of a long questionnaire developed in the Korean setting with a five-point Likert to assess preservice teachers quality of teaching and classroom management skills. It is translated and back translated in this study (Han, 2017). Reliability of this scale was computed using Cronbach's alpha and McDonald's omega and their values are reported in **Table 2**.

Reliability of instruments

Numerous studies suggested the use of McDonald's omega side by side with Cronbach's alpha in assessment of internal consistency reliability of instruments owing to the advantages of the former and the defects of the latter (Cho & Kim, 2015; Deng & Chan, 2016; Dunn et al., 2014; Green & Yang, 2009; Zhang & Yuan, 2016). In this study, SPSS version 26 was used to compute alpha and omega coefficients that are reported in **Table 2**.

Table 2 indicates that the measures have adequate internal consistency reliability, with McDonald's omega and Cronbach's alpha values ranging from .796 to .882. The narrow confidence intervals suggest that the reliability estimates are accurate. The broadest confidence interval (.087) was observed for the alpha of TK, while the narrowest for the alpha of the QTES. **Appendix A** shows item scales.

RESULTS

The results of TARC items, TPACK component, TK component, TCK component, and QTESQ items are shown in **Table 3**, **Table 4**, **Table 5**, **Table 6**, and **Table 7**, respectively. **Table 8** reveals a positive correlation among the constructs. The weakest correlation, at 0.361, occurred between TPACK and TK. Conversely, the strongest relationship, indicated by a correlation of 0.633, was found between TCK and QTES.

Table 3. Results of the TARC items

Items	M (SD)	Agree, No. (%)	Neutral, No. (%)	Disagree, No. (%)
TARC 1	3.89 (.82)	236 (74.4)	67 (21.1)	14 (4.4)
TARC 2	3.87 (.79)	229 (72.2)	74 (23.3)	14 (4.4)
TARC 3	3.93 (.85)	247 (77.9)	50 (15.8)	20 (6.3)
TARC 4	3.90 (.87)	229 (72.2)	68 (21.5)	20 (6.3)
TARC 5	3.98 (.86)	247 (77.9)	53 (16.7)	17 (5.4)
TARC 6	3.90 (.84)	235 (74.1)	62 (19.6)	20 (6.3)
TARC 7	3.83 (.85)	223 (70.3)	72 (22.7)	22 (6.9)
TARC 8	3.78 (.90)	221 (69.7)	73 (23.0)	23 (7.3)
TARC 9	3.91 (.81)	230 (72.6)	73 (23.0)	14 (4.4)
TARC 10	3.80 (.94)	221 (69.7)	65 (20.5)	31 (9.8)
TARC 11	3.74 (.93)	207 (65.3)	82 (25.9)	28 (8.8)

Table 4. Results of the TPACK component

Items	M (SD)	Agree, No. (%)	Neutral, No. (%)	Disagree, No. (%)
TPACK 1	4.03 (.88)	250 (78.9)	20 (6.3)	17 (5.4)
TPACK 2	4.08 (.92)	260 (82.0)	38 (12.0)	19 (6.0)
TPACK 3	4.02 (.89)	244 (77.0)	58 (18.3)	15 (4.7)
TPACK 4	4.11 (.88)	260 (82.0)	44 (13.9)	13 (4.1)
TPACK 5	3.88 (.90)	229 (72.2)	65 (20.5)	23 (7.3)
TPACK 6	3.99 (.92)	243 (76.7)	52 (16.4)	22 (6.9)

Table 5. Results of the TK component

Items	M (SD)	Agree, No. (%)	Neutral, No. (%)	Disagree, No. (%)
TK 1	3.95 (.96)	241 (76.0)	48 (15.1)	28 (8.8)
TK 2	3.77 (1.00)	216 (68.1)	57 (18.0)	44 (13.9)
TK 3	3.98 (.97)	240 (75.7)	53 (16.7)	24 (7.6)
TK 4	4.23 (.82)	236 (74.4)	41 (12.9)	10 (3.2)
TK 5	4.19 (.85)	233 (73.5)	42 (13.2)	12 (3.8)
TK 6	4.12 (.93)	248 (78.2)	49 (15.5)	20 (6.3)

