Intersection of Cultural Competence in TPACK Development within Conventional and AVR-Based EFL Teacher Education

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Abstract

As technology becomes more integral to education, its practical use is shaped by cultural influences, especially in diverse classrooms. EFL teachers have recognized the significance of cultural and multicultural awareness, which enriches the educational experience, particularly in advanced settings. Consequently, this qualitative exploratory study investigated the impact of cultural and multicultural awareness on Iranian EFL teachers' TPACK in both AVR-based and traditional teacher training courses. Therefore, 28 Iranian EFL teachers participated in an eight-week training program, followed by semi-structured interviews and reflective inquiries. The data was analyzed through qualitative thematic analysis, both manually and using MAXQDA, guided by Mishra and Koehler's (2006) TPACK framework. The findings revealed that both AVR-based and traditional training methods improved TPACK, but each had unique strengths and limitations. AVR training led to significant improvements in teachers' TCK and TPK, enhancing their ability to integrate cultural knowledge into teaching practices and adapt pedagogical strategies. Traditional training also improved TPACK, strengthening PK and PCK through effective media use. In addition to updating teaching practices to meet the needs of Generation Z, AVR's strengths included increased adaptability and creativity in lesson planning, while traditional methods offered solid, practical approaches to cultural integration. Challenges such as the high cost and complexity of AVR technology contrasted with the more straightforward implementation of traditional methods. Additionally, pedagogical implications include integrating AVR technology to enhance culturally relevant teaching, emphasizing ongoing professional development, addressing technological and cost challenges, and combining innovative and traditional methods for comprehensive teacher preparation.

Keywords: Augmented Virtual Reality, Cultural Competence, Multicultural Awareness, TPACK

Submission date: 2024/07/27

Acceptance date: 2024/09/14

INTRODUCTION

Cultural and multicultural awareness are crucial elements of effective education, particularly in the context of EFL teaching. Given the interconnectedness of language and culture (Dabou, 2021), numerous researchers highlighted its importance as comprehending a language necessitates insights into its cultural dimensions (Baydak et al., 2015; Hidayati et al., 2017; Shmidt et al., 2021). Moreover, applied linguistics has increasingly focused on the dynamic relationship between language, culture, and context, highlighting the need for educational practices that are both culturally sensitive and contextually relevant (Chapelle,

2013). As student demographics become more diverse due to globalization and immigration, it is imperative for teacher educators to incorporate cultural and multicultural awareness into teaching practices. This need is particularly significant for EFL teachers to navigate a variety of cultural backgrounds to provide effective instruction (Chinh, 2013; Ramlan & Maarof, 2014; Zohrabi et al., 2019; Tebben, 2021). Therefore, in designing language curricula, it is crucial to pay close attention to cultural varieties, identify critical cultural elements, and apply appropriate teaching strategies that bridge cultural gaps (Rashid et al., 2024).

Similarly, technology has become an integral part of modern education, offering new tools and methods that enhance interactive, immersive, and efficient teaching and learning experiences. One of the primary roles of digital technology is to provide access to a diverse range of teaching resources (Li, 2024). However, the integration of technology is not merely about adopting new tools; it must also consider the cultural context in which these tools are used. While technology has the potential to enhance learning experiences, its effectiveness is significantly influenced by how well it aligns with the cultural backgrounds and needs of both students and educators (Erbas & Demirer, 2019; Merchant et al., 2014). Therefore, technology integration must be approached with an understanding of cultural and multicultural factors that shape its use and impact.

Technologies such as messaging, video conferencing, and virtual reality enhance education by allowing individuals to dive into engaging cultural experiences (Shadiev et al., 2023; Tafazoli, 2024). Augmented virtual reality (AVR) aligns with constructivist learning theory by facilitating active knowledge construction in environments that transcend traditional classroom settings (Alizadeh, 2019; Berti et al., 2020; Yang & Liao, 2014). However, its effectiveness, like other technologies, is also influenced by cultural factors since distinct groups and individuals interact with and employ technology in specific, differentiated manners. This variation leads to diverse experiences and outcomes at both group and individual levels (Masimba et al., 2019; Sunny et al., 2019). Additionally, challenges such as the digital divide, the need for digital literacy, and equitable access to technology must be addressed to fully leverage these tools for language education (Li, 2024).

Subsequently, theoretical frameworks such as TPACK (Mishra & Koehler, 2006) and Rogers's (2003) Diffusion of Innovations (DOI) theory provide valuable insights into the factors that affect technology adoption and integration. TPACK highlights the interconnections between technological, pedagogical, and content knowledge in teaching, while DOI theory indicates the importance of factors such as relative advantage, compatibility, complexity, trialability, and observability in understanding how technology is adopted and implemented in educational settings. Therefore, empowering teachers with cultural knowledge rooted in culturally responsive pedagogy (Ladson-Billings, 2014) is vital for effective teaching to increase educational equity and embrace constructivist principles in diverse contexts (Salimi & Rad, 2024). Addressing these factors enables educators to effectively consider culture by incorporating contemporary technologies into EFL teaching.

Despite extensive research on technology integration in education, a significant gap remains in understanding how cultural and multicultural awareness affects TPACK (Technological Pedagogical Content Knowledge) in EFL (English as a Foreign Language) teacher training. While studies have explored TPACK's benefits and practical aspects of AR and VR tools (Huang et al., 2021; Alizadeh, 2019; Saito & Lee, 2023) and digital cultural transformations (Thyssen et al., 2023), there is limited research on how culture influences the adoption and effectiveness of these technologies in diverse EFL settings. Existing research also highlights the need for more nuanced approaches to TPACK, particularly in intercultural

contexts (Wang, 2022; Haga, 2024). This study addresses this gap by examining the role of cultural and multicultural awareness in EFL teacher training, providing insights into TPACK development through innovative methods, and enriching the literature on the intersection of culture and technology. It lays the groundwork for integrating cultural awareness with technological innovations, such as AVR, enhancing teacher education through a more culturally and technologically integrated approach.

LITERATURE REVIEW

Culturally Responsive Teacher Education

Amid the rising cultural diversity and fast-paced technological developments in the EFL context, teachers must heighten their cultural and multicultural understanding. Embracing modern, culturally sensitive teaching practices enables them to meet the unique needs of students and cultivate an atmosphere of inclusivity in the classroom (Gonzalez-Vidal & Moore, 2024). Thus, educational authorities play a vital role in recognizing and adopting efficient teaching practices by incorporating cultural factors that empower educators to promptly adapt to the ever-evolving educational landscape (Cowie & Alizadeh, 2022; Mensah, 2021). However, teacher education programs face the significant challenge of preparing future teachers for the diverse demands of modern classrooms, including content knowledge, classroom management, meaningful communication, technology integration, and reflective practice (Darling-Hammond, 2010). In this regard, many teacher candidates fail to develop essential skills to address the challenges of teaching diverse populations (Sanders et al., 2014; Acquah & Commins, 2017; Williams et al., 2023) in terms of cultural and multicultural awareness and culturally responsive pedagogy (Williams et al., 2023). Therefore, culturally responsive teacher training is crucial for educators, particularly those working in urban schools with diverse student bodies (Allen et al., 2017), which requires teachers' cultural and multicultural awareness.

Cultural awareness involves recognizing similarities and differences among cultural groups (Hofstede et al., 2010), which influences education (Yurtsever & Özel, 2021). This enhanced understanding of cultural diversity encourages fair and inclusive teaching practices by bridging differences, navigating evolving educational challenges, and increasing tolerance between societies. Likewise, multicultural awareness is characterized by an openness to understanding cultural differences and acknowledging personal biases (Gayles & Kelly, 2007; Shey & Fangwi, 2020). By cultivating empathy, communication, and reflection, this awareness ensures inclusive learning environments that bridge cultural divides, challenge stereotypes and enable equitable education for all students. Culturally responsive pedagogy (CRP) and culturally responsive teaching (CRT) are vital approaches that emphasize integrating students' cultural backgrounds into teaching practices to cultivate inclusivity and academic success. CRP indicates high academic achievement by encouraging self-advocacy and embracing cultural competence by incorporating students' cultural backgrounds into daily interactions and instruction (Ladson-Billings, 2014). Likewise, CRT leverages students' cultural knowledge, prior experiences, and unique perspectives to create engaging and effective learning experiences for diverse learners (Gay, 2013). It stresses multicultural awareness for teachers, helping them examine their cultural values and beliefs (Aceves & Orosco, 2014). Both approaches, which are built on cultural awareness, aim to create transformative educational practices that empower learners and promote social consciousness by celebrating their diverse backgrounds and

tailoring learning experiences. Consequently, addressing cultural and multicultural awareness in EFL teaching is crucial, especially as remote learning becomes more widespread.

