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Research Article

Exploring the role of virtual simulation in advancing sustainable teacher preparation for English learners

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This study investigates how virtual simulations contribute to sustainable and inclusive teacher education by enhancing Teacher Candidates' psychological preparation and confidence in teaching English Learners. Aligned with Sustainable Development Goal 4, which emphasizes equitable and quality education, the research explores how digital tools can reduce inequities in teacher preparation and bridge the gap between theory and practice. Participants were teacher candidates enrolled in teacher education programs and participated in semi-structured interviews reflecting on their experiences with virtual simulations. Thematic analysis revealed that simulations significantly improve preparedness by providing opportunities to refine communication strategies, receive real-time feedback, and adapt teaching to diverse English Learner proficiency levels. Importantly, the use of virtual simulations fosters sustainable training practices by reducing dependency on limited classroom placements, lowering barriers for resource-constrained institutions, and supporting scalable, inclusive approaches to teacher development. Findings highlight the potential of virtual simulations as a digital innovation that equips future educators with both technical competence and psychological readiness while advancing institutional sustainability and equity in higher education.

Keywords: Digital transformation; English learners; Inclusive pedagogy; Sustainability in education; SDG 4; TeachLivE; Teacher candidates; Virtual simulations

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1. Introduction

In recent years, the U.S. educational landscape has seen a growing emphasis on improving instructional strategies for English Learners [ELs], driven by the significant achievement gap between these students and their English-proficient peers (Garcia & Weiss, 2017; Nutta et al., 2010). As the EL population continues to expand, the need for effective teacher preparation programs becomes more urgent, especially in equipping teacher candidates [TCs] with the communication skills necessary to meet the unique needs of ELs (García & Weiss, 2019). While traditional teacher preparation methods have long focused on theoretical knowledge and pedagogical techniques, the gap between this knowledge and its practical application in diverse classrooms remains a persistent challenge (Dieker et al., 2014). Virtual simulations, such as TeachLivE, offer a promising solution by providing immersive, realistic experiences where TCs can practice and refine their teaching strategies in a controlled environment (Grossman, 2018).

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At a global level, United Nations Educational, Scientific and Cultural Organization [UNESCO] emphasizes that achieving SDG 4 depends heavily on addressing the worldwide teacher shortage and ensuring that teachers are qualified, motivated, and equipped with new pedagogical skills, particularly in digital and inclusive practices (UNESCO, 2024). Nearly 44 million teachers will be needed worldwide by 2030, and countries are already undertaking transformative actions in teacher training and professional development to strengthen equity and inclusion in education (UNESCO, 2024). Virtual simulation tools such as TeachLivE respond to this urgent need by providing scalable and sustainable pathways for preparing teacher candidates in diverse instructional contexts. Unlike traditional practicum placements, which are often constrained by limited availability and inconsistent quality, simulations create equitable access to authentic teaching practice while reducing risks for both learners and novice teachers. This positions virtual simulations not only as an innovative instructional strategy but also as a transformative approach that supports institutional sustainability, expands access to high-quality teacher education, and contributes to more inclusive educational outcomes for linguistically diverse learners.

2. TeachLivE™ Virtual Simulation

Virtual simulation, a concept introduced in the 1980s, refers to the use of computer technology to create immersive 3D environments that replicate real-world scenarios, offering users the opportunity to practice and refine their skills in a risk-free setting (Asad et al., 2019; Peterson-Ahmed, 2018). In the field of education, virtual simulations have gained prominence as a powerful tool for teacher training, enabling pre-service and in-service teachers to engage in realistic teaching experiences without the consequences of real-life classroom errors (Dieker et al., 2014). One such innovative tool is TeachLivE™**,** a virtual reality-based program developed at the University of Central Florida enables pre-service and in-service teachers to practice instructional and classroom-management skills in real time. Operated by trained simulation specialists, animated avatar students respond dynamically to verbal and nonverbal cues, replicating authentic classroom interactions. Each session, conducted via Zoom, lasted 10–15 minutes and was followed by guided reflection. Avatars represented English Learners at beginner, intermediate, and advanced proficiency levels, allowing teacher candidates to apply differentiated scaffolding strategies (see Figure 1 and 2). Simulation coaches provided immediate feedback on communication, pacing, and cultural responsiveness. Following simulation practice, TCs completed 10–30 hours of authentic classroom teaching to transfer and refine learned strategies. This dual-stage model positioned TeachLivE™ as an experiential bridge between theory and practice, fostering reflective, confident, and culturally responsive teachers prepared to meet the linguistic and academic needs of diverse English Learners.

Figure 1

TLE TeachLivE avatars for Kindergarten through Grade 5

Source: Images created by Eric Imperiale.

Figure 2
TLE TeachLivE middle school/high school EL avatars (images are made by Eric Imperiale)

Source: Images created by Eric Imperiale.

This study explores how virtual simulations advance sustainable teacher preparation for English Learners by enhancing teacher candidates' confidence, psychological readiness, and communication skills for real-world classrooms. It highlights the role of technology-driven practice in developing reflective, well-prepared, and culturally responsive educators.

The study sets out to answer two key questions:

RQ 1) How does participation in virtual simulations, such as TeachLivE, influence teacher candidates' psychological preparation for teaching real English Learners?

RQ 2) In what ways do virtual simulations build teacher candidates' confidence in applying communication strategies in real-life classroom settings with ELs?