Table 6. Results of the TCK component

Items	M (SD)	Agree, No. (%)	Neutral, No. (%)	Disagree, No. (%)
TCK 1	4.17 (.87)	269 (84.9)	34 (10.7)	14 (4.4)
TCK 2	4.13 (.91)	263 (83.0)	34 (10.7)	20 (6.3)
TCK 3	4.06 (.89)	246 (77.6)	53 (16.7)	18 (5.7)
TCK 4	4.09 (.88)	253 (79.8)	47 (14.8)	17 (5.4)
TCK 5	4.16 (.90)	258 (81.4)	41 (12.9)	18 (5.7)
TCK 6	4.15 (.84)	255 (80.4)	50 (15.8)	12 (3.8)

Table 7. Results of the QTESQ items

Items	M (SD)	Agree, No. (%)	Neutral, No. (%)	Disagree, No. (%)
QTESQ 1	3.89 (.88)	230 (72.6)	68 (21.5)	19 (6.0)
QTESQ 2	3.94 (.82)	241 (76.0)	61 (19.2)	15 (4.7)
QTESQ 3	3.89 (.87)	230 (72.6)	68 (21.5)	19 (6.0)
QTESQ 4	4.03 (.81)	255 (80.4)	48 (15.1)	14 (4.4)
QTESQ 5	4.02 (.90)	247 (77.9)	49 (15.5)	21 (6.6)
QTESQ 6	4.07(.86)	260 (82.0)	41 (12.9)	16 (5.0)
QTESQ 7	4.02 (.84)	251 (79.2)	51 (16.1)	15 (4.7)
QTESQ 8	4.07 (.83)	256 (80.8)	48 (15.1)	13 (4.1)
QTESQ 9	4.09 (.86)	252 (79.5)	49 (15.5)	16 (5.0)
QTESQ 10	4.17 (.80)	267 (84.2)	39 (12.3)	11 (3.5)

Table 8. Correlation matrix among different measures

#	Measures	1	2	3	4	5
1	TARC	1				
2	TPACK	0.400**				
3	TK	0.361**	0.580**			
4	TCK	0.399**	0.551**	0.601**		
5	QTESQ	0.399**	0.514**	0.555**	0.633**	1

Note. **Significant at 0.01 level

Table 9 indicates that there were no significant differences between male and female students across all variables, as the p-values for the F-tests on all constructs did not reach statistical significance at either the 0.05 or 0.01 levels.

Table 9. Gender differences in TARC, TPACK, TK, TCK, and QTES

Subscale	Source	Sum of squares	df	Mean square	F	p-value
TARC	Between groups	4.934	1	4.934	2.669	0.103
	Within groups	582.347	315	1.849		
	Total	587.281	316			
TPACK	Between groups	0.798	1	0.798	0.376	0.540
	Within groups	668.048	315	2.121		
	Total	668.845	316			
TK	Between groups	1.624	1	1.624	0.661	0.417
	Within groups	773.708	315	2.456		
	Total	775.331	316			
TCK	Between groups	0.591	1	0.591	0.259	0.611
	Within groups	716.943	315	2.276		
	Total	717.533	316			
QTESQ	Between groups	1.275	1	1.275	0.693	0.406
	Within groups	579.463	315	1.840		
	Total	580.748	316			

Table 10 presents the results of a multiple linear regression analysis model. Each row corresponds to a predictor variable. One critical aspect to note is the interpretation of the standardized coefficients (β), which indicate the strength and direction of the relationship between each predictor and the dependent variables. In this context, TCK appears to have the highest standardized coefficient (β = 0.395), followed by TK (β = 0.194), TPACK (β = 0.132), and TARC (β = 0.131). These coefficients suggest that TCK has the strongest influence on the outcome variable, followed by TK, TPACK, and TARC, respectively. The p-values suggest that all predictor variables are statistically significant ($p < 0.05$), indicating that they contribute significantly to the model.

Table 10. Multiple linear regression analysis model

Model	B	SE	β	t	p-value	Lower 95% CI	Upper 95% CI
Constant	1.768	.397		4.448	.000	.986	2.550
TARC	.130	.045	.131	2.866	.004	.041	.220
TPACK	.123	.050	.132	2.443	.015	.024	.222
TK	.168	.048	.194	3.494	.001	.073	.262
TCK	.356	.049	.395	7.270	.000	.259	.452

Note. Predictors: TARC, TPACK, TK, TCK; Dependent variable: QTES; N = 317; R = .691; R^2 = .478; CI: Confidence interval.

