

Reimagining Teaching English to Young Learners through the Metaverse: A Study of Pre-Service ELT Teachers' Professional Development

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ABSTRACT : The rapid development of immersive technologies has introduced new possibilities for language teacher education, yet existing research has predominantly focused on learner outcomes rather than teacher development. Addressing this gap, this qualitative case study investigates how a semester-long metaverse-integrated Teaching English to Young Learners (TEYL) course mediates the professional development of pre-service ELT teachers. Grounded in an interpretivist paradigm, data were collected from 48 third-year pre-service teachers through reflective journals, focus group interviews, instructional artifacts, and field notes, and analyzed using thematic analysis. The findings reveal a multidimensional process of professional transformation characterized by four interrelated themes: epistemic reframing of pedagogy, negotiation of digitally mediated teacher identity, development of pedagogical self-efficacy, and emergence of critical technological awareness. The results indicate that immersive environments function not merely as technological tools but as mediational pedagogical spaces that enable experiential learning, reflective practice, and identity reconstruction. By foregrounding teacher cognition and identity development, the study extends existing metaverse research beyond learner-centered perspectives and demonstrates how immersive environments can support transformative professional learning in teacher education. The findings also highlight the importance of pedagogical alignment, critical digital literacy, and contextual awareness in the effective integration of immersive technologies.

KEYWORDS: *Metaverse; Teacher cognition; Professional identity; Pre-service teachers; Teaching English to Young Learners (TEYL)*

I. INTRODUCTION

The advancement of immersive digital technologies has significantly reshaped educational practices, enabling learning experiences that extend beyond the constraints of physical classrooms. Among these innovations, the metaverse—conceptualized as a persistent, shared, and embodied virtual environment—has emerged as a promising space for experiential, interactive, and socially mediated learning (Mystakidis, 2022; Hwang & Chien, 2022). Grounded in sociocultural and constructivist learning theories, metaverse environments facilitate participation through avatars, multimodal interaction, and spatial engagement, thereby supporting meaning-making as a socially situated process (Vygotsky, 1978; Wenger, 1998).

In the field of English Language Teaching (ELT), immersive technologies have demonstrated considerable potential in enhancing learner engagement, communicative interaction, and contextualized language use by simulating authentic environments (Dhimolea et al., 2022; Chen et al., 2021). Empirical studies further indicate that metaverse-based language learning can positively influence motivation, vocabulary retention, and learners' sense of presence (Çelik & Baturay, 2024). However, despite this growing body of research, existing studies have predominantly focused on learner outcomes, leaving the implications of immersive environments for teacher education relatively underexplored.

Effective technology integration in teacher education extends beyond technical competence and requires the development of pedagogical reasoning, reflective practice, and professional identity (Tondeur et al., 2012; Johnson, 2009). Research on teacher cognition emphasizes that teachers' beliefs and instructional practices are shaped by prior experiences and evolve through situated engagement and reflective processes (Borg, 2003, 2015). Similarly, professional identity is understood as a dynamic and socially constructed process emerging through participation in communities of practice (Beauchamp & Thomas, 2009; Wenger, 1998). In this sense, immersive environments may function as mediational spaces where pre-service teachers experiment with pedagogical roles and reconstruct their professional identities.

This issue is particularly salient in Teaching English to Young Learners (TEYL), which requires developmentally appropriate, experiential, and child-centered pedagogies (Cameron, 2001; Pinter, 2017). While the affordances of immersive environments appear conceptually aligned with TEYL principles—such as

storytelling, play-based learning, and multimodal interaction—there remains limited qualitative research examining how pre-service ELT teachers reinterpret these principles within metaverse-based contexts.

This study contributes to the emerging literature on immersive technologies in language teacher education in three significant ways. First, it extends existing metaverse research beyond learner-centered outcomes by examining how immersive environments influence pre-service teachers' pedagogical beliefs and instructional decision-making. Second, it conceptualizes the metaverse as a mediational space that supports professional identity development and reflective practice within a sociocultural framework. Third, it bridges the gap between Teaching English to Young Learners (TEYL) pedagogy and immersive instructional design by demonstrating how experiential learning principles can be reinterpreted in digitally mediated environments. In doing so, the study offers both theoretical and pedagogical insights into the integration of immersive technologies in language teacher education.