Developing cultural awareness is not an innate skill for instructors but can be cultivated through training (Chen & Yang, 2017). Therefore, Teacher education programs should prioritize cultural responsiveness and use various methods and technologies to enhance teachers' cultural and multicultural awareness, ensuring fair learning environments. Effective programs are required to integrate multicultural education throughout the curriculum rather than treating it as an add-on, allowing educators to continuously adapt their practices to meet the diverse and evolving needs of students (Ebersole et al., 2016). For instance, Gist et al. (2019) investigated the significance of culturally responsive teaching methods in U.S. teacher preparation programs. It critiqued the programs for focusing too much on a predominantly white teacher population, which often treats culturally relevant practices as secondary rather than central. They argued for making culturally responsive teaching a core part of preservice training and called for a more inclusive approach to help future teachers better connect with diverse students. Additionally, Salimi and Rad's (2024) exploration of multiculturalism in Iran's EFL teacher education revealed significant factors, including equity, enhancing communicative skills, increasing positive thinking, embracing differences, integrating multicultural content, and implementing varied assessment methods. Their research highlighted the importance of incorporating cultural elements into teacher education through innovative training and curriculum enhancements to refine teaching methodologies.

TPACK and the Role of Technology in Teacher Education

As it is mentioned, cultural and multicultural awareness is crucial for training teachers to manage diverse classrooms. Consequently, teacher trainers must combine instructional methods and subject knowledge with cultural sensitivity. Technology is essential in this process because it overcomes language barriers and enhances communication through digital innovations that provide immersive cultural experiences, deepening educators' understanding of diverse contexts. As globalization grows, incorporating these tools into teaching practices helps educators better meet the varied needs of their students (Ebersole et al., 2016). Yet, educators must develop their technological knowledge to successfully incorporate new technologies in language teaching practices (Rahimi & Pourshahbaz, 2018). As per Mishra and Koehler (2006), understanding the interconnectedness of content, pedagogy, and technology is vital. Some teachers use technology simply to present content, while others harness it as a transformative tool in their teaching (Harris et al., 2009). Thus, a well-developed TPACK is essential for teachers to effectively balance technology with diverse backgrounds, especially in EFL contexts (Lee et al., 2013; Mishra & Koehler, 2006).

Mishra and Koehler's (2006) TPACK framework comprises seven knowledge constructs (Figure 1): CK represents the knowledge of instructional content, PK denotes the understanding of teaching methods and strategies, PCK refers to the skill of employing effective teaching practices for specific content, TK signifies the expertise in utilizing various technological tools and resources, TCK involves the ability to present content using technology, TPK encompasses the knowledge of integrating technology to enhance teaching practices, and TPACK combines knowledge of content, pedagogy, and technology to facilitate students' learning.

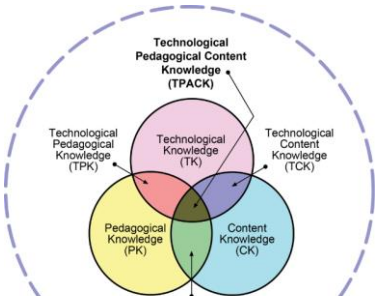

Figure 1. *TPACK Framework (Adapted from http://tpack.org)*

Various studies emphasize the crucial role of cultural factors in TPACK development, highlighting the importance of integrating cultural knowledge into teacher training to bridge gaps between teachers and students through technology (Adam, 2017; Chai et al., 2013; Greene & Jones, 2020; Haga, 2024). For example, Shiyao's (2021) study adopted a quantitative method to explore six EFL teachers' TPACK, focusing on the mediation of different teaching experiences. The results indicated that teachers with multicultural teaching experience rated their TPK, TCK, and PCK more positively than their counterparts without such experience. This result emphasized how diverse teaching experiences mediate EFL teachers' TPACK and contribute to the existing literature by examining TPACK through a contextual and cultural lens.

Moreover, Novita and Purwati's (2022) mixed-methods study investigated the online professional development of 125 in-service EFL teachers in East Java, Indonesia, through a sociocultural lens. They found that while teachers demonstrated strong PCK and TCK, their sociocultural TPACK practices were limited by a lack of experience with cultural concepts despite the extensive online training program and assessments provided. The study highlighted the need for revising online training curricula to include broader cultural networking and experiences to better support teachers in applying sociocultural knowledge effectively in their teaching practices. Additionally, Haga (2024) explored how effective the TPACK framework is in integrating technology, paying particular attention to cultural influences. She employed analytic autoethnography to delve into the experiences of a Canadian EFL teacher working at a Japanese university for seven years, incorporating concepts from culturally responsive teaching and both Western and Japanese cultural theories. The findings revealed notable shortcomings in the TPACK model when applied to intercultural settings, advocating for the addition of cultural knowledge as a unique yet interconnected construct (TPACCK). This new framework emphasizes that cultural awareness significantly affects the understanding of individuals and their interactions with technology within diverse contexts. Consequently, there is a growing need to focus on cultural factors in TPACK development to enhance culturally responsive teaching practices.

Although the aforementioned studies indicate improvements in TPACK across various cultural contexts, they fall short of thoroughly exploring how cultural and multicultural awareness specifically impacts TPACK and its underlying constructs. Additionally, these studies offer limited insights into practical strategies for addressing the challenges identified. Building on these observations, it is essential to explore innovative approaches that may bridge these gaps in EFL teacher training.

Augmented Virtual Reality in Teacher Education

Teachers who integrate cultural knowledge into their TPACK are more likely to have professional success in creating inclusive and engaging learning environments (Harris & Hofer, 2011). However, while cultural

knowledge is a critical factor, the incorporation of innovative tools also contributes to an engaging learning environment. For instance, Huang's (2021) study demonstrated the effectiveness of a two-year online teacher training program in enhancing 100 EFL teachers' TPACK competencies. The program used online platforms such as Zoom and Microsoft Teams. This program highlighted the importance of cultural awareness and multilingual competencies in effective teaching while also showcasing how technology can overcome traditional constraints and improve TPACK development.

Understanding the adoption of such technological innovations can be further informed by Rogers's (2003) diffusion of innovation (DOI) theory, which describes how information about new technologies is shared among adopters, influencing their integration into educational settings. This theory, along with related models, helps explain how educators adopt and integrate digital technologies (Ofosu-Amaah, 2021). For example, Mundy et al. (2019) explored educators' attitudes toward using augmented reality in K-12 and higher education through the lens of DOI theory. They found that educators utilized AR for various purposes, including introducing concepts, activating prior knowledge, creating AR games, and enabling students to showcase their knowledge. However, barriers such as costs, technology accessibility, and limited educational apps were identified. The study applied DOI theory to classify current AR users as innovators and early adopters, enhancing understanding of AR adoption among educators. Consequently, educators are urged to equip themselves to incorporate novel technologies such as augmented and virtual reality (AVR) into their instructional practices (Peterson & Stone, 2019).

Virtual reality (VR) is a computer-generated environment that simulates real situations and provides immersive experiences through interactive and sensory inputs like sight, touch, and hearing using devices such as goggles and gloves (Fernandez, 2017). Fernandez (2017) explained that, unlike virtual reality, augmented reality (AR) integrates digital information with real-world environments, combining real and virtual elements, interacting in real-time, and registering information in 3D to enhance the user's perception of their surroundings. AVR blends AR and VR technologies to establish immersive experiences. Despite the absence of a uniform definition, AVR shares conceptual similarities with Mixed Reality (MR) or Extended Reality (XR), as it merges real and virtual worlds, enabling the coexistence and interaction of objects and their associated data within these mixed environments (Sharma, 2021).

Innovative applications of AVR are anticipated to significantly influence teaching by introducing new methods and simulating real-life scenarios in virtual environments (Smith et al., 2021). Despite not being specifically designed for education initially (Antonenko et al., 2017), these innovative technologies can create engaging and immersive learning environments that cater to diverse cultural backgrounds and learning needs. As such, AVR holds the promise to transform traditional teaching methods by enhancing motivation, engagement, and retention within experiential and interactive contexts (Billinghurst & Duenser, 2012). Zhang (2021) examined the implementation of VR in K-12 ESL classrooms by providing some curriculum examples and highlighted its potential value for teacher educators and cooperative curriculum design. While increased engagement and authentic cultural simulations were identified as benefits, issues such as technological support and age appropriateness were also noted. Zhang recommended the purposeful incorporation of VR into teacher education programs, ensuring it aligns with learning goals and offers necessary classroom assistance.

Moreover, Azam et al.'s (2023) quantitative study on 33 teachers showed that AR technology enhances teachers' TPACK, boosting their TK and TPK. Their study found a positive relationship between teachers' readiness to use AR and their TK, suggesting AR exposure improves their technological skills.