As known, narrow confidence intervals suggest more precise estimates. In **Table 10**, the widths of the intervals vary across the coefficients. the confidence interval of the TPACK (.024 to .222) has a relatively wide range, indicating some uncertainty about the true value of the corresponding regression coefficient. On the other hand, the confidence interval of the TARC (.041 to .220) appears narrower, suggesting greater precision in estimating the corresponding coefficient.

Frequencies and percentages of the participants who selected three categories of responses: agree, neutral, and disagree were computed for all measures. Values indicated that the majority, comprising over two-thirds of respondents across various measures TARC, TPACK, TK, TCK, and QTES, opted for responses

indicating "strongly agree" and "agree." Conversely, 13% or fewer individuals selected responses denoting "strongly disagree" and "disagree," with approximately 26% or fewer participants expressing a "neutral" response. This high agreement rate suggests that participants possess the essential requisites and skills to effectively utilize augmented reality and contemporary technological tools in English language teaching.

Descriptive statistics of augmented reality competencies questionnaire (**Table 2**) showed that the rank of item 5 " *I can use augmented reality educational resources and tools to teach (e.g., present, demonstrate, explain the educational content) my students*" was the highest (3.98) while and the rank of item 11"*I can secure the safe use of augmented reality resources and tools by all participating in the educational activities (e.g., securing participants' resources, safety, health)"* was the lowest (3.74). This finding implies that pre-service teachers of English harbor apprehensions about safety procedures when employing augmented reality in instruction, despite their competence in utilizing augmented reality resources and tools within the learning and teaching processes. This is contradictory with findings reported by Han (2017) that students' self-confidence in learning English was not high.

Concerning findings of the TPACK (**Table 2**), item 4 "*I can use a range of technologies that enable students to become active participants*" gained the highest mean score (4.11), which implies that students were greatly interested in blading learners' motivation to be active and positively participate in classroom activities adopting different technologies. On the other hand, item 5 "*I can provide equitable access to digital language learning tools and resources*" occupied the lowest rank (3.88) because the availability and accessibility of augmented reality infrastructure might be out of the pre-service teacher's control.

Regarding TK, it is clear in **Table 5** that item 4 "*I know how to use generic office applications (i.e., Word, PowerPoint, and excel)"* took the highest rank (4.23). This is because these are the simplest applications in Microsoft office group. Mostly, all students are aware of how to use this software. On the other hand, item 2 "*I know about basic computer hardware (i.e., CD-ROM, motherboard, RAM) and their functions"* got the lowest rank (3.77) This finding is explained by the fact that students show less enthusiasm for becoming acquainted with the technical details and functions of the hardware compared to their level of familiarity with its practical application in the classroom.

Concerning TCK, mean scores reported in **Table 6**, it is obvious that item 1 *"I know how to use computer-mediated-communication technologies (e.g., e-mail, chat)"* got the highest rank (4.17). This finding is highly reasonable since chatting and emails are commonly used modes of communication in contemporary times, and almost all students can proficiently utilize them. Conversely, item 3 "*I know about technologies that I can use to teach writing in English*" took the lowest rank (4.06). This finding is in line with results reported by Bizetto (2020) which stated that writing is regarded as being a difficult skill to acquire and teach due to students' lack of interest in writing and the less time assigned to correcting their written expression essays.

Table 7 showed that item 10 "*Using appropriate volume of voice and accent*" took the highest rank (4.17) while items 1 and 3 occupied the lowest ranks "*Running learner-centered classes, including teacher-students and student-student interactions*"; "*Organizing the lessons that enable learners' autonomous knowledge construction"*. This finding is supported by prior research which indicated that pre-service teachers receive little training on autonomous learning instruction (Basri, 2023; Khotimah et al., 2023; Perlman, 2011).

A one-way ANOVA was performed to compare the effect of gender (male-female) of pre-service teachers on TARC, TPACK, TK, TCK, and QELTQ. Results revealed that there were insignificant gender differences in TARC, $F(1.315) = 2.669$, $p = .103$. In TPACK, $F(1.315) = 0.376$, $p = 0.540$, in TK, $F(1.315) = 0.661$, $p = 0.417$, in TCK, $F(1.315) = 0.259$, $p = 0.611$, and in QELTQ, $F(1.315) = 0.693$, $p = 0.406$. Due to the insignificant differences, no post hoc tests were employed. Unlike the prior research, these findings demonstrate no significant differences in TARC, TPACK, TK, TCK, and QELTQ. This result is surprisingly contradictory with findings reported by Dirin et al. (2019) which indicated that female participants were more motivated about the usage of new technologies such as augmented reality and virtual reality than males. On the other hand, Wood and Li (2005) found that males exhibited a greater willingness to rapidly embrace new technologies compared to females. Relatedly, our results are inconsistent with those reported by Kongaut and Bohlin (2016) who found significant gender differences in mobile technology adoption.