1.1 Purpose of the Study

Grounded in an interpretivist paradigm, this qualitative case study aims to investigate how a semester-long metaverse-integrated Teaching English to Young Learners (TEYL) course mediates the professional development of pre-service ELT teachers (Creswell & Poth, 2018; Schwandt, 2014). Rather than evaluating the technological effectiveness of immersive environments, the study seeks to examine the interpretive processes through which pre-service teachers reconstruct their pedagogical beliefs, instructional practices, and emerging professional identities within digitally mediated learning contexts (Borg, 2003; Johnson & Golombek, 2016).

Specifically, the study conceptualizes the metaverse as a mediational space that enables experiential learning, reflective practice, and identity negotiation, grounded in sociocultural theory (Vygotsky, 1978; Wenger, 1998). By foregrounding teacher cognition and identity development, the research aims to provide an in-depth understanding of how immersive pedagogical experiences contribute to transformative professional learning in language teacher education (Beauchamp & Thomas, 2009; Johnson, 2009).

The following research questions are designed to systematically investigate how metaverse-integrated pedagogical experiences mediate the transformation of teacher cognition, instructional decision-making, and professional identity development in pre-service ELT teachers:

1. How does a metaverse-integrated TEYL course influence pre-service ELT teachers' pedagogical beliefs?
2. How do immersive lesson design and microteaching practices shape instructional decision-making?
3. How does participation in metaverse-based teaching activities contribute to professional identity development?
4. What affordances and constraints do pre-service teachers perceive in immersive TEYL contexts?

II. LITERATURE REVIEW

2.1 Metaverse and Immersive Technologies in Language Education

The metaverse has emerged as an extension of VR and virtual worlds, enabling embodied interaction and social presence in persistent digital environments (Mystakidis, 2022). In language education, immersive environments facilitate contextualized communication, experiential learning, and multimodal engagement (Dhimolea et al., 2022). Systematic reviews confirm positive effects on engagement and vocabulary learning, though most studies remain learner-centered (Xiaodi et al., 2024). The concept of the metaverse has recently emerged as an extension of virtual reality (VR), augmented reality (AR), and persistent virtual world platforms, integrating immersive interaction, social presence, and digital embodiment within interconnected Three Dimensional (3D) environments (Mystakidis, 2022). In educational contexts, the metaverse is increasingly conceptualized not merely as a technological tool but as a socio-technical ecosystem that facilitates experiential, collaborative, and embodied learning (Hwang & Chien, 2022; Dwivedi et al., 2022).

Recent systematic reviews highlight the growing application of immersive environments in second language education, emphasizing their capacity to increase engagement, reduce anxiety, and support authentic language use (Xiaodi et al., 2024; Dhimolea et al., 2022). Dhimolea, et al. (2022) argue that immersive virtual environments enable contextualized communicative interaction, allowing learners to practice language in simulated real-world settings. Similarly, Chen et al. (2021) found that VR-supported language learning enhances multimodal engagement and situational understanding.

Empirical studies conducted within metaverse-based learning contexts further suggest positive outcomes in vocabulary retention, learner engagement, and sense of presence. For instance, Çelik and Baturay (2024) demonstrated that Metaverse-Based Language Teaching (MBLT) significantly improved L2 vocabulary learning and engagement among secondary school students. Despite these advancements, the majority of metaverse research remains learner-centered. Studies often focus on measurable outcomes such as vocabulary gains, technological acceptance, or motivation (Hwang & Lee, 2024), while relatively little attention is given to how immersive environments shape teacher cognition, pedagogical reasoning, and professional development within teacher education programs.

2.2 Technology Integration in Teacher Education

Technology integration in teacher education has been widely studied, yet research consistently demonstrates that effective integration requires more than technical competence; it necessitates pedagogical transformation and critical engagement with digital tools (Tondeur et al., 2012; Scherer et al., 2021). Within the field of Computer-Assisted Language Learning (CALL), scholars have long emphasized the importance of aligning technology use with pedagogical objectives rather than treating it as an end in itself (Chapelle, 2001; Hubbard, 2008).