However, a gap remained between readiness and TPK, indicating the need for more comprehensive pedagogical training. This highlights the importance of updated training programs that address both technological and pedagogical aspects to maximize AR's educational benefits. Similarly, Saito and Lee's (2023) review study indicated that integrating VR into educational settings significantly affects teachers' TPACK. They emphasized that effective VR integration enhances teachers' TK by requiring improvements in managing technology infrastructure, such as internet connectivity and physical space. Additionally, it impacts TPK, as educators must adapt their pedagogical strategies to accommodate VR's unique demands, such as setting appropriate educational goals and assessment systems. While the study did not explicitly address the impact of cultural factors, it suggested that adapting VR technology to diverse classroom contexts could influence how effectively TPACK develops.

Effective AVR integration in education requires addressing the challenges and training needs. By doing so, more robust programs can be designed not only to support the development of teachers' TPACK but also to boost their ability to navigate and implement emerging technologies in diverse educational settings. For instance, Belda-Medina and Calvo-Ferrer's (2022) mixed-methods research through pre- and post-tests on 92 pre-service teachers' digital competence and attitudes toward AR revealed a positive impact on their TPACK. While teachers showed strong self-perceived knowledge in CK, TK, and PK, they experienced difficulties with TPK. They emphasized the necessity for comprehensive training combining technology and teaching strategies. Despite challenges, teachers had positive attitudes toward AR, acknowledging its potential to improve learning via increased engagement and cognitive skills. Thus, successful AR integration demands thorough training programs concentrating on practical application and digitally focused teaching abilities.

Although scholars have explored AR/VR technologies in education, significant gaps persist in EFL teacher education, particularly regarding comprehensive pedagogical training and alignment with cultural diversity. The combined use of AR and VR and its impact on TPACK development, especially concerning cultural demands, remains underexplored. To address these gaps, this exploratory qualitative study will investigate how cultural and multicultural awareness influences Iranian EFL teachers' TPACK development in both conventional and AVR-based teacher training courses. By doing so, this study aims to contribute novel insights into the role of contemporary technological tools in teacher education and provide a deeper understanding of how these innovations can enhance teaching practices in culturally diverse settings. The research seeks to answer the following question: In what ways do EFL teachers within AVR-based and conventional teacher education groups perceive the integration of cultural and multicultural awareness into their TPACK development?

METHOD

Design

The objective of this exploratory qualitative research was to examine the perspectives of EFL teachers on the influence of cultural and multicultural awareness in developing their TPACK, specifically in traditional and AVR-based teacher training contexts. Since this study aimed to apply an innovative method in EFL teacher training courses, this approach was selected, which enables researchers to uncover novel concepts and insights, develop new theories, and explore uncharted aspects of teacher education programs (Heigham & Croker, 2009). Furthermore, a phenomenological perspective was adopted to explore EFL teachers' lived

experiences, providing deeper insights into how these experiences influence their TPACK development (Creswell, 2014; Worthington, 2013).

Participants and Context of the Study

Identifying suitable participants is crucial for validating research results and applying them effectively. Thus, convenience sampling was employed, where readily available individuals were selected. Although this approach may have drawbacks like potential bias or limited applicability, its practicality and viability within constraints such as time and resources are essential considerations (Creswell, 2014). Consequently, this approach was selected due to the limited access to a broader population of EFL teachers, time constraints, and the exploratory nature of the study, making it the most feasible option for this research. Thus, 28 Iranian EFL teachers, both male and female, were selected.

Instruments

A multi-method triangulation approach effectively addressed the current study's aims by employing three distinct data collection instruments, thereby ensuring a comprehensive understanding and enhancing the validity and reliability of our findings (Nassaji, 2020). First, semi-structured interviews with supplemental open-ended questions were developed based on relevant literature and expert feedback. The questions were tailored for each group of participants and explored their attitudes, perceptions, and views regarding cultural and multicultural awareness in their TPACK development, allowing for an in-depth examination of issues raised in an exploratory manner (Dornyei, 2007; Mackey & Gass, 2005). The interview protocol was validated through a pilot study with a small sample of participants, ensuring clarity and effectiveness of the questions. Second, participants were asked to write reflective narratives after each course session. The narrative inquiry method, which examines personal experiences within cultural contexts over time (Riessman, 2008), was combined with a reflective practice involving analyzing teaching experiences for learning outcomes and potential improvements (Cirocki & Farelly, 2016; Farrell, 2011). This approach was chosen due to the increasing value placed on teachers' perspectives and reflection in teacher education research (Burton, 2009).

Procedure and Data Analysis

The study included two separate eight-week teacher training programs: one utilizing AVR and the other employing conventional methods. Each program featured theoretical teaching methodologies, practical teaching experiences, and final demonstrations. Key assessment criteria for participants' performance were based on their teaching practices, where they were required to prepare and present lesson plans for specific topics. Participants were expected to demonstrate their understanding of various teaching strategies, cultural content integration, and effective use of technology in their teaching practice. These assessments were conducted through observations of their teaching practices and evaluation of the lesson plans they prepared. The final demonstrations were also evaluated based on these criteria, ensuring a comprehensive assessment of the participant's overall performance throughout the training programs.

Participants were informed about the study’s objectives, and ethical standards were upheld, including consent, confidentiality, and anonymity. To ensure research trustworthiness, four aspects were established. First, to enhance transferability, comprehensive documentation throughout the research process allowed findings to be applied to various contexts. For credibility, we employed a triangulation design by

integrating data from reflective narratives and interviews, resulting in consistent and reliable data. Specifically, we compared and contrasted the themes and insights emerging from both data sources to cross-validate our results. This process involved analyzing both types of data for commonalities and differences, thereby ensuring a more comprehensive and accurate understanding of the research topic. The confirmability was ensured through member checking to validate responses and minimize biases. Finally, intra-rater dependability in data analysis was maintained by implementing a code-recode strategy (Ary et al., 2019).

Throughout the eight-week conventional program, participants engaged in theoretical sessions on modern English as a foreign language teaching strategies twice weekly. Validated course material, designed by the researcher and reviewed by applied linguistics experts, was used in both programs. Participants explored online teaching technologies, practiced teaching in these settings, and studied ways to incorporate cultural and multicultural awareness into their lesson plans. They engaged in group teaching practices, switching between teaching and learning roles. In the final demonstration session, trainees in groups of four or five alternated roles and presented 15-20 minute lessons. Participants wrote narratives after each session to document their experiences and, upon completing the program, took part in a semi-structured interview to discuss integrating cultural and multicultural concepts into their teaching and their significance for TPACK.

In the AVR-based program, trainees engaged in theoretical instruction on contemporary teaching methodologies twice a week for eight weeks. Trainees observed real-world classrooms in virtual reality, allowing them to analyze teaching styles and strategies. These sessions, recorded with an Insta360 X3 camera, were viewed through VR headsets using the Side Quest app. Trainees were tasked with studying diverse teaching strategies and incorporating cultural and multicultural awareness into their teaching practice sessions. For practice and demonstration sessions, a custom software application was developed on the Unity game engine, compatible with both Android headsets and Windows computers. Participants used Oculus Quest 2 headsets to teach English in virtual reality, interacting with avatars that represented learners from various cultural backgrounds and language levels. Trainees practiced teaching in groups, switching between teacher and student roles. In the demonstration session, trainees delivered 15-20-minute lessons in virtual reality, engaging with avatars controlled by real foreign language learners. They prepared by creating lesson plans and materials with cultural and multicultural elements. Mirroring conventional trainees, participants documented their experiences, focusing on how cultural awareness influenced their teaching and TPACK development. After the course, they participated in a semi-structured interview to share their views on integrating cultural and multicultural understanding into EFL education.

Data analysis was conducted using a combination of manual and MAXQDA software-supported qualitative thematic analysis, following the six-phase process outlined by Braun and Clarke (2006). Phase 1: Familiarization with the data began with the transcription of all recorded interviews, during which researchers immersed themselves in the data by repeatedly reviewing and annotating the transcripts. Phase 2: Generating initial codes was achieved through In-Vivo coding, where 283 codes were identified based on the exact words and terminologies used by participants in their interviews and narratives. Phase 3: Searching for themes involved a thorough examination of these codes to identify patterns, with the assistance of MAXQDA's visual tools such as Code Maps and MAXMaps, which helped to visualize relationships between codes. In Phase 4, reviewing potential themes, these initial themes were cross-checked against the entire dataset and refined to ensure they were coherent, distinct, and relevant to the research objectives. Phase 5: Defining and naming themes involved the finalization of theme names and

definitions, ensuring alignment with the research question. Finally, in Phase 6, the report was produced, and the researchers extracted broad TPACK development themes by indicating commonalities among codes within conventional and AVR-based contexts for each concept.

RESULTS

EFL Teachers' TPACK Development

In addressing the objective of the present study, the researchers opted to employ Mishra and Koehler's (2006) framework and its seven knowledge constructs as the foundation for data analysis. As shown in Figures 2 and 3, the thematic analysis of conventional and AVR-based teacher education programs yielded three main themes and their corresponding sub-themes concerning EFL teachers' perceptions of their TPACK development.