The insignificant gender differences in our study can be attributed to the unanimous perception among students that augmented reality applications serve as a source of inspiration. They believe that augmented

reality applications are more engaging and thrilling compared to conventional methods of learning and teaching. This study recruited a female-dominant sample; and this imposes another potential interpretation of our insignificant gender differences due to the unbalanced ratios of males and females.

Pearson correlation coefficient revealed positive significant correlation at 0.01 level among the investigated variables ranging from ($r = 0.361$ to 0.633, $p > 0.01$) (see **Table 8**). Linear regression analysis revealed that TARC, TPACK, TK, and TCK were significant predictors of QTES (see **Table 10**). Findings indicated that TARC, TPACK, TK, and TCK account for 47.8% of the variance in students' scores on QTES questionnaire. This finding is consistent with results reported in previous studies and confirmed that modern technology knowledge and use plays a vital role in successful EFL teaching and learning (Koşar, 2023; Liu et al., 2014).

DISCUSSION

This study investigated the correlation relationship amongst augmented reality competencies and quality of English language teaching in the light of the TPACK model. Additionally, it explored the utility of augmented reality competencies and TPACK model components in predicting quality of English language teaching in Kuwaiti undergraduates.

To the best of the author's knowledge, this is one of the first studies addressing this topic in the Kuwaiti context using college undergraduates. The items of the instruments were rated using a 5-point Likert scale type ranging from 1 (strongly disagree) to 5 (strongly agree) with 5 denoting the highest rank. Mean scores were categorized into three levels: scores of 1-2.33 were considered low, 2.34-3.66 moderate, and 3.67-5 high (Ahmed et al., 2023). Considering the cut-off-scores mentioned above, all items occupied the high rank indicating that participants strongly believe that they acquire the essential competencies related to augmented reality in EFL classrooms as measured by QTES, Similarly, they possess a high level of proficiency in TPACK, TK, and TCK (see **Tables 2–7**).

Results of this study support previous research on augmented reality. In augmented reality and modern technology increases students' motivation to learn, moreover, students' attitudes towards augmented reality are positively associated with better academic performance because it facilitates learning English for undergraduates (Liu, 2009; Mohamed & Razali, 2019). Augmented reality offers interactive learning style in which students easily interact with content and activities (Küçük et al., 2014). *"Augmented reality offers simulations where operations of real-world processes are imitated*" (Mohamed & Razali, 2019, p. 728). Relatedly, Sáez-López et al. (2020) argued that teachers' use of augmented reality provokes learners' enthusiasm for learning, creativity, innovation, and classroom participation. Contradictory with the present findings, other studies (e.g., Sáez-López et al., 2020) highlighted that teacher education programs need to provide pre-service teachers initial training to enable them design and apply augmented reality applications in instruction and exploit its benefits in maximizing learning opportunities.

CONCLUSIONS

The outcomes of this study yield several implications for both pre-service teachers and education policymakers. Pre-service teachers exhibited elevated proficiency in augmented reality and contemporary technological tools, expressing a readiness to incorporate these technologies into English teaching within classroom settings. The crucial consideration lies in instilling ethical practices for the optimal utilization of these advanced technologies, ensuring that they enhance learning opportunities and achieve the desired learning outcomes. It is essential to provide training for both pre-service and in-service teachers on ensuring the safety of learners when utilizing virtual or augmented reality in classrooms. This includes safeguarding them from cyber-bullying or potential hacking threats. It is worth noting that customizing virtual reality and augmented reality applications for educational purposes necessitates a specific emphasis on technical assistance and user-friendly interfaces (Dirin et al., 2019).

The findings of this investigation suggested that students are well-acquainted with contemporary technological apps and programs. Consequently, the focus should shift from introducing additional programs for training students in the basic use of modern technologies. Instead, the emphasis should be on providing guidance on using these technologies judiciously and in ways that are beneficial.