3. Literature Review

In recent years, the number and proportion of English Learners in U.S. public schools have significantly increased, rising from 9.2% in fall 2010 to 10.4% in fall 2018, underscoring the need for specialized teaching strategies to address the diverse needs of this growing student population (National Center for Education Statistics [NCES], 2023). This rapid demographic shift has created an urgent need for teachers who can effectively instruct ELs in mainstream classrooms. Despite the growing demand for EL instruction, research indicates that teacher preparation programs have been largely insufficient in equipping teacher candidates with the skills and confidence necessary to meet the needs of this diverse student population (García & Weiss, 2019). Teacher preparation programs in the U.S. have faced increasing scrutiny for not adequately preparing future educators with the hands-on skills needed to navigate real-world teaching challenges (Cochran-Smith et al., 2013). Critics argue that traditional programs place too much emphasis on theory, leaving novice teachers ill-prepared for classroom realities, particularly in areas like classroom management and student engagement (Gage et al., 2018; Oliver, 2007). With the growing diversity in student populations and the pressures of initiatives like Race to the Top, teacher educators often find themselves justifying their methods rather than focusing on developing practical teaching competencies in pre-service teachers (Kretchmar & Zeichner, 2016). Classroom management, a critical area for fostering effective learning environments, is frequently cited as a gap in teacher readiness. Novice teachers often feel unprepared to handle behavioral issues or create proactive strategies to promote student engagement, despite theoretical knowledge gained during training (Al-Enzi, 2021; Dieker et al., 2014). Consequently, many TCs feel unprepared to manage the linguistic and academic challenges posed by ELs. This gap in teacher preparation has been exacerbated by the disparity between the predominantly white, monolingual teaching force and the increasing diversity of U.S. classrooms (National Center for Education Statistics, 2012). Therefore, teacher preparation programs must find innovative ways to address these inadequacies, particularly in areas like communication strategies and classroom management tailored for ELs (Regalla et al., 2016).

Oliver (2007) highlights the need for proactive management strategies that build positive classroom environments, while Gage et al. (2018) emphasizes that well-prepared teachers foster engagement and reduce stress. Darling-Hammond (2006) notes that integrating theory with practice better equips teachers for complex classrooms. In preparing candidates to teach English Learners, virtual simulations have become transformative tools, offering risk-free environments for practicing instructional and management strategies (Dieker et al., 2014). As Judge et al. (2013) observe, traditional preparation poses challenges for novices; thus, simulations bridge theory and practice, enhancing teacher readiness and promoting sustainable, experiential, and effective teacher preparation for diverse learners.

Although simulations are widely used in medicine and engineering (Judge et al., 2013), their application in teacher education remains underexplored (Hughes et al., 2005). Mixed-reality platforms like TeachLivE™ have proven effective in developing teacher candidates' pedagogical and communication skills through real-time, interactive scenarios with avatar English Learners (Dieker et al., 2014). These simulations provide immediate feedback, helping TCs refine classroom management and instructional strategies (Lampert et al., 2013) while fostering practices responsive to ELs' linguistic and academic needs (Grossman et al., 2009). However, gaps persist in understanding how such experiences transfer to authentic teaching contexts (Mendez, 2021). This study addresses these gaps by exploring how TeachLivE™ enhances TCs' psychological preparedness and confidence, bridging theory and practice to cultivate reflective, adaptive, and culturally responsive educators prepared to support diverse learners effectively.

This study explores how virtual simulations advance sustainable teacher preparation for English Learners by enhancing teacher candidates' psychological readiness, confidence, and communication strategies.

4. Theoretical Framework

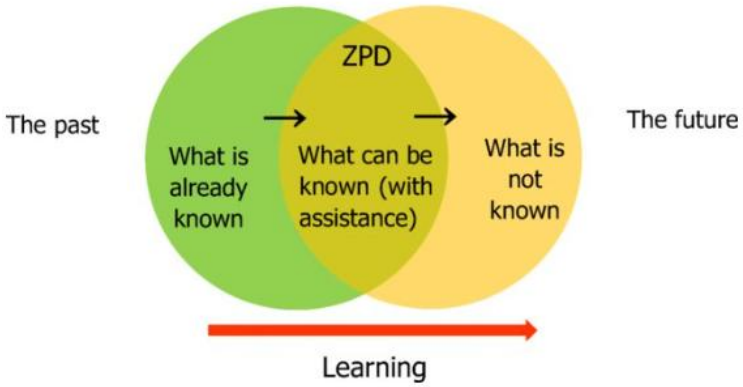
This study is grounded in two complementary theoretical models: Vygotsky's Zone of Proximal Development [ZPD] and Bandura's Self-Efficacy Theory. These frameworks provide a comprehensive understanding of how virtual simulations, such as TeachLivE, support teacher candidates in preparing for real-world teaching by building both their psychological readiness and confidence.

4.1. Zone of Proximal Development

Lev Vygotsky's concept of the Zone of Proximal Development is essential for understanding how learning occurs through social interaction and cultural context (see Figure 3). The ZPD represents the gap between what learners can accomplish independently and what they can achieve with guidance from a more knowledgeable other, such as a teacher or peer (Vygotsky, 1978). Within this zone, learners develop new skills through scaffolding that supports growth without causing frustration. For teacher candidates working with English Learners, the ZPD underscores the need for structured guidance and feedback to connect theory and practice. Virtual simulation tools like TeachLivE situate TCs within their ZPD, allowing them to practice teaching strategies, receive real-time feedback, and refine their approaches in a supportive, low-risk environment (Nomura et al., 2019).

TeachLivE simulations provide teacher candidates with opportunities to develop scaffolding techniques essential for supporting English Learners. In this risk-free environment, TCs practice modifying instruction using simplified language, visuals, and step-by-step guidance aligned with learners' proficiency levels. Coaching feedback helps refine questioning strategies, promoting real-time adaptation and iterative learning. As TCs interact with diverse EL avatars, they also build cultural competence, aligning with Vygotsky's socio-cultural theory that emphasizes learning through social and cultural contexts. Integrating ZPD principles with guided feedback, TeachLivE strengthens both instructional and cultural responsiveness, fostering confident, empathetic, and well-prepared educators for diverse classrooms.

Figure 3
Diagram of the ZPD concept



Note. Adapted from Nomura et al. (2019).