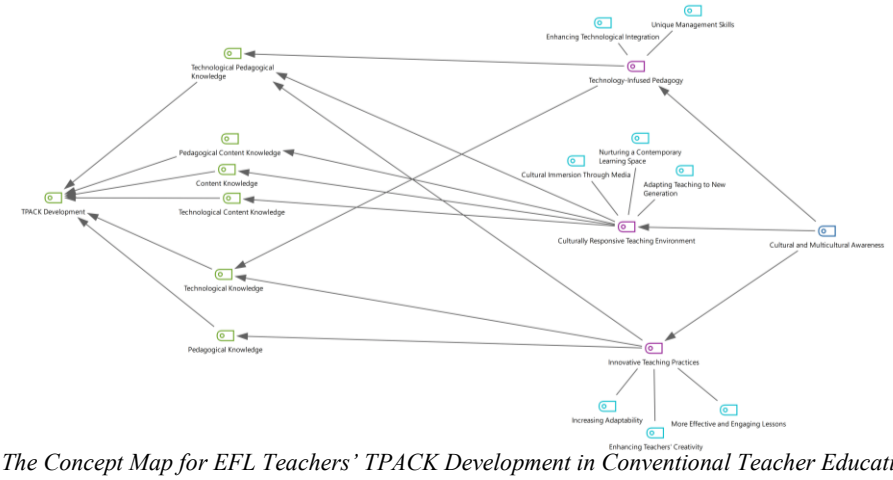

Figure 2. *The Concept Map for EFL Teachers' TPACK Development in Conventional Teacher Education Program as Illustrated by MAXQDA*

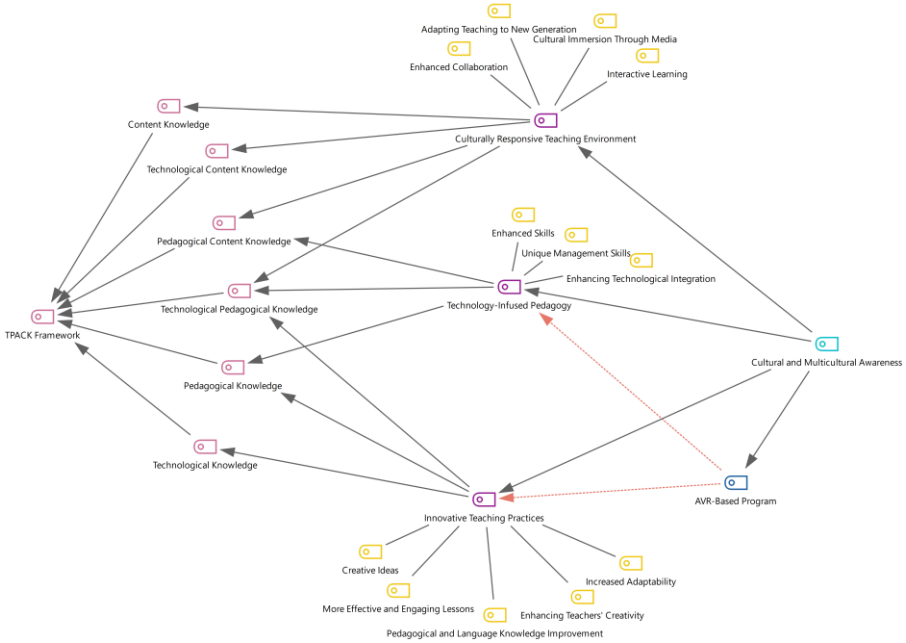

Figure 3. *The Concept Map for EFL Teachers' TPACK Development in AVR-Based Teacher Education Program as Illustrated by MAXQDA*

Culturally Responsive Teaching Environment

EFL teacher trainees in both conventional and AVR-based groups acknowledged the significance of cultural immersion through media in enhancing their TCK and PCK. For instance, participant 3 noted, “Using different media resources such as movies, songs, TV shows, and social media can help us learn how people communicate in real-life situations and to get to know other people better.” Although the AVR-based group participants believed that AVR offered a more immersive and authentic real-world experience, both groups agreed that utilizing media resources to introduce authentic cultural experiences into the classroom would contribute to the development of culturally responsive teaching. For instance, participant 25 indicated that “since I’ve been exposed to various media resources, I have a good grasp on various cultures. In practice sessions, we could bring various media, which was so realistic! We could get to know our students better.” However, participant 26 in the AVR group noted, “While the immersive experience was valuable, the technology sometimes felt overwhelming, and I found it difficult to navigate between cultural content and the tools. It took away from my focus on teaching.” This suggests that although AVR can enhance cultural immersion, the complexity of the technology may detract from its pedagogical effectiveness if not managed properly. The added cognitive load required to navigate these tools could potentially overshadow the benefits of cultural immersion.

As the second sub-them, participants were of the belief that adapting teaching to a new generation was another effect of cultural and multicultural knowledge in their TPACK development. Participant 13 stated that “it is very important that we always update technological knowledge as teachers! When I see how smart and skilled the new generation is in technology, I think it's very crucial for me to have something to offer myself." Therefore, cultural and multicultural knowledge has impacted teachers’ TPK, TCK, and CK to meet the diverse needs of learners. The third sub-theme concerning culturally responsive teaching and its influence on teachers' TPK involved creating a contemporary learning space. For instance, participant 22 stated, “Well, I must organize and update my materials to engage students, considering their behavioral and cultural differences. So knowledge of cultural needs and technology can help teachers create an attractive class environment." This concept was emphasized by the conventional group participants, who focused on utilizing technology to promote cultural awareness, address learners' needs, and enhance teaching practices.

Enhanced collaboration was another sub-theme recognized by participants in the AVR group. They argued that incorporating AVR technology into teaching practice facilitated collaboration with students, as participant 7 mentioned, “The collaborative aspect of teaching in AVR among teacher and learner was a remarkable point. During practice sessions, I could observe other trainees and see many different teaching styles, attitudes toward learners, and creativity for better performance.” This concept positively affects TPK and PK, resulting in more culturally responsive teaching and a more meaningful learning environment. The final sub-theme identified through the perceptions of the AVR group was interactive learning, which improved their TPACK. Participant 21 quoted: “In practice, I realized I didn't need constant eye contact. By using games in PowerPoint and emojis for feedback, I could make interactions more engaging and correct errors with various technological tools.” This approach not only enhanced the interactivity of the learning experience but also demonstrated an improvement in their TPK and PK by effectively integrating technology to support pedagogy. Nevertheless, participant 9 remarked, “The collaboration was beneficial, but the technology sometimes created barriers. Not all students were comfortable with the AVR

environment, which led to disengagement during some collaborative activities." This indicates that while AVR can foster collaboration, it can also create new challenges, particularly when students or teachers are not comfortable with the technology. This discomfort may hinder engagement and collaboration, reducing the effectiveness of AVR-based training.

Technology-Infused Pedagogy

Regarding the first sub-theme as enhancing technology integration, participants in both groups emphasized the significance of utilizing technology in their teaching practices to raise cultural and multicultural awareness. This enhanced their TPK and TK. Trainees in conventional group had the opportunity to use various websites and applications in online practice sessions to draw students' attention to culturally infused contents, while AVR trainees could bring AVR-friendly media to immerse their students in a culturally infused environment. Participant 8 mentioned that "after practicing online teaching, I realized we must adapt to advanced teaching methods and technology, learning to use and keep up with them as we become increasingly connected to them daily." Likewise, participant 27 indicated that "the practice session was a brand-new experience! Teaching in VR was extraordinary. I realized that there is still room for improvement, but for now I have learned many things about using technology in my classes to make it more interesting." Both groups acknowledged that this experience made them more curious about technology in education, and they found out they needed to increase their knowledge in this area. However, participant 16 reflected, "I found it challenging to manage the classroom dynamics in AVR. The technology was sometimes distracting, and it was difficult to keep everyone engaged while navigating the virtual environment." This illustrates the potential distractions of the technology itself which hinders classroom management skills. Teachers need to develop new management strategies to maintain engagement and focus within these virtual environments.

The second sub-theme shared between the two groups was unique management skills affecting TPK. Participant 20 quoted, "My classmates' teaching practices and their feedback, along with instructors' comments, were invaluable to my understanding of online teaching. Their actions and classroom management provided insights, while the feedback enhanced my awareness and broadened my perspective on my own performance." In addition, members of the AVR group also recognized the need to enhance their pedagogical skills, which had an effect on their PK within the virtual reality context, in order to create more captivating lesson plans. They highlighted the importance of developing unique management skills to incorporate technology and cultural content into their lessons, which significantly affected their PK and TPK, as they learned to manage and adapt various technological tools and resources to promote cultural and multicultural understanding. For instance, participant 11 noted, "It's different because I've taught various classes: mixed, female, and male, teenagers and adults. Each group needs unique management skills, especially in virtual reality. You must be fully prepared with your lesson plan, materials, and games."