Limitations & Future Research

The primary and foremost limitation of this study is the predominance of female participants. Subsequent research should aim for a more balanced representation of genders. The second limitation pertains to the reliance on self-report questionnaires for data collection; future studies are encouraged to incorporate mixed methods. The third limitation is associated with the use of convenient sampling, introducing inherent bias; therefore, future research should focus on recruiting simple or clustered random samples to guarantee generalization of results. Owing to the unbalanced distribution of male and female participants, the gender differences among pre-service teachers in augmented reality and virtual reality adoption deserves further research.

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Ethics declaration: The author declared that the standards of human information procedure ethics at Kuwait University were followed during this study. The ethics committee's approval was not obtained because the research posed minimal risk to the participants. This means that the probability and magnitude of harm or discomfort anticipated in the study are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests. Informed consent was obtained from participants at the onset of data collection. Data collection was implemented in line with the ethical standards set by Kuwait University, as well as the 1964 Helsinki Declaration and its subsequent amendments or comparable ethical guidelines.

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Data availability: Data generated or analyzed during this study are available from the author on request.

REFERENCES

Ahmed, E. A., Alkhaldi, S. M., Alduraidi, H., Albsoul, R. A., & Alhamdan, M. Z. (2023). Quality of life of mothers and fathers of children with autism spectrum disorder in Jordan. *Clinical Practice and Epidemiology in Mental Health, 19*(1). https://doi.org/10.2174/17450179-v19-e230529-2022-40

Akbana, Y. (2023). The substantial need for digitalizing language teaching methods and materials. In E. A. Yunus, & K. Gülten (Eds.), *Digitalizing English language teaching*. Pegem Academy Publishing Training and Consultancy Services.

Al Rubaie, R. (2010). *Future teachers, future perspectives: The story of English in Kuwait* [Unpublished doctoral dissertation]. The University of Exeter.

Alenezi, A. A., Alazemi, A. M., & Alnwaiem, A. F. (2021). Willingness to communicate in Kuwaiti EFL classroom settings. *International Journal of English Language and Linguistics Research, 9*(4), 12–26.

Alenezi, M. A. (2022). *English in Kuwait: A pattern-driven perspective* [Doctoral dissertation, University College Dublin].

Alfelaij, B. (2016). Why integrating technology has been unsuccessful in Kuwait? An exploratory study. *E-Learning and Digital Media, 13*(3–4), 126–139. https://doi.org/10.1177/2042753016672901

Almutairi, M. A. (2021). Underachievement in English speaking skills among Kuwaiti EFL students at the college of basic education: Possible causes and possible solutions. *Journal of Language Teaching and Research, 12*(1), 206–210. https://doi.org/10.17507/jltr.1201.23

Al-Nouri, R. M. (2019). Why are Kuwaiti students weak in the English language? *Multi-Knowledge Electronic Comprehensive Journal for Education & Science Publications, 26*, 1–25.

Anderson, A. (2019). *Virtual reality, augmented reality, and artificial intelligence in special education: A practical guide to supporting students with learning differences*. Routledge. https://doi.org/10.4324/9780429399503

Assaf, H. M. (2023). *A comprehensive exploration of challenges that English as foreign language learners in Kuwait encounter and suggestions for enhancement* [Master thesis, Asia University].

Bahrani, T. (2011). Technology as an assessment tool in language learning. *International Journal of English Linguistics, 1*(2), 295–298. https://doi.org/10.5539/ijel.v1n2p295

Basri, F. (2023). Factors influencing learner autonomy and autonomy support in a faculty of education. *Teaching in Higher Education, 28*(2), 270–285. https://doi.org/10.1080/13562517.2020.1798921

Billinghurst, M., & Dünser, A. (2012). Augmented reality in the classroom. *Computer, 45*(7), 56–63. https://doi.org/10.1109/MC.2012.111

Bizetto, C. A. (2020). The challenges and benefits of teaching writing as a skill. *Educational Resurgence, 2*(4), 32–39.

Bonner, E., & Reinders, H. (2018). Augmented and virtual reality in the language classroom: Practical ideas. *Teaching English with technology, 18*(3), 33–53.