4.2. Self-Efficacy Theory

Bandura's Self-Efficacy Theory (1977) explains how teacher candidates build confidence in teaching English Learners through belief in their ability to achieve desired outcomes. In teacher preparation, self-efficacy influences motivation, persistence, and resilience in diverse classrooms. Virtual simulations like TeachLivE create mastery experiences—the most powerful source of self-efficacy—by allowing TCs to practice and refine instructional strategies without fear of failure. These experiences enable TCs to adapt communication techniques to varying EL proficiency levels, receive feedback, and make real-time adjustments, thereby enhancing their sense of competence and confidence. When integrated with Vygotsky's Zone of Proximal Development, this framework illustrates how guided practice within virtual environments fosters both skill acquisition and psychological readiness. Together, these theories highlight how simulations bridge theory and practice, cultivating confident, reflective, and effective educators prepared to meet the diverse needs of ELs.

5. Methodology

5.1. Research Approach

This study employs a qualitative case study approach, well-suited for understanding the nuanced and complex interactions between teacher candidates and English Learners within virtual simulations. As Kozleski (2017) asserts, qualitative methods provide flexibility, allowing researchers to adapt to changes and uncover deep, contextual insights. The case study method, selected for this research, offers a detailed examination of how virtual simulations influence TCs' preparedness and confidence with real ELs, facilitating a thorough exploration of real-life scenarios (Simons, 2020).

5.2. Participants

The sample for this study was purposively selected from teacher candidates enrolled in a bachelor's program leading to certification in Elementary and/or Secondary Education at a large university in the Southeastern United States. Purposive sampling was used for its efficiency in recruiting participants who meet the study's criteria (Etikan et al., 2016). Five teacher candidates were recruited, representing a diverse population in terms of age, gender, and ethnicity. This diversity provided a broad spectrum of experiences, allowing the study to assess the differential impacts of virtual simulations across various subsets of the population. Table 1 shows the charasteristics of the participants.

Table 1
Demographic Information of Participants

Demographic information	*N*
Ethnicity	
Caucasian/White	2
Hispanic/Latino/	3
Gender	
Female	4
Male	1
Age	
18-20	1
20-30	2
30-40	1
40-50	1
First Language	
English	3
Spanish	2
Prior Teaching Experience	
Yes	4
No	1
Workplace with Real ELs	
K-12 School	4
Non K-12 School	1

5.3. Data Collection

Data were collected through semi-structured interviews followed by a structured checklist. The semi-structured interviews provided participants the opportunity to reflect on their experiences with TeachLivE and ELs in a real-world setting. Interviews were conducted either in person or via Zoom, depending on participant availability, with each session lasting between 30 to 1 hour. A structured checklist was used to assess the specific strategies teacher candidates employed when interacting with ELs during their TeachLivE simulations and in real-life classroom settings. The checklist was developed based on prior research (Dieker et al., 2014) and included items such as visual aid usage, question types, and language adaptation based on EL proficiency levels.

5.4. Data Analysis

The qualitative data were analyzed using Braun and Clarke's (2006) thematic analysis approach, which involved systematically coding the data, identifying recurring patterns, and developing coherent themes related to teacher candidates' psychological preparation, communication strategies, and confidence-building through TeachLivE simulations.

5.4.1. Validity and reliability

To ensure reliability, the research followed a consistent interview protocol, used structured data collection tools, and involved member checking, where participants reviewed their transcripts for accuracy. The use of MAXQDA software for coding and thematic analysis also enhanced reliability by facilitating systematic data organization and retrieval.

Validity was achieved through triangulation of data sources (semi-structured interviews and checklists), member checking, and the use of established analytical frameworks (Braun & Clarke, 2006). Additionally, the focus on ecological validity ensured that the findings reflect real-world classroom dynamics.

5.4.2. Trustworthiness

This study prioritized trustworthiness through several key strategies. First, member checking was employed, where participants were given the opportunity to review their interview transcripts and confirm the accuracy of the data. This process validated the findings and ensured that the participants' voices and experiences were accurately represented.

5.4.3. Ethical considerations

Ethical approval was obtained from the Institutional Review Board on January 8, 2024, before the study commenced. Participants provided informed consent and were assured of confidentiality, with all data anonymized to protect their identities. They were also informed of their right to withdraw from their study at any time without penalty.

6. Findings

The findings from the study underscore the significant role virtual simulations, such as TeachLivE, play in enhancing the psychological preparation and confidence of teacher candidates when working with English Learners. Through simulated environments, TCs can practice and refine essential communication strategies and teaching techniques in a controlled setting, which closely mirrors real-life classroom dynamics. These experiences help reduce first-time teaching anxiety and foster confidence by allowing candidates to experiment with teaching methods without the fear of making irreversible mistakes. Additionally, simulations provide immediate feedback, helping TCs adapt their teaching styles to meet the varied needs of ELs, including managing diverse proficiency levels and classroom behaviors.

6.1. Theme I: Strengthened Preparation and Confidence

One of the key themes identified in the study, "Strengthened Preparation and Confidence," highlights the impact of virtual simulation experiences on the pedagogical development of teacher candidates working with English Learners. This theme emphasizes the vital role virtual simulations play in enhancing prospective teachers' preparedness and confidence.

Virtual simulations have proven to be a powerful tool in teacher education, combining realism with controlled practice. All TCs agreed that these platforms allow them to immerse themselves in simulated classroom environments, providing opportunities to practice and refine various teaching methods. Significantly, these virtual simulation practice enable TCs to rehearse lesson plans or instructional strategies in a dynamic and comprehensive training setting, where they can experiment with a variety of teaching and communication techniques, including classroom management, student engagement, and strategies for addressing diverse classroom dynamics.

Reflecting on their experience with virtual simulations, one teacher candidate shared “I feel that virtual simulation teaching was definitely similar to real-life teaching. And it definitely helped me be ready for dealing with real ELs” (TC1).