Innovative Teaching Practices

Both groups acknowledged that considering cultural and multicultural awareness enhanced their creativity. Participant 10 experienced that "the online classes have pushed me to think outside the box when considering cultural elements in my lessons. It's exciting to experiment with new ideas in a new environment," which encouraged participants to utilize unique content and materials in their classrooms, affecting their PK and TPK. Similarly, participant 1 mentioned, "teaching with technological tools helped me to come out of my comfort zone and try different strategies, especially in assessing my students."

Participant 22 also reflected: “Teaching practice in VR has inspired me to develop interactive, culturally diverse activities that my students find both enjoyable and educational! It inspired me to develop some unique tasks to feed any type of cultural background and need.” They believed that continued exploration and integration of technology in education could further support them in developing culturally responsive and compelling learning environments. Nonetheless, participant 19 shared a concern: “While VR inspired new ideas, the technology itself was sometimes a barrier to execution. It wasn’t always intuitive, and I spent more time figuring out the tools than actually teaching.” This suggests that although AVR can stimulate creativity, the complexity of the technology can act as a barrier to its effective implementation. The time spent learning to use the tools may detract from the creative process, limiting the potential benefits of AVR.

The second shared sub-theme included more effective and engaging lessons affecting participants’ PK and TPK. For instance, participant 28’s experience illustrated the enhancement of PK: “My classmates’ curiosity as students in practice sessions about different cultures drove me to research and create informative and captivating lessons. I was greatly aided by the websites and applications you introduced.” Their acknowledgment of the benefits of online resources demonstrates how PK is strengthened by the ability to design and deliver content that resonates with students’ diverse backgrounds. Participant 3 mentioned: “I've noticed a significant improvement in students’ engagement with 3D video in my class! It was rewarding to see my lessons resonate with students. Without VR, I couldn’t make such a realistic experience.” This demonstrates how TPK is enhanced by using advanced technologies to create immersive and realistic learning experiences, which enriches and supports a more engaging pedagogical approach. However, participant 12 noted, “The cost of AVR tools is a major concern. Not every school can afford the high-end equipment needed, which limits the widespread adoption of these innovative practices.” This highlights a significant barrier to the effectiveness and scalability of AVR-based training. The high cost of the necessary tools may restrict access and prevent some educators from benefiting from these advanced technologies, thereby impacting the overall reach and effectiveness of AVR-based pedagogical approaches.

Two additional sub-themes emerged from AVR group interviews and narratives: increasing adaptability affecting PK and TPK, and pedagogical and language knowledge improvement influencing PK and PCK. Participant 15 highlighted that: “Working with AVR technology has forced me to adapt and refine my teaching strategies, making me more confident in my ability to integrate cultural content effectively.” This demonstrates how cultural and multicultural adaptability enhanced their PK and TPK by stimulating more effective and confident use of cultural content. Moreover, participant 8 noted that “the opportunity to teach in a virtual reality setting has strengthened my language instruction skills while challenging me to incorporate cultural content in innovative ways,” which reflects growth in both PCK and PK, showing how AVR context can strengthen language teaching while promoting creative integration of cultural elements.

DISCUSSION

The initial purpose of this study was to investigate the impact of cultural and multicultural awareness on EFL teachers’ TPACK, with a particular focus on conventional and AVR-based teacher training contexts. EFL teacher trainees from both conventional and AVR-based groups recognized the importance of cultural integration through media in enhancing their TCK and PCK, with AVR participants finding the experiences more immersive and authentic. They agreed that adapting teaching methods to incorporate cultural and

multicultural awareness significantly impacted their TPK, CK, and overall TPACK. The AVR group highlighted enhanced collaboration, interactive learning, and the development of unique management skills as key benefits of the technology, leading to more culturally responsive and engaging teaching practices. Both groups emphasized the role of technology in fostering creativity, adaptability, and effective lesson planning, with the AVR context offering additional advantages in creating realistic, culturally diverse learning environments that strengthened their PK, TPK, and PCK.

Regarding the culturally responsive teaching environment, the results revealed improvements in all EFL teachers' TCK and PCK due to adopting media-facilitated multicultural components in their teaching practices. While both groups utilized technology to incorporate various media, the AVR-based group showed better competency in delivering contextually appropriate content and enhancing their knowledge of culturally sensitive teaching methods. The immersive and interactive nature of AVR technology, such as 3D videos, storytelling, role plays, and games, provided a more authentic and realistic experience compared to traditional training methods, enabling AVR-trained teachers to create more engaging and effective learning environments. This result complements Budianto et al.'s (2023) findings on exploring EFL teachers' TPACK, which indicate that although teachers demonstrated competence in TCK, they struggled with PCK, particularly when applying authentic problem-solving and real-world content. Novita and Purwati's (2022) mixed-methods study on EFL teachers' online development programs similarly highlighted that in-service teachers had a strong TPACK but struggled with integrating sociocultural aspects due to their limited cultural understanding and interaction. This gap was attributed to inadequate exposure and training in such environments. It highlights the need for targeted training to address these challenges, yet their study did not focus on innovative tools as a potential solution. The present study demonstrates that novel technologies, such as AVR, effectively address these limitations by facilitating more personalized and culturally responsive teaching practices. Moreover, AVR's ability to support collaborative and interactive learning environments enhances teachers' pedagogical flexibility, enabling them to engage students better across diverse cultural contexts. Rogers's (2003) DOI theory supports these findings which offer significant improvements in pedagogical practices through its compatibility with contemporary educational needs. This emphasizes AVR's potential to bridge gaps in traditional training and enhance pedagogical practices, as evidenced by the findings of Budianto et al. and Novita and Purwati.

Moreover, the findings indicated that adapting teaching methods to cater to generation Z's needs significantly impacted teachers' TPACK development, emphasizing the importance of continually updating technological skills to remain relevant. This suggests that cultural and multicultural knowledge greatly influences TPK, TCK, and CK, enabling teachers to address diverse learner needs through using various media such as music, video, audio, games, etc. Creating a contemporary learning space was another crucial aspect, with both groups acknowledging the importance of updating materials and incorporating culturally relevant examples. Although no significant difference in CK was found between the groups, the results diverge from Shiyao's (2021) study, as our findings suggest that cultural and multicultural knowledge positively impacts CK. This broader impact is reinforced by Dalal et al.'s (2021) study, highlighting the effectiveness of cultural exchange programs in enhancing TPACK. This result emphasizes the need for teachers to continuously update their skills and knowledge to keep up with evolving technological demands, underscoring the critical role of understanding technology's affordances and adapting pedagogical strategies to address classroom diversity.

Adopting AVR technology in culturally responsive teaching environments significantly improves collaboration by increasing interaction between teachers and students. This enhanced collaboration

contributes to more engaging and interactive learning environments. Novel technological tools like AVR facilitate dynamic interactions and effective error correction, allowing teacher trainees to overcome challenges faced in traditional training methods, especially when interacting with students from various cultural backgrounds. Tafazoli's (2024) study corroborates these findings, demonstrating that VR enhances collaboration, interaction, cultural immersion, and engagement. However, practical challenges may affect its real-world effectiveness. The present study encountered similar challenges, and as a solution, the researchers found that teacher trainees needed practice in AVR contexts to learn how to handle problematic situations with various types of students, leading to better performance in their final assessments. Haga's (2024) study highlights the importance of integrating cultural knowledge into TPACK frameworks, emphasizing its limitations in intercultural settings. AVR tools can address this by offering simulations of diverse cultural contexts, allowing teacher trainees to practice culturally responsive teaching strategies. The customization of cultural content, interactive scenarios, and collaboration with cultural experts contribute to enhancing teachers' cultural knowledge. Consequently, AVR technology bridges the gap identified in Haga's study, enabling educators to effectively integrate technology, pedagogy, and content in diverse educational settings.

In terms of technology-infused pedagogy, integrating technology into teaching enhanced participants' cultural and multicultural perceptions, positively impacting their TPK and TK. Each group utilized different sources and methods to infuse culturally relevant content into their teaching based on their teaching context, which increased their TPK. This approach sparked greater interest in educational technology and highlighted the need for ongoing skill development, emphasizing the critical role of advanced teaching methods and technology in improving educational practices. Activities resulting from cultural awareness, such as designing culturally relevant lesson plans and engaging in cultural simulations further supported this development. These results extend Zhang's (2022) broad review of EFL teachers' TPACK development through practices in virtual settings. The findings demonstrate how the continuous use of diverse technological tools across various teaching contexts, including the integration of diverse resources (e.g. culturally diverse literature, films, music, multicultural lesson plans and curricula, online and digital platforms) and interactive cultural experiences (Role-play activities, AR/VR experiences that immerse teachers in diverse cultural contexts, collaborative projects with diverse peers), can further solidify and expand teachers' TPK.