Bostancıoglu, A., & Handley, Z. (2018). Developing and validating a questionnaire for evaluating the EFL 'total PACKage': Technological pedagogical content knowledge (TPACK) for English as a foreign language (EFL). *Computer Assisted Language Learning 31*(5–6), 572–598. https://doi.org/10.1080/09588221.2017.1422524

Buhamad, A. M., Almisad, B. M., & Alsaffar, R. D. (2024). Poor performance of teachers in public education schools in Kuwait using educational technology. *International Journal of Learning and Development, 14*(1), 63–72. https://doi.org/10.5296/ijld.v14i1.21653

Byram, M., Porto, M., & Yulita, L. (2023). Beyond teaching languages for communication—Humanistic perspectives and practices. *Languages*, *8*(3), Article 166. https://doi.org/10.3390/languages8030166

Cho, E., & Kim, S. (2015). Cronbach's coefficient alpha: Well-known but poorly understood. *Organizational Research Methods, 18*(2), 207–230. https://doi.org/10.1177/1094428114555994

Daif-Allah, A. S., & Aljumah, F. H. (2020). Developing the English language teaching skills of Saudi teachers of young learners. *English Language Teaching, 13*(3), 20–30. https://doi.org/10.5539/elt.v13n3p20

Dalim, C. S. C., Dey, A., Piumsomboon, T., Billinghurst, M., & Sunar, S. (2016). TeachAR: An interactive augmented reality tool for teaching basic English to non-native children. In *Proceedings of the 2016 IEEE International Symposium on Mixed and Augmented Reality* (pp. 82–86). IEEE. https://doi.org/10.1109/ISMAR-Adjunct.2016.0046

Deng, L. & Chan, W. (2016). Testing the difference between reliability coefficients alpha and omega. *Educational and Psychological Measurement, 77*(2), 185–203. https://doi.org/10.1177/0013164416658325

Dirin, A., Alamäki, A., & Suomala, J. (2019). *Gender differences in perceptions of conventional video, virtual reality and augmented reality*. International Association of Online Engineering. https://doi.org/10.3991/ijim.v13i06.10487

Dunn, T. J., Baguley, T., & Brunsden, V. (2014). From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *British Journal of Psychology, 105*(3), 399–412. https://doi.org/10.1111/bjop.12046

Farrell, T., & Jacobs, G. (2010). *Essentials for successful English language teaching*. Continuum International Publishing Group.

Gefen, D., Straub, D. W., & Boudreau, M.-C. (2000). Structural equation modeling and regression guidelines for research practice. *Communications of the Association for Information Systems, 4*(7), 2–77. https://doi.org/10.17705/1CAIS.00407

Green, S. B., & Yang, Y. (2009). Commentary on coefficient alpha: A cautionary tale. *Psychometrika, 74*(1), 121–135. https://doi.org/10.1007/S11336-008-9098-4

Han I. (2017). Attributes of quality English teachers and teaching perceived by academic high school students in Korea. *Modern English Education*, *18*(4), 139–167. https://doi.org/10.18095/meeso.2017.18.4.07

Işık, A., & Sarı, R. (2021). Are English language teachers assessment literate?. *Cukurova University Faculty of Education Journal*, *50*(2), 907–928. https://doi.org/10.14812/cuefd.877706

Karacan, C. G., & Akoglu, K. (2021). Educational augmented reality technology for language learning and teaching: A comprehensive review. *Shanlax International Journal of Education, 9*(2), 68–79. https://doi.org/10.34293/education.v9i2.3715

Khotimah, K., Basthomi, Y., & Eliyanah, E. (2023). EFL pre-service teacher development for autonomy: Rethinking future autonomy supportive teacher. In *Proceedings of the 20th AsiaTEFL-68th TEFLIN-5th iNELTAL Conference* (pp. 321–329). Atlantis Press. https://doi.org/10.2991/978-2-38476-054-1_27

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education, 9*(1), 60–70. https://doi.org/10.1177/002205741319300303

Kongaut, C., & Bohlin, E. (2016). Investigating mobile broadband adoption and usage: A case of smartphones in Sweden. *Telematics and Informatics, 33*(3), 742–752. https://doi.org/10.1016/j.tele.2015.12.002

Koşar, G. (2023). An examination into pre-service English-as-a-foreign-language teachers' self-perceived technological pedagogical-content-knowledge. *E-Learning and Digital Media*, *21*(3), 236–254. https://doi.org/10.1177/20427530231156169