This quotation reinforces the theme by demonstrating how virtual simulations closely replicate real-life teaching scenarios, effectively preparing teacher candidates for real classroom interactions with ELs. It underscores the value of simulations in cultivating practical teaching skills and communication strategies that can be directly applied in actual educational settings.

6.2. Theme II: Psychological Preparation and Confidence Building in Utilizing Communication Strategies in Real-World Teaching

Another notable finding centers on the psychological aspect of teaching, highlighting the essential role of preparedness and confidence in the effective application of communication strategies in real-world classroom settings. Participation in the TeachLivE simulated teaching environments has been instrumental for teacher candidates, fostering the development of key communication strategies, classroom management techniques, and overall teaching skills. Most importantly, these

simulations have instilled in TCs the confidence and readiness to implement these strategies and skills in real classrooms, addressing the diverse needs of their ELs:

> In my real-life EL teaching experience, I feel like it helps me to know what tools to use the visuals and kind of what questions to ask for each level [ELs proficiency levels]. And it just kind of helps you have a little bit more confidence with it to know you know the structure of what you're supposed to do. Um, I think it just helped with like, what to say and how to go about it. Um, it helps me to be more prepared of what I would bring and say for certain questions, and what type of language to use for each different? (TC5)

This quotation illustrates how virtual simulation experiences play a crucial role in the psychological preparation and confidence-building of TCs. Teacher Candidate 5's reflection shows that engaging in these simulations enhances their grasp of practical teaching tools and questioning techniques tailored to various EL proficiency levels and strengthens their understanding of instructional structures and content. This experience boosts their confidence in their teaching abilities, and the increased readiness to select appropriate language and materials for diverse learners underscores how simulations prepare teachers to navigate the complexities of real classroom dynamics with confidence and competence.

One of the key findings regarding the impact of virtual simulation training is the confidence it instills in TCs. All TCs reported that participating in these simulated experiences exposes them to a wide range of classroom scenarios, including challenging or unexpected situations. This exposure is invaluable in preparing them to teach diverse groups of learners, such as English Learners (ELs) with varying proficiency levels and cultural backgrounds. By navigating these challenges in a controlled, simulated environment, teacher candidates build the confidence needed to effectively manage similar situations in real classrooms.

One Teacher Candidate shared:

> In my real-life EL teaching experience, I feel like it helps me to know what tools to use, the visuals and kind of what questions to ask for each level... It just kind of helps you have a little bit more confidence. (TC1)

This Teacher Candidate's experience demonstrates how virtual simulations enhanced their ability to utilize various tools and tailor questions for ELs at different proficiency levels, which in turn boosted their teaching confidence. This directly highlights the role of practice in building confidence, as the simulations allowed them to refine these skills in a supportive environment.

Analysis of the interview data revealed multiple examples of how teacher candidates' confidence and readiness increased by adapting their instructional communication to scaffold English Learners during TeachLivE simulations. Teacher Candidate 3, for instance, reflected on how the simulation helped them to be prepared to modify questioning techniques in real time:

> In TeachLivE session, I had to rephrase the questions because I kept asking the same questions over and over again. I learned how to rephrase questions in a different way to make sure the student [EL] understood what I was saying. My professor encouraged me to ask more complicated questions for advanced ELs. So, I was ready for real life practice. (TC3)

This adaptive questioning mirrors a key EL teaching practice—aligning question complexity with proficiency levels. For example, after receiving coaching, TC3 shared that they shifted from an abstract question ("Why does condensation happen?") to a simpler, choice-based one ("Does condensation mean water goes up or down?") for a beginner avatar, then extended to higher-order "how" questions for advanced ELs.

Similarly, Teacher Candidate 2 demonstrated recasting and clarification techniques to elicit accurate language output from avatar ELs:

> Using these techniques like recasting or clarification, I wasn't aware of them before, but I realized how much they help in teaching real-life ELs… I saw a light bulb moment when they understood and related it properly with their current knowledge.

Other TCs illustrated multimodal strategies that are widely recognized in English language teaching. For beginner ELs, TC1 emphasized visual-contextual integration, stating "Having the

visual aids definitely is a great thing… I would want to have pictures on the wall in different languages so they could refer to them."

Meanwhile, TC2 incorporated gestures and kinesthetic learning to support comprehension of abstract scientific vocabulary:

> I could probably have a picture of a cloud and rain… then act how the water falls from the sky moving my hands and pointing out the graph.

TC4 discussed graduated language complexity, explaining how Teacher Talk varied across proficiency levels:

> For beginner ELs, I talk less and use simple words. For intermediate and advanced ELs, I talk more and introduce complex structures because they can pick up more.

Together, these examples illustrate how virtual simulations are prepared for TCs for cultivating nuanced pedagogical decision-making parallels to real EL classroom practice. Through guided coaching and immediate avatar feedback, TCs build confidence learning scaffolding instruction by adjusting linguistic input, employing visuals and gestures, rephrasing questions, and differentiating feedback—all core competencies in effective English language teaching.

6.3. Theme III: Reduction in First-Time Teaching Anxiety

For many Teacher Candidates, stepping into a real classroom for the first time can be overwhelming. Virtual simulations have been instrumental in reducing this anxiety. By offering a space where mistakes are part of the learning process and feedback is immediate and constructive, these simulations help demystify the classroom experience. TCs learn to adjust their teaching styles to cater to different learners, utilize effective questioning techniques, and incorporate visual aids to enhance comprehension. This practice results in a significant reduction in the anxiety typically associated with first-time teaching experiences.

> ..it [TeachlivE] taught me that like I have to rephrase the question because I kept just asking those same questions over and over again. So, I definitely learned how to rephrase a different way to make sure that the student was understanding what I was saying. (TC3)

The quotation from Teacher Candidate 3, who had no prior experience teaching ELs, highlights the practical benefits of virtual simulations in teacher training. This candidate's experience underscores a key aspect of reducing first-time teaching anxiety: developing adaptive teaching skills through practice in a simulated environment.