Moreover, the results revealed the significance of developing unique management skills in improving teachers' PK and TPK across both groups. For conventional trainees, classroom management involved organizing and utilizing technological tools effectively within a traditional classroom setting. They enhanced their pedagogical skills by comparing their technological use with peers and incorporating feedback from instructors, refining their behavior management and engagement strategies. Conversely, AVR participants faced the challenge of adapting their management skills to the virtual reality environment, where they had to organize virtual classrooms, manage avatar students, and prepare culturally relevant lesson plans. This context required a higher level of flexibility and adaptability to create engaging content and respond to real-time feedback, making it more demanding than the traditional classroom setting. This aligns with Rogers’s DOI theory of compatibility and complexity, which suggests that innovative tools are more effectively adopted when they meet educators' needs and are supported by adequate training. The iterative skill development observed in both approaches reflects Rogers’s DOI trialability, where experimentation and refinement enhance the effectiveness of technological integration. Additionally, consistent with Belda-Medina and Calvo-Ferrer's (2022) findings, the results emphasized the importance

of practical training in technology and pedagogy for pre-service teachers. Despite initial challenges, targeted skill development in AR content creation and AVR integration ultimately improved teachers' pedagogical practices.

Regarding innovative teaching practices, incorporating cultural and multicultural considerations positively impacted EFL teachers' creativity and led to the development of more enriching and compelling content. This outcome was attributed to the use of various tools, such as interactive whiteboards, LMS, collaboration tools, and quiz platforms in traditional contexts, as well as VR headsets, AR apps, and 360-degree media in AVR context. The integration of these tools in both teaching environments significantly improved EFL teachers' PK and TPK. Mishra and Warr (2021) substantiate this finding by highlighting that successful technology integration in educational settings requires more than just using tools; it necessitates adapting pedagogical practices and enhancing teachers' knowledge, skills, and attitudes. Consequently, educators must extend beyond their comfort zones and strategically align technological tools with their pedagogical approaches to optimize educational outcomes. Thus, this study offers additional confirmation of the current literature in which teachers need competencies in integrating technology into their instruction and incorporating cultural elements, which enhances their pedagogical knowledge and creativity (Lisa et al., 2021; Lita et al., 2023; Prayudha & Pradana, 2023).

Despite the benefits of AVR-based teacher training, various challenges arise, as has been suggested by multiple scholars (Al-Ansi, 2023; Alzahrani, 2020; Biswas et al., 2021; Li, 2024; Mundy et al., 2019; Tafazoli, 2024). Although AVR can provide immersive experiences that improve cultural understanding, the technology's complexity may diminish its pedagogical value. Teachers often struggle with the sophisticated tools and their integration with cultural content, which can divert attention from teaching and increase cognitive load. This added complexity diverges from Rogers' (2003) DOI theory, which suggests that simpler innovations are more likely to be adopted, making it difficult for educators to fully utilize AVR's potential. Furthermore, while AVR environments are intended to promote collaboration, they can also create new obstacles. Teachers and students might feel uncomfortable or disengaged as they adapt to the technology, which differs from Rogers' emphasis on compatibility between innovations and existing practices, potentially impeding collaborative activities and reducing the training's overall effectiveness. The technology itself can distract from classroom management and diminish engagement, which may further hinder its adoption. Another major issue is the cost and availability of AVR tools. The high expense of purchasing and maintaining these technologies limits their accessibility, especially for institutes with tight budgets. This financial constraint is at odds with Rogers' theory, which posits that innovations with lower perceived risks and costs are more readily adopted, hindering the widespread adoption of AVR-based training and preventing many educators from taking advantage of these innovative practices. Therefore, despite AVR's promising advancements in teacher training, these limitations must be addressed to maximize its effectiveness and ensure equitable access in diverse educational contexts.

CONCLUSION

This study investigated the impact of cultural and multicultural awareness on EFL teachers' TPACK within traditional and AVR-based training contexts. The findings revealed that both training approaches had distinct advantages and disadvantages. AVR-based training offered more immersive and interactive experiences, enhancing teachers' cultural integration and pedagogical adaptability, aligning with Haga's (2024) TPACK framework and Rogers's (2003) DOI theory. Conversely, traditional training methods, while effective in their own right, often lacked the dynamic engagement and realism provided by AVR

technology. Theoretically, the findings supported the integration of cultural content through innovative technologies, reinforcing the importance of adapting pedagogies to modern educational needs.

Moreover, this study has various pedagogical implications. It emphasized the value of integrating AVR into teacher training programs to create immersive, culturally relevant lessons. AVR technology uniquely benefits teacher education by offering authentic and dynamic interaction, essential for preparing educators to navigate diverse classrooms. Programs should incorporate virtual cultural exchanges, role-playing scenarios, and modules that simulate real-world teaching challenges, fostering cultural sensitivity and pedagogical adaptability. Additionally, continuous professional development is crucial for keeping teachers' TPACK updated with technological advancements. Collaborative and interactive learning environments should be prioritized, and customized training should address diverse learner needs. Although AVR presents challenges, such as technological complexity, comprehensive support and resources can mitigate these issues, ensuring effective implementation. Finally, fostering innovation in pedagogy through technology will help teacher trainers create engaging, culturally relevant teaching practices.

Every research has various limitations, and this study is not an exception. The absence of demographic details in the data analysis may influence the findings and the exploratory qualitative methodology, relying solely on interviews and narratives, could constrain the study's generalizability. To address these limitations, future research should consider employing mixed-methods designs, such as adding pre- and post-training surveys, to more comprehensively assess the impact of contextual factors. Including a diverse demographic profile in the sample would also provide a more nuanced understanding of how different groups respond to culturally integrated training. Additionally, while the short duration of the training may not fully capture the long-term effects of AVR, this technology shows promising potential for enhancing EFL teacher training, particularly in integrating cultural content and improving pedagogical practices. Thus, practitioners should explore the gradual integration of AVR tools in their curricula, starting with pilot programs that focus on specific cultural competencies and gradually expanding to broader pedagogical applications. Ongoing exploration of its long-term benefits and challenges will be essential for maximizing its effectiveness and preparing educators to meet diverse student needs.

References

Aceves, T. C., & Orosco, M. J. (2014). Culturally responsive teaching (Report No. IC-2). Collaboration for Effective Educator, Development, Accountability, and Reform Center, University of Florida. http://ceedar.education.ufl.edu/tools/innovation-configurations/

Acquah, E. O., & Commins, N. L. (2017). Methods that matter in addressing cultural diversity with teacher candidates. *Teaching in Higher Education*, *22*(5), 501-518. https://doi.org/10.1080/13562517.2016.1273217

Adam, A. (2017). A framework for seeking the connections between technology, pedagogy and culture: A study in the Maldives. *Journal of Open, Flexible, and Distance Learning*, *21*(1), 35–51. Distance Education Association of New Zealand. Retrieved August 18, 2024 from https://www.learntechlib.org/p/180235/.

Al-Ansi, A. M., Jaboob, M., Garad, A., & Al-Ansi, A. (2023). Analyzing augmented reality (AR) and virtual reality (VR) recent development in education. *Social Sciences & Humanities Open*, *8*(1), 100532. http://dx.doi.org/10.1016/j.ssaho.2023.100532

Allen, A., Hancock, S. D., Starker-Glass, T., & Lewis, C. W. (2017). Mapping culturally relevant pedagogy into teacher education programs: A critical framework. *Teachers College Record, 119*(1), 1-26. https://doi.org/10.1177/016146811711900107

Alizadeh, M. (2019). Virtual reality in the language classroom: Theory and practice. *Computer-Assisted Language Learning Electronic Journal, 20*(3), 21-30. https://callej.org/index.php/journal/article/view/280/211

Alzahrani, N. M. (2020). Augmented reality: A systematic review of its benefits and challenges in e- learning contexts. *Applied Sciences, 10*(16), 5660. https://doi.org/10.3390/app10165660

Antonenko, P. D., Dawson, K., & Sahay, S. (2017). A framework for aligning needs, abilities and affordances to inform design and practice of educational technologies. *British Journal of Educational Technology, 48*(4), 916-927. https://doi.org/10.1111/bjet.12466

Ary, D., Jacobs, L. C., & Irvine, C. K. (2019). *Introduction to research in education*. Boston, MA: Wadsworth Cengage Learning.