Küçük, S., Yılmaz, R. M., & Göktaş, Y. (2014). Augmented reality for learning English: Achievement, attitude and cognitive load levels of students. *Journal of Education and Science*, *39*(176), 393–404. https://doi.org/10.15390/EB.2014.3595

Lee, L. K., Chau, C. H., Chau, C. H., & Ng, C. T. (2017). Using augmented reality to teach kindergarten students English vocabulary. In *Proceedings of the 2017 International Symposium on Educational Technology* (pp. 53–57). IEEE. https://doi.org/10.1109/ISET.2017.20

Liu, S., Liu, H., Yu, Y., Li, Y., & Wen, T.-S. (2014). TPACK: A new dimension to EFL teachers' PCK. *Journal of Education and Human Development, 3*(2), 681–693.

Liu, T. Y. (2009). A context-aware ubiquitous learning environment for language listening and speaking. *Journal of Computer Assisted Learning, 25*(6), 515–527. https://doi.org/10.1111/j.1365-2729.2009.00329.x

Martínez, A. A., Benito, J. R. L., González, E. A., & Ajuria, E. B. (2017). An experience of the application of augmented reality to learn English in infant education. In *Proceedings of the 2017 International Symposium on Computers in Education* (pp. 1–6). IEEE. https://doi.org/10.1109/SIIE.2017.8259645

Mohamed, M. H., & Razali, A. B. (2019). Augmented reality in teaching and learning English reading: Realities, possibilities, and limitations. *International Journal of Academic Research in Progressive Education and Development, 8*(4), 724–737. https://doi.org/10.6007/IJARPED/v8-i4/6696

Nikou, S., Perifanou, M., & Economides, A. A. (2022). Towards a teachers' augmented reality competencies (TARC) framework. In M. E. Auer, & T. Tsiatsos (Eds.), *New realities, mobile systems and applications, proceedings of international conference on interactive mobile and communication technologies and learning* (vol. 411, pp. 203–212). Springer. https://doi.org/10.1007/978-3-030-96296-8_19

Perlman, D. (2011). The influence of an autonomy-supportive intervention on preservice teacher instruction: A self-determined perspective. *Australian Journal of Teacher Education, 36*(11), 73–79.

Redondo, B., Cózar-Gutiérrez, R., González-Calero, J. A., & Sánchez Ruiz, R. (2020). Integration of augmented reality in the teaching of English as a foreign language in early childhood education. *Early Childhood Education Journal, 48*(2), 147–155. https://doi.org/10.1007/s10643-019-00999-5

Sáez-López, J. M., Cózar-Gutiérrez, R., González-Calero, J. A., & Gómez Carrasco, C. J. (2020). Augmented reality in higher education: An evaluation program in initial teacher training. *Education Sciences, 10*(2), Article 26. https://doi.org/10.3390/educsci10020026

Suryadi, A. I. (2021). Augmented and virtual reality for teaching English to young learners: Practical ideas. *Proceedings of the Twelfth Annual International Symposium of Foreign Language Learning (The 12th AISOFOLL)* (pp. 100–108).

Tryzna, M., & Al Sharoufi, H. (2017). English language education policy in Kuwait. In R. Kirkpatrick (Ed.), *English language education policy in the Middle East and North Africa. Language Policy, vol. 13* (pp. 77–91). Springer. https://doi.org/10.1007/978-3-319-46778-8_6

Tseng, J. J, Chai, C. S., Tan, L., & Park, M. (2020). A critical review of research on technological pedagogical and content knowledge (TPACK) in language teaching. *Computer Assisted Language Learning, 35*(4), 948–971. https://doi.org/10.1080/09588221.2020.1868531

Tulgar, T. A. (2019). In between reality and virtuality: Augmented reality in teaching English to young learners. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 41*, 356–364.

Wood, W., & Li, S. (2005). The empirical analysis of technology camel. *Issues in Information Systems, 6*(2), 154–160.

Zhang, Z., & Yuan, K. H. (2016). Robust coefficients alpha and omega and confidence intervals with outlying observations and missing data: Methods and software. *Educational and Psychological Measurement, 76*(3), 387–411. https://doi.org/10.1177/0013164415594658

APPENDIX A

Age (in years): _____ Gender: ( ) Male ( ) Female, Academic year: 1, 2, 3, 4, 5 (please circle)
Cumulative grade point average (CGPA): _____ Governorate: _____
Please circle the number that best suits your response.