The quotation reflects how virtual simulations offer TCs a unique opportunity to experiment with various teaching strategies, such as rephrasing questions, without the fear of making irreversible mistakes in a real classroom. This safe, controlled setting allows for immediate feedback and constructive criticism, essential for learning and improvement. The candidate's realization of the need to rephrase questions to enhance student comprehension demonstrates an important teaching skill—flexibility and responsiveness to the needs of ELs.

This practice is especially crucial when teaching ELs with varying levels of language proficiency. The ability to adjust questions and teaching methods to suit different learners significantly reduces anxiety by equipping teacher candidates with the tools and confidence to manage diverse classroom scenarios. By learning to adapt their teaching approaches, utilize effective questioning techniques, and employ visual aids, TCs become better prepared and more self-assured in their teaching abilities.

A clearer example of how Teacher Candidate 3 (TC3) applied questioning strategies during the TeachLivE session highlights the pedagogical significance of rephrasing questions to enhance EL comprehension. During the simulation, TC3 initially asked a beginner-level avatar EL, "*Can you explain what condensation means?*"—a question that yielded a blank stare from the avatar. Recognizing the confusion, the candidate immediately rephrased the question, simplifying both language and structure: "*Does condensation mean water goes up or water comes down?*" This adjustment prompted the avatar EL to respond correctly, indicating comprehension. For advanced

avatar ELs, the same teacher candidate employed higher-order questioning by asking, "*How does condensation help form rain?*" rather than repeating simplified yes/no questions.

Through this iterative practice, TC3 demonstrated an evolving understanding of scaffolding language to match proficiency levels—an essential classroom skill for teachers of English Learners. The simulation feedback loop allowed the candidate to perceive the direct relationship between question complexity and EL engagement. As TC3 reflected:

> In TeachLivE, I learned how to rephrase questions in different ways to make sure the student was understanding what I was saying… I had never thought about asking questions based on ELs' proficiency levels before this class.

This concrete example illustrates how virtual simulation experiences foster TCs preparedness and readiness to reduce first time teaching anxiety and for dynamic communication strategies central to EL instruction. By rephrasing questions, adjusting linguistic complexity, and interpreting learner responses—both verbal and non-verbal—teacher candidates reduce their teaching anxiety and became prepared in critical competencies for scaffolding comprehension in multilingual classrooms

6.4. Theme IV: Promoting Student Engagement

The findings highlight the positive impact of TeachLivE simulations on improving teacher candidates' ability to foster student engagement in real classrooms because of well preparedness and confidence. All teacher candidates reported that the simulations enhanced their instructional strategies and boosted their capacity to engage students effectively. This increased engagement stemmed from applying experiences gained in the simulations to real-life teaching, such as making quick decisions, managing unexpected student behaviors, and encouraging active classroom participation. The simulations were valuable for both novice and experienced teachers, helping them to be well prepared and quickly translate their acquired knowledge into effective strategies for promoting student engagement.

> Even if I have prior teaching experiences, ... I've had issues with some ELLs where, ... But dealing with the avatars [in virtual simulations] and dealing with this class, it definitely put a different perspective on how to communicate with them. ... It just definitely opened my eyes to working with them in a little different way. How to simplify, how to follow up with them. Just being ... knowing, letting them know that you're there to help them all. (TC1)

The quotation reflects how TCs apply knowledge gained from virtual simulations to enhance student engagement in real classrooms, particularly with ELs. It highlights the journey of a specific teacher candidate who initially struggled with engaging students but, through simulation experiences, gained valuable insights into confidently preparing and effectively communicating with ELs. These experiences allowed the TC to practice strategies for engaging students who displayed challenging behaviors, such as pretending not to understand English to avoid participation. By learning to use simplified communication and consistently following up with students, the TC demonstrated adaptability in teaching methods to meet the diverse needs of ELs, fostering a more inclusive and engaging learning environment.

The study found that teacher candidates perceived the transition from virtual simulations to real-world classrooms as smoother because they could transfer the communication and scaffolding strategies practiced in TeachLivE to their actual teaching experiences. Several participants explicitly described how the simulation helped them feel more confident and prepared when interacting with English Learners in live classrooms. For instance, TC3 reflected,

> After TeachLivE, I realized I could use the same techniques in my classroom. In my real classroom teaching, when one of my beginners EL students didn't respond, I rephrased the question just like I did with the avatar, and it worked. The student answered after I simplified my question.

Similarly, TC2 shared that the simulation experience provided a framework for managing linguistic diversity in real teaching:

> The avatars helped me practice by giving instructions slowly and clearly. Later, in my practicum class, I saw my ELs understanding better when I did the same thing—using visuals and repeating key words.

TC4 echoed this sense of preparedness, emphasizing the continuity between simulated and authentic classroom experiences:

> TeachLivE made me feel ready to face real EL students. I used the same scaffolding steps—modeling first, then asking them to try. I noticed they responded more confidently.

These reflections illustrate that the teacher candidates were not merely practicing isolated skills in virtual environments but internalizing communicative and instructional routines transferable to authentic EL teaching contexts. Although the study cannot claim that the transition was universally seamless, participants consistently perceived that the simulation experiences reduced their anxiety, increased their readiness, and helped them enact adaptive scaffolding strategies more effectively when working with actual English Learners. Overall, the study highlights that virtual simulations not only prepare TCs for real-world challenges but also build the confidence needed to navigate complex classroom environments, ultimately promoting student engagement and improving teaching effectiveness.