Azam, S. M., Nasir, M. K. M., & Husnin, H. (2023). Readiness, technological knowledge (TK), and technological pedagogical knowledge (TPK) of teachers integrating augmented reality (AR) technology during the teaching process. *International Journal of Academic Research in Progressive Education and Development, 12*(2). http://dx.doi.org/10.6007/IJARPED/v12-i2/17244

Baydak, A. V., Scharioth, C., & Il'yashenko, I. A. (2015). Interaction of language and culture in the process of international education. *Procedia-Social and Behavioral Sciences, 215,* 14-18. http://dx.doi.org/10.1016/j.sbspro.2015.11.567

Belda-Medina, J., & Calvo-Ferrer, J. R. (2022). Integrating augmented reality in language learning: Pre-service teachers' digital competence and attitudes through the TPACK framework. *Education and Information Technologies, 27*(9), 12123-12146. http://dx.doi.org/10.1007/s10639-022-11123-3

Berti, M., Maranzana, S., & Monzingo, J. (2020). Fostering cultural understanding with virtual reality: A look at students' stereotypes and beliefs. *International Journal of Computer-Assisted Language Learning and Teaching (IJCALLT), 10*(1), 47-59. http://dx.doi.org/10.4018/IJCALLT.2020010104

Billinghurst, M., & Duenser, A. (2012). Augmented reality in the classroom. *Computer, 45*(7), 56-63. http://dx.doi.org/10.1109/MC.2012.111

Biswas, P., Orero, P., Swaminathan, M., Krishnaswamy, K., & Robinson, P. (2021, May). Adaptive accessible AR/VR systems. In *Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1-7). https://doi.org/10.1145/3411763.3441324

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology, 3*(2), 77-101. http://dx.doi.org/10.1191/1478088706qp063oa

Budianto, L., Arifani, Y., Wardhono, A., & Poedjiastutie, D. (2023). The TPACK level of in-service EFL teacher online professional training: The perspectives of teachers, students, and trainers. *Journal of Digital Learning in Teacher Education*, *39*(2), 87-101. http://dx.doi.org/10.1080/21532974.2023.2167024

Burton, J. (2009). *Reflective practice. In A. Burns & J. C. Richards (Eds.), The Cambridge guide to second language teacher education* (pp. 298–307). New York: Cambridge University Press. https://doi.org/10.1017/9781139042710

Chai, C. S., Koh, J. H. L., Tsai, C.C. (2013). A review of technological pedagogical content knowledge. *Journal of Educational Technology & Society*, *16*(2), 31-51. http://www.jstor.org/stable/jeductechsoci.16.2.31

Chapelle, C. (2013). *The encyclopedia of applied linguistics*. Oxford, England: Wiley Blackwell.

Chen, D., & Yang, X. (2017). Improving active classroom participation of ESL students: Applying culturally responsive teaching strategies. *Theory and Practice in Language Studies*, *7*(1), 79-86. http://dx.doi.org/10.17507/tpls.0701.10

Chinh, N. D. (2013). Cultural diversity in English language teaching: Learners' voices. *English Language Teaching*, *6*(4), 1-7. http://dx.doi.org/10.5539/elt.v6n4p1

Cirocki, A., & Farelly, R. (2016). Research and reflective practice in the EFL classroom: Voices from Armenia. *Eurasian Journal of Applied Linguistics, 2(1),* 31-56. http://dx.doi.org/10.32601/ejal.460995

Cowie, N., & Alizadeh, M. (2022). The affordances and challenges of virtual reality for language teaching. *International Journal of TESOL Studies*, *4*(3), 50-65. http://dx.doi.org/10.46451/ijts.2022.03.05

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). Los Angeles: Sage Publications.

Dabou, S. P., Hammoudi, A., & Chibani, R. (2021). Teachers and students' attitudes towards the integration of the target culture in the English as a foreign language class: A case study. *International Journal of Linguistics, Literature and Translation*, *4*(4), 253-266. http://dx.doi.org/10.32996/ijllt.2021.4.4.28

Dalal, M., Archambault, L., & Shelton, C. (2021). Fostering the growth of TPACK among international teachers of developing nations through a cultural exchange program. *Australasian Journal of Educational Technology*, *37*(1), 43-56. http://dx.doi.org/10.14742/ajet.5964

Darling-Hammond, L. (2010) Constructing 21st century teacher education. In V. HillJackson & C. W. Lewis (Eds.), *Transforming teacher education: What went wrong with teacher training and how we can fix it* (pp. 223–248). Sterling, VA: Stylus. https://doi.org/10.4324/9781003448365

Dornyei, Z. (2007). *Research methods in applied linguistics.* Oxford: Oxford Univeristy Press.

Ebersole, M., Kanahele Mossman, H., & Kawakami, A. (2016). Culturally Responsive Teaching: Examin ing Teachers' Understandings and Perspectives. *Journal of Education and Training Studies*, *4*(2), 97-104. http://dx.doi.org/10.11114/jets.v4i2.1136

Erbas, C., & Demirer, V. (2019). The effects of augmented reality on students' academic achievement and motivation in a biology course. *Journal of Computer Assisted Learning*, *35*(3), 450-458. http://dx.doi.org/10.1111/jcal.12350

Farrell, T. S. (2011). 'Keeping SCORE': Reflective practice through classroom observations. *RELC Journal, 42*(3), 265-272. http://dx.doi.org/10.1177/0033688211419396

Fernandez, M. (2017). Augmented virtual reality: How to improve education systems. *Higher Learning Research Communications*, *7*(1), 1-15. http://dx.doi.org/10.18870/hlrc.v7i1.373

Gay, G. (2013). Teaching to and through cultural diversity. *Curriculum Inquiry*, *43*, 48–70. http://dx.doi.org/10.1111/curi.12002

Gaston Gayles, J., & Kelly, B. T. (2007). Experiences with diversity in the curriculum: Implications for graduate programs and student affairs practice. *Journal of Student Affairs Research and Practice*, *44*(1), 193-208. http://dx.doi.org/10.2202/1949-6605.1761

Gist, C., Jackson, I., Nightengale-Lee, B., & Allen, K. (2019). Culturally responsive pedagogy in teacher education. *Oxford Research Encyclopedia of Education.* Retrieved 18 June. 2024, from https://doi.org/10.1093/acrefore/9780190264093.013.266

Gonzalez-Vidal, T., & Moore, P. (2024). Technology-enhanced language and culture teaching in Chile: the perceptions and practices of in-service EFL teachers. *Journal for Multicultural Education, 18*(1/2), 25-37. http://dx.doi.org/10.1108/JME-08-2023-0073

Greene, M. D., & Jones, W. M. (2020). Analyzing contextual levels and applications of technological pedagogical content knowledge (TPACK) in English as a second language subject area: A systematic literature review. *Journal of Educational Technology & Society*, *23*(4), 75-88. https://doi.org/10.1108/JME-08-2023-0073

Haga, S. (2024). From knowledge to inclusion: Culturally responsive TPACK (TPACCK). *Research and Practice in Technology Enhanced Learning, 20*, 3. http://dx.doi.org/10.58459/rptel. 2025.20003

Harris, J. B., & Hofer, M. J. (2011). Technological pedagogical content knowledge (TPACK) in action: A descriptive study of secondary teachers' curriculum-based, technology-related instructional planning. *Journal of Research on Technology in Education, 43*(3), 211-229. Retrieved August 18, 2024 from https://www.learntechlib.org/p/54099/.

Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education, 41*(4), 393-416. http://dx.doi.org/10.1080/15391523.2009.10782536

Heigham, J., & Croker, R. (Eds.). (2009). *Qualitative research in applied linguistics: A practical introduction*. Springer.

Hidayati, N., Fauziati, E., & Tarjana, S. (2017). The influence of mastering target-language culture on the students' language skills. *Journal of English Education*, *2*(1), 89-96. https://dx.doi.org/10.31327/jee.v2i1.264

Hofstede, G., Hofstede, G. J. & Minkov, M. (2010). *Cultures and organizations: Software of the mind.* 3rd Edition, McGraw-Hill USA.

Huang, X., Zou, D., Cheng, G., & Xie, H. (2021). A systematic review of AR and VR enhanced language learning. *Sustainability*, *13*(9), 4639. https://doi.org/10.3390/su13094639

Ladson-Billings, G. (2014). Culturally relevant pedagogy 2.0: aka the remix. *Harvard educational review*, *84*(1), 74-84. http://dx.doi.org/10.17763/haer.84.1.p2rj131485484751

Lee, S. G., Trimi, S., & Kim, C. (2013). The impact of cultural differences on technology adoption. *Journal of world business*, *48*(1), 20-29. http://dx.doi.org/10.1016/j.jwb.2012.06.003

Li, N. (2024, June). Integrating Cross-cultural Competence into English Language Teaching: A Digitally-enabled Approach. In *Proceedings of the 3rd International Conference on Educational Innovation and Multimedia Technology, EIMT 2024,* (pp. 29–31). Wuhan, China. http://dx.doi.org/10.4108/eai.29-3-2024.2347751

Lisa, A., Faridi, A., Bharati, D. A., & Saleh, M. (2022, June). *TPACK-in Practice Model: Effects on EFL students' professional knowledge and online teaching practices.* In *Proceedings of the 10th UNNES Virtual International Conference on English Language Teaching, Literature, and Translation (ELTLT 2021)*, 14-15 August 2021, Semarang, Indonesia. http://dx.doi.org/10.4108/eai.14-8-2021.2317611

Lita, R. A., Puspitaloka, N., & Ambarwati, E. K. (2023). Exploring the challenges of technology integration in secondary EFL classroom: Perspective of TPACK. *Innovative: Journal of Social Science Research*, *3*(4), 440-450. https://doi.org/10.31004/innovative.v3i4.3541

Mackey, A., & Gass, S. M. (2005). *Second Language Research.* Routledge.