Table A1. Item scales

#	Items	SA	A	N	D	SD
Teachers' augmented reality competencies (TARC) scale (Nikou et al., 2023)						
1	I can design AR educational experiences using AR applications and tools to meet specific educational objectives.	5	4	3	2	1
2	I can develop AR educational resources using easy-to-use AR templates and asset libraries.	5	4	3	2	1
3	I can modify and adapt AR educational resources to my teaching goals.	5	4	3	2	1
4	I can use AR educational resources and tools employing various pedagogies and teaching methods.	5	4	3	2	1
5	I can use AR educational resources and tools to teach (e.g., present, demonstrate, explain the educational content) my students.	5	4	3	2	1
6	I can use AR educational resources and tools (e.g., AR and multimodal game-based and/or simulation-based assessments) to assess the students' progress and provide feedback.	5	4	3	2	1
7	I can use search engines, digital repositories, and databases to find existing AR educational resources and tools using appropriate criteria, metadata filters, and recommender systems.	5	4	3	2	1
8	I can evaluate AR educational resources and tools using appropriate criteria.	5	4	3	2	1
9	I can organize and schedule the most appropriate AR educational resources and tools for achieving specific educational objectives.	5	4	3	2	1
10	I can ensure and control the ethical and responsible use of AR resources and tools by all participating in educational activities (e.g., respecting participants' personality, privacy, & rights).	5	4	3	2	1
11	I can secure the safe use of AR resources and tools by all participating in the educational activities (e.g., securing participants' resources, safety, & health).	5	4	3	2	1
Quality of teaching English skills questionnaire (Han, 2017)						
1	Running learner-centered classes, including teacher-students and student-student interactions.	5	4	3	2	1
2	Having management skills that lead concentration of all students.	5	4	3	2	1
3	Organizing the lessons that enable learners' autonomous knowledge construction.	5	4	3	2	1
4	Leading learner participation with their presentations.	5	4	3	2	1
5	Encouraging the learners' trials and errors.	5	4	3	2	1
6	Frequently checking learner comprehension.	5	4	3	2	1
7	Being responsive to the individual learners' levels, needs and questions.	5	4	3	2	1
8	Integrating grammar, audio-visual materials, and communicative activities.	5	4	3	2	1
9	Helping learners to achieve high scores on tests.	5	4	3	2	1
10	Using appropriate volume of voice and accent.	5	4	3	2	1
Self-perceived technological-pedagogical-content knowledge (EFL TPACK questionnaire) (Bostancıoglu & Handley, 2018)						
TPACK component items						
1	I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn.	5	4	3	2	1
2	I can use technology effectively to communicate relevant information to students and peers.	5	4	3	2	1
3	I can use a range of technologies to help students pursue their individual curiosities.	5	4	3	2	1
4	I can use a range of technologies that enable students to become active participants.	5	4	3	2	1
5	I can provide equitable access to digital language learning tools and resources.	5	4	3	2	1
6	I can facilitate intercultural understanding by using technology to engage students with different cultures.	5	4	3	2	1
TK component items						
1	I know how to use computer-mediated-communication (CMC) technologies (e.g. E-mail, chat).	5	4	3	2	1
2	I know about basic computer hardware (i.e. CD-ROM, motherboard, RAM) and their functions.	5	4	3	2	1
3	I know how to save data into/from a digital device (i.e., flash disk, USB stick, CD).	5	4	3	2	1
4	I know how to use generic office applications (i.e., Word, PowerPoint, and excel).	5	4	3	2	1
5	I know how to play audio and video files on my computer.	5	4	3	2	1
6	I know how to record video files (i.e., using a video camera).	5	4	3	2	1
TCK component items						
1	I know about technologies that I can use to teach listening in English.	5	4	3	2	1
2	I know about technologies that I can use to teach reading in English.	5	4	3	2	1
3	I know about technologies that I can use to teach writing in English.	5	4	3	2	1
4	I know about technologies that I can use to teach English language grammar.	5	4	3	2	1
5	I know about technologies that I can use to teach English vocabulary.	5	4	3	2	1
6	I know about technologies that I can use to teach pronunciation of English words.	5	4	3	2	1

SA: Strongly agree, A: Agree, N: I do not know, D: Disagree, SD: Strongly disagree