7. Discussion

The findings from this study clearly highlight the transformative impact of virtual simulations, such as TeachLivE, on teacher candidates' psychological preparation and confidence in teaching English Learners. The study demonstrates how virtual simulation environments provide an invaluable platform for teacher candidates to bridge the gap between theoretical knowledge and practical teaching strategies in a low-risk, controlled setting. This aligns with the findings of Dieker et al. (2014), who emphasize the potential of simulated environments in teacher education to build practical skills without the real-life consequences of classroom errors.

These findings also resonate with the global agenda for transforming education towards the Sustainable Development Goals. UNESCO (2024) underscores that achieving SDG 4—ensuring inclusive and equitable quality education and lifelong learning for all—requires systemic innovation in pedagogy, teacher preparation, and digital learning. Virtual simulations such as TeachLivE address these imperatives by offering scalable, equitable, and sustainable approaches to teacher education. By reducing dependency on limited practicum placements and providing consistent, high-quality training opportunities, simulations contribute to overcoming structural inequities that often disadvantage teacher candidates working with culturally and linguistically diverse learners. This aligns with UNESCO's call for digital transformation as a driver of inclusion, equity, and quality in education, as countries increasingly leverage technology to strengthen teacher training and expand access to marginalized groups (UNESCO, 2024). In this way, the study's findings extend beyond individual teacher preparation to reflect broader institutional and policy-level commitments to sustainability, positioning virtual simulations as a transformative tool that can strengthen resilience, advance equity, and contribute to the long-term realization of SDG 4 in higher education systems. The findings offer a nuanced examination of how theoretical knowledge is translated into practical application. Building on the foundational work of Wake et al. (2017), which describes coaching as a critical feedback mechanism and transformative process that connects theory to practice, this study expands these ideas from the virtual realm to real-world teaching. The study emphasizes the pivotal role of real-time coaching in enhancing the preparedness and skills of teacher candidates, closely resembling the "bug-in-the-ear" model as discussed by Benson and Cotabish (2014) and Sharplin et al. (2016). This form of virtual coaching, specifically designed for the education of ELs, utilizes immediate feedback to empower teacher candidates, transforming them from passive recipients of knowledge into confident educators, as Nutta et al. (2018) highlighted.

Although the effectiveness of virtual simulations in improving teacher candidates' preparedness and self-efficacy is well documented (Ashtari, 2016; Burn et al., 2016; Dieker et al., 2014; Regalla et al., 2016), the extent to which these candidates can apply this preparedness and self-efficacy in real classroom scenarios with ELs remains underexplored. This study adds to the conversation by investigating how virtual coaching can facilitate this transition, addressing a critical gap in current research. The findings directly address the research question by showing that virtual simulation experiences significantly enhance TCs preparedness and confidence, particularly in their interactions with ELs. The study demonstrates that TCs are able to successfully transfer the readiness and self-efficacy gained from virtual simulations into real-world teaching scenarios. By incorporating real-time coaching and feedback within these simulations, TCs are able to bridge the gap between theoretical knowledge and practical application, leading to improvements in both their technical skills and psychological readiness for actual teaching. This process enables TCs to dynamically adjust their teaching strategies in response to immediate feedback and fosters a deeper understanding of and adaptability in their communication with ELs. As a result, the preparation and confidence developed through virtual simulations equip TCs to handle the diverse challenges of real-life classrooms more effectively, ensuring they can assess, respond to, and meet the educational needs of ELs with greater competence and confidence (Noor, 2024; Regalla et al., 2016).

Moreover, all TCs found that the skills developed through virtual simulations encompass both technical competencies and psychological preparation. They were able to dynamically adjust teaching strategies, language complexity, and questioning techniques in response to the real-time feedback provided during simulations. TCs reported that virtual simulation fosters an essential skill set for real-world teaching, particularly when working with ELs in diverse classrooms. The findings reveal that these simulation practices enhance the ability of TCs to quickly assess and respond to the varied linguistic and educational needs of ELs. For instance, many TCs noted significant improvement in their ability to adjust language complexity during real-time teaching, shifting from simple to complex structures as needed. This flexibility was developed through the immediate feedback characteristic of virtual platforms. As Teacher Candidate 3 highlighted, the TeachLivE sessions were pivotal in learning how to rephrase and modify questions based on EL proficiency levels, which ultimately strengthened their real-life teaching abilities (Noor, 2024; Regalla et al., 2016).

This adaptability in communication is crucial for managing the complexities of teaching diverse groups, ensuring that all students, regardless of their language proficiency, can engage with the material being taught. For TCs entering the classroom for the first time, virtual simulations were key in alleviating the anxiety typically associated with initial teaching experiences. The built-in feedback mechanism was particularly effective in offering real-time guidance, helping new teachers navigate classroom management and student interaction with greater confidence. This support system prepared them for the realities of teaching and reduced the stress and apprehension that often hinder effective instruction (Noor, 2024).

On the other hand, TCs with prior teaching experience reported different benefits from virtual simulations. For these seasoned educators, the simulations provided an opportunity to refine their teaching strategies, especially regarding classroom dynamics and the specific needs of ELs. The targeted feedback from coaches was invaluable, allowing experienced TCs to further develop and practice level-based questioning techniques. This personalized approach, which considered the varying proficiency levels of ELs, ensured that instruction was both accessible and sufficiently challenging, promoting a more inclusive and effective learning environment. The findings demonstrate that virtual simulations are a versatile and impactful training tool for teacher candidates, regardless of their prior teaching background. New teachers gain confidence and reduce anxiety through guided practice and feedback, while experienced educators sharpen their ability to meet the diverse needs of ELs, underscoring the simulations' role in improving teaching efficacy for both novice and seasoned teachers (Noor, 2024).

The study's findings bridge the gap between theoretical knowledge and practical implementation, as highlighted by Purmensky (2009), and align with the "in-practice" skills emphasized by Cochran-Smith and Lytle (1999), and Tricarico and Yendol-Hoppey (2012). The research demonstrates that virtual simulations effectively mimic real-life teaching scenarios, equipping teacher candidates for actual classroom interactions with ELs. In the context of teacher preparation, these simulations provide a unique dialogic engagement where TCs, as novice teachers, interact with simulated ELs while being guided by expert coaches.