Masimba, F., Appiah, M., & Zuva, T. (2019, November). A review of cultural influence on technology acceptance. In *2019 International Multidisciplinary Information Technology and Engineering Conference (IMITEC)* (pp. 1-7). IEEE. http://dx.doi.org/10.1109/IMITEC45504.2019.9015877

Mensah, F. M. (2021). Culturally relevant and culturally responsive: Two theories of practice for science teaching. *Science and Children*, *58*(4), 10-13. https://10.12691/education-12-4-2

Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & education*, *70*, 29-40. http://dx.doi.org/10.1016/j.compedu.2013.07.033

Mishra, P., & Koehler, M.J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teacher knowledge. *Teachers College Record*, *108*(6), 1017-1054. http://dx.doi.org/10.1111/j.1467-9620.2006.00684.x

Mishra, P., & Warr, M. (2021). Contextualizing TPACK within systems and cultures of practice. *Computers in Human Behavior*, *117*, 106673. https://doi.org/10.1016/j.chb.2020.106673

Mundy, M. A., Hernandez, J., & Green, M. (2019). Perceptions of the effects of augmented reality in the classroom. *Journal of Instructional Pedagogies*, *22*.

Nassaji, H. (2020). Good qualitative research. *Language Teaching Research*, *24*(4), 427-431. https://doi.org/10.1177/1362168820941288

Novita, D., & Purwati, O. (2022). In-service EFL teachers' sociocultural-based TPACK beliefs and practices: Voice of teachers and students. *Computer-Assisted Language Learning Electronic Journal*, *23*(1), 278 - 293. https://callej.org/index.php/journal/article/view/381

Ofosu-Amaah, F. N. (2021). *Diffusion of virtual and augmented reality in Pre-K to 12 education: Experiences and perceptions of pioneer teachers* (Doctoral dissertation, Seton Hall University). https://scholarship.shu.edu/dissertations/2906

Peterson, K., & Stone, B. A. (2019). From theory to practice: Building leadership opportunities through virtual reality science expeditions. *International Journal of the Whole Child*, *4*(1), 67-74.

Prayudha. S, J., & Pradana, A. (2023). Unravelling EFL teachers' mastery of TPACK to promote students' participation. *Erudita: Journal of English Language Teaching*, *3*(2), 132-143. https://doi.org/10.28918/erudita.v3i2.1153

Rahimi, M., & Pourshahbaz, S. (Eds.). (2018). English as a foreign language teachers' TPACK: emerging research and opportunities: emerging research and opportunities. https://doi.org/10.4018/978-1-5225-6267-2

Ramlan, N. F. B. J. N., & Maarof, N. (2014). Multicultural education: The influence of cultural diversity on second language acquisition. *International Journal of English and education*, *3*(4), 284-294.

Rashid, M. H., Shamem, A. S. M., & Hui, W. (2021). The position of culture in English language teaching. *Linguistics and Culture Review*, *6*(S2), 43-51. https://doi.org/10.21744/lingcure.v6nS2.1908

Riessman, C. K. (2008). *Narrative methods for human sciences*. Sage Publications, Thousand Oaks, CA.

Rogers, E. M. (2003). Diffusion of Innovations. 5. Aufl. New York: A Division of Simon & Schuster.

Saito, K., & Lee, J. J. (2023). Work-in-Progress-VR Implementation in Classrooms: A TPACK Perspective. *Immersive Learning Research-Academic*, 17-23. http://dx.doi.org/10.56198/ZH3JOHA64

Sanders, M. S., Haselden, K., & Moss, R. M. (2014). Teaching diversity to preservice teachers: Encouraging self-reflection and awareness to develop successful teaching practices. *Multicultural Learning and Teaching*, *9*(2), 171-185. http://dx.doi.org/10.1515/mlt-2012-0012

Salimi, E. A., & Rad, M. R. (2024). Nurturing multiculturalism in Iranian EFL teacher education: an in-depth scrutiny of experts' and teachers' perceptions. *Asian-Pacific*

Journal of Second and Foreign Language Education, 9(1), 9. http://dx.doi.org/10.21203/rs.3.rs-3333073/v1

Shadiev, R., Hwang, W. Y., Altinay, F., & Guralnick, D. (2023). Technology-assisted cultural diversity learning. *Frontiers in Psychology, 14*, 1274292. https://doi.org/10.3389%2Ffpsyg.2023.1274292

Sharma, R. (2021). Extended reality: Its impact on education. *International Journal of Scientific & Engineering Research*, *12*(12), 247-251.

Shey, P. F., & Fangwi, M. L. (2020). Culturally responsive pedagogy: A pathway for the inclusion of diverse learners in today's contemporary classroom. *American Research Journal of Humanities and Social Science, 3*(7), 59-68.

Shiyao, W. (2021). Exploring the TPACK of Chinese EFL teachers: the effects of multicultural teaching experiences. *Frontiers in Art Research, 3*(7), 27-31. https://dx.doi.org/10.25236/FAR.2021.030707

Shmidt, E., Chelpanova, E., Bolina, M., Novikova, V., & Naumenko, L. (2021). Developing sociocultural competence of university students of foreign languages by mastering the culture-oriented linguistics component of the instructional content. *In EDULEARN21 Proceedings (pp. 4895-4898)*. IATED.

Smith, R., Ralston, N. C., & Gallegos, B. (2021). Integrating culturally responsive pedagogy and virtual reality: Preparing preservice educators for secondary language arts classes. In C. M. Moran and M. Rice (Eds.), *Virtual and augmented reality in English language arts education* (pp. 225-244). Lexington Books.

Sunny, S., Patrick, L., & Rob, L. (2019). Impact of cultural values on technology acceptance and technology readiness. *International Journal of Hospitality Management*, *77*, 89-96. http://dx.doi.org/10.1016/j.ijhm.2018.06.017

Tafazoli, D. (2024). From virtual reality to cultural reality: integration of virtual reality into teaching culture in foreign language education. *Journal for Multicultural Education, 18*(1/2), 6-24. http://dx.doi.org/10.1108/JME-12-2023-0135

Tebben, C. (2021), "Teachers' perceptions and experiences in cultural awareness professional development", Unpublished manuscript, available at: https://repository.stcloudstate.edu/edad_etds/75

Thyssen, C., Huwer, J., Irion, T., & Schaal, S. (2023). From TPACK to DPACK: The "Digitality-related pedagogical and content knowledge"-model in STEM-education. *Education sciences*, *13*(8), 769. https://doi.org/10.3390/educsci13080769

Wang, A. Y. (2022). Understanding levels of technology integration: A TPACK scale for EFL teachers to promote 21st-century learning. *Education and Information Technologies*, *27*(7), 9935-9952. http://dx.doi.org/10.1007/s10639-022-11033-4

Williams, N. N., Williams, B. K., Jones-Fosu, S., & Carter, T. (2023). An examination of cross-cultural experiences on developing culturally responsive teacher candidates. *Emerald Open Research*, *1*(3). http://dx.doi.org/10.12688/emeraldopenres.12852.1

Worthington, M. (2013). *Differences between phenomenological research and a basic qualitative research design*. London: Capella University.

Yang, M. T., & Liao, W. C. (2014). Computer-assisted culture learning in an online augmented reality environment based on free-hand gesture interaction. *IEEE Transactions on Learning Technologies*, *7*(2), 107-117. http://dx.doi.org/10.1109/TLT.2014.2307297

Yurtsever, A., & Özel, D. (2021). The role of cultural awareness in the EFL classroom. *Turkish Online Journal of Qualitative Inquiry*, *12*(1), 102-132. http://dx.doi.org/10.17569/tojqi.776499

Zhang, Y. (2021). Virtual reality in ESL teacher training: Practical ideas. *International Journal of Technology in Teaching and Learning*, *16*(1), 20-36. http://dx.doi.org/10.37120/ijttl.2020.16.1.03

Zhang, Y. (2022). Developing EFL Teachers' Technological Pedagogical Knowledge Through Practices in Virtual Platform. *Frontiers in Psychology*, *13*, 916060. https://doi.org/10.3389/fpsyg.2022.916060

Zohrabi, Kh., Razmjoo, S.A., & Ahmadi, A.R. (2019). Developing and validating a pluralistic curriculum (PC) model for English teaching in Iranian high schools. *Journal of Modern Research in English Language Studies*, *6*(1), 31-49. https://doi.org/10.30495/ttlt.2022.696899

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