This approach leverages Vygotsky's ZPD, where TCs are not only helping simulated ELs within their ZPD but are themselves receiving support from the coach within their own ZPD. This dual-level engagement showcases the application of the ZPD concept at both the learner and teacher level, fostering a dynamic learning environment through real-time instructional conversations and leveled questioning. As a result, teaching strategies and understanding are continuously refined, reflecting a seamless integration of theory into practice (Noor, 2024).

Teacher candidates reported that these simulation experiences helped them recognize the effectiveness of specific teaching techniques, particularly the need to adjust language to match learners' proficiency levels. Additionally, they noted significant improvements in their psychological preparedness and confidence, which are essential for managing complex classroom interactions. The study further reveals that virtual simulations reduce first-time teaching anxiety, enhance classroom management, and improve student engagement, leaving TCs feeling better equipped to handle the dynamics of real-world classrooms. Overall, the findings underscore the transformative impact of virtual simulations in developing TCs who are knowledgeable, confident and adaptable. This preparation enables them to meet the challenges of diverse educational environments with increased efficacy, ensuring they are ready to foster inclusive and engaging learning experiences for their students (Noor, 2024; Regalla et al., 2016).

The findings of this theme, supported by a comprehensive literature review, examine the impact of virtual simulations on teacher preparation. This study's findings align with Mendez's (2021) research, as both emphasize the critical role of virtual simulations in teacher education, particularly through the lens of the ZPD. Both studies highlight a dialogic learning experience where TCs are guided by expert coaches to effectively engage with simulated English Learners within their ZPD, thereby enhancing their adaptive communication strategies. This dual-level support—targeting both ELs within their learning zone and TCs within their developmental zone—demonstrates the significant impact of virtual simulations in bridging the gap between theory and practice in teaching ELs. The study effectively addresses a crucial gap in teacher education research, showing that TCs can transfer the preparedness and confidence gained from virtual simulation experiences into successful real-life teaching scenarios with ELs. By utilizing the ZPD framework to create a dialogic learning environment, TCs develop adaptive communication strategies that facilitate a smooth transition of skills from virtual to physical classrooms. This synergy between theory and practice highlights the transformative potential of virtual simulations in improving the efficacy of teaching ELs, underscoring their value as a powerful tool in teacher preparation programs.

The study's findings on teacher candidates enhanced preparedness and confidence closely aligned with existing research emphasizing the transformative impact of virtual simulations on teacher education. Prior studies (Dismuke et al., 2019; Ledger et al., 2019; Regalla et al., 2016) collectively demonstrate that simulated teaching environments—such as TeachLivE™—foster both self-efficacy and pedagogical readiness by providing immediate feedback, opportunities for reflection, and repeated practice in a low-risk setting. Across these works, simulations are shown to reduce instructional anxiety, strengthen professional identity, and improve candidates' ability to transfer theory into practice.

Building on this consensus, the current study extends the discussion by illustrating how these confidence gains manifest specifically in the context of real English Learners instruction. Unlike earlier research that focused broadly on the impact of virtual simulation based on TCs after

simulation experience, this study highlights how TCs can apply their theoretical knowledge in real life classroom teaching with real ELs—such as rephrasing questions, using multimodal scaffolds, and differentiating feedback—through iterative practice with avatar ELs. These nuances highlight the implication of virtual simulations that support future educators with both technical competence and psychological readiness while advancing institutional sustainability and equity in higher education.

In addition, the findings from Ledger et al. (2019) provide strong support for the theme of enhanced preparation and confidence among teacher candidates using virtual simulations, as observed in this study. Their research highlights the effectiveness of virtual simulation environments like TeachLivE™ in fostering a deeper understanding and application of teaching strategies, as well as self-efficacy. Ledger et al.'s (2019) conclusions align with this study's findings, showing that virtual simulations significantly contribute to teacher candidates' psychological preparedness and confidence, particularly in their communication with ELs. Ledger et al. (2019) also identified a preference for direct instruction and questioning methods among preservice teachers, coupled with an emphasis on reflective practice. This mirrors the development of both technical and soft skills observed in this study, with soft skills such as adaptability, empathy, and patience being crucial for effective teaching in linguistically diverse classrooms. Additionally, the positive impact of virtual simulations on teaching confidence, as explored by Ledger et al. (2019), supports this study's findings that such experiences can reduce first-time teaching anxiety, strengthen classroom management skills, and enhance student engagement. The findings from both studies reinforce the transformative potential of virtual simulations in teacher preparation, validating that these digital platforms are essential in equipping teacher candidates with the confidence and competencies necessary to manage the complexities of real-world educational environments with diverse student populations. The alignment between this study and Ledger et al. (2019) underscores the value of virtual simulations like TeachLivE in preparing teacher candidates for effective, adaptable, and empathetic teaching in varied classroom settings.

Moreover, the study's findings on the technical and psychological readiness of TCs for real-life interactions with ELs align with Regalla et al.'s (2016) observations on the transformation of teaching strategies and confidence following virtual simulation experiences. The study emphasizes the critical role of immediate feedback in virtual simulations, which echoes Regalla et al.'s (2016) conclusion that TeachLivE provides TCs with real-time feedback from a coach. This feedback helps candidates assess their teaching abilities and identify areas for improvement. The immediate feedback mechanism is vital to the iterative process of skill development, enabling TCs to refine their teaching approaches based on direct observations and expert guidance.

Additionally, Yilmaz et al. (2022) found that virtual simulations are highly effective in preparing TCs for diverse classroom environments. This study corroborates those findings, demonstrating that virtual simulations not only replicate real-life teaching scenarios but also effectively prepare teacher candidates for actual classroom interactions with ELs. This preparation encompasses both technical skills, such as teaching methods, and psychological readiness, including the development of confidence and resilience for navigating the complexities of real-world classroom dynamics. Together, these findings affirm the powerful role of virtual simulations in enhancing both the competence and confidence of TCs as they enter diverse educational settings.

However, Regalla et al. (2016) found in their research that although TCs initially reported a high sense of self-efficacy in pre-simulation surveys, their practical skills were more critically assessed during the TeachLivE experience. This discrepancy revealed the limitations of theoretical knowledge alone. Despite the high self-efficacy ratings before the simulation, TCs' reflections after the simulation highlighted the challenges, they faced in applying this knowledge within the virtual environment, emphasizing the difficulty of translating theory into practice. The study underscored the need for further investigation into whether the self-efficacy and confidence developed through virtual simulation experiences translate into successful performance in real-life classroom settings,

particularly with English Learners—the ultimate objective of teacher training. Regalla et al. (2016) specifically called for research to examine the extent to which TCs can apply the theoretical knowledge and skills acquired through virtual simulations to actual classroom teaching, addressing a critical gap in understanding how well virtual preparation equips TCs for real-world teaching.

Addressing this critical gap, the study found that teacher candidates were able to successfully transfer the confidence and self-efficacy gained from virtual simulation experiences to real-life teaching scenarios with ELs. This outcome highlights the value of integrating virtual simulations into teacher preparation programs and emphasizes the importance of these technologies in effectively bridging the divide between theoretical learning and practical application in education. The findings affirm that virtual simulations play a pivotal role in equipping teacher candidates with the necessary skills and psychological readiness to navigate the complexities of real-world classroom dynamics.

Overall, this study demonstrates the critical role that virtual simulations play in preparing TCs for the complexities of real-world teaching, particularly in classrooms with ELs. The findings suggest that integrating virtual simulations into teacher preparation programs can significantly enhance the psychological readiness and confidence of TCs, ensuring they are better equipped to meet the challenges of diverse educational environments.

8. Limitations

While the study demonstrates the effectiveness of virtual simulations in enhancing teacher candidates' preparedness and confidence, its scope was limited to a small, purposively selected sample of participants. This relatively small cohort restricts the generalizability of the findings to broader teacher education contexts. However, within the framework of qualitative inquiry, such a focused sample enabled the collection of rich, in-depth data that illuminate the nuanced experiences, reflections, and evolving practices of teacher candidates engaging with virtual simulation technology. Rather than seeking statistical representativeness, the study aimed to explore emerging pedagogical practices and the ways in which simulation-based training informs teacher cognition and behavior when working with English Learners. The findings should therefore be interpreted as exploratory yet meaningful contributions to understanding how virtual simulations may shape future directions in teacher preparation, research and practice.

9. Conclusion

This study highlights the transformative role of virtual simulations, such as TeachLivE™, in reimagining teacher education for linguistically diverse classrooms. By immersing teacher candidates in dynamic, feedback-rich environments, virtual simulations bridge the gap between theory and practice, fostering both technical proficiency and psychological preparedness. Teacher candidates developed adaptive questioning, differentiated scaffolding, and intercultural communication skills that enhanced their readiness to teach English Learners effectively.

Thus, this research demonstrates how TeachLivE™ redefines teacher preparation as a context-responsive and inclusive pedagogy. The simulation environment allows teacher candidates to engage with culturally and linguistically diverse avatar students, encouraging reflexivity, empathy, and adaptive instruction grounded in real classroom challenges. Moreover, TeachLivE™ exemplifies a sustainable model of pedagogical innovation—one that reduces logistical and ethical barriers in field placements while expanding equitable access to experiential learning.

By situating virtual simulations within the broader global movement to transform education toward SDG 4—ensuring inclusive and equitable quality education and lifelong learning opportunities for all (UNESCO, 2024), this study underscores the potential of technology-enhanced pedagogies to reshape teacher education as both a locally grounded and globally informed practice. Ultimately, TeachLivE™ offers a model for reimagining teacher preparation that is socially just, ethically responsive, and pedagogically future-oriented.

10. Implications

The findings underscore the necessity of integrating virtual simulations into teacher education, particularly for preparing candidates to work with diverse student populations such as English Learners. These simulations provide a versatile and sustainable platform for practicing instructional strategies in a supportive, feedback-rich environment, thereby strengthening classroom management and fostering meaningful student engagement. Beyond technical competency, the study highlights how virtual simulations cultivate essential soft skills—including adaptability, empathy, and confidence—that are critical for teaching in inclusive and equitable classrooms. This aligns with Sustainable Development Goal 4, which calls for innovative practices that ensure quality education for all learners, especially those from marginalized and linguistically diverse backgrounds (UNESCO, 2024). By reducing reliance on limited practicum placements and offering scalable, high-quality training opportunities, virtual simulations support institutional sustainability while advancing teacher preparation programs. Ultimately, this approach equips teacher candidates with the psychological readiness and pedagogical expertise needed to navigate complex, real-world classroom environments and to contribute to more inclusive, resilient, and globally responsive education systems.

11. Further Research

Future studies could explore the long-term impacts of virtual simulations on teacher performance and student outcomes in real-world settings. Expanding the research to include a larger, more diverse sample of TCs across various simulation platforms would also provide more comprehensive insights into the generalizability of the findings. Additionally, investigating how virtual simulations could be tailored to support TCs working with other student demographics, such as students with disabilities, could broaden the application of these tools in teacher preparation programs. Finally, further research could examine the specific elements of virtual simulations that most effectively enhance psychological readiness and teaching confidence, offering insights into how to optimize these platforms for teacher training.

Declaration of Interest: The author declares no competing interests related to this study.

Data Availability: The data that support the findings of this study are available from the corresponding author upon reasonable request. Restrictions apply due to privacy.

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