Chun (2003) highlights that the effectiveness of technology in language learning depends on its capacity to support meaningful interaction, authentic communication, and learner engagement. Similarly, Hubbard (2008) argues that teacher education programs must prepare future language teachers not only to use digital tools but also to critically evaluate their pedagogical affordances and limitations. Extending this perspective, Stockwell (2013) emphasizes that technology integration in language education should be guided by principled pedagogical decision-making, taking into account learner needs, contextual constraints, and task design.

The Technological Pedagogical Content Knowledge (TPACK) framework further underscores the importance of integrating technological, pedagogical, and content knowledge domains (Mishra & Koehler, 2006). However, recent scholarship suggests that teacher education should move beyond competence-based models toward reflective and identity-oriented approaches (Fawns, 2022). In this regard, immersive and design-based learning experiences have been shown to support deeper pedagogical reflection, creativity, and professional confidence among pre-service teachers (Lee & Hwang, 2022).

Moreover, teacher professional development is increasingly conceptualized as a socially constructed and identity-based process (Johnson & Golombek, 2016). From a CALL perspective, this implies that digital environments—including immersive and metaverse contexts—should not only be viewed as instructional tools but also as spaces that shape teachers' beliefs, agency, and professional identities. However, empirical research examining how such environments mediate identity formation in ELT teacher education remains limited.

2.3 Teacher Cognition and Professional Identity

Teacher cognition encompasses beliefs, knowledge, and assumptions shaping instructional practice (Borg, 2003). These cognitions evolve through experience and reflection (Johnson & Golombek, 2016). Professional identity is similarly dynamic, constructed through participation in communities of practice and negotiation of professional roles (Beauchamp & Thomas, 2009; Wenger, 1998). Digital environments may intensify identity negotiation by reshaping authority, agency, and instructional presence (Liontas, 2020 & Veletsianos, 2021).

Teacher cognition research has established that teachers' beliefs, knowledge systems, and contextual experiences shape their instructional practices (Borg, 2003). In language education, cognition is dynamic and evolves through experiential practice, reflection, and social interaction (Johnson, 2009). Pre-service teachers often enter teacher education programs with established beliefs shaped by their prior learning experiences, which may be resistant to change (Borg, 2015).

Professional identity, closely intertwined with cognition, is constructed through participation in communities of practice and engagement in authentic teaching experiences (Wenger, 1998). Beauchamp and Thomas (2009) argue that identity formation in teacher education involves ongoing negotiation between personal beliefs and professional expectations. In digital contexts, identity negotiation becomes more complex, as teachers must position themselves within technologically mediated environments (Liontas, 2020 & Veletsianos, 2021).

Recent studies suggest that immersive and simulation-based environments may function as mediational spaces where pre-service teachers experiment with professional roles and instructional strategies in low-risk contexts (Lee & Hwang, 2022). Such environments may promote reflective practice and identity reconstruction, yet further qualitative investigation is needed to understand these processes in depth.

2.4 Teaching English to Young Learners (TEYL) and Experiential Pedagogy

Teaching English to Young Learners requires developmentally appropriate, interactive, and experiential pedagogical approaches (Pinter, 2017). Young learners benefit from storytelling, movement-based activities, play, and contextualized language exposure rather than abstract, grammar-focused instruction (Cameron, 2001). Experiential learning theory (Kolb, 1984) emphasizes learning through active experimentation and reflective observation, principles that align closely with TEYL practices.

Immersive environments may provide spatial and narrative affordances that support experiential pedagogy. For instance, metaverse environments allow teachers to create virtual story worlds, interactive role-play scenarios, and multimodal tasks that mirror child-centered instructional strategies (Dhimolea et al., 2022). However, while immersive technology appears conceptually aligned with TEYL pedagogy, limited research has examined how pre-service ELT teachers reinterpret TEYL principles within immersive contexts.

TEYL pedagogy emphasizes experiential, interactive, and developmentally appropriate practices (Cameron, 2001; Pinter, 2017). Experiential learning theory (Kolb, 1984) aligns closely with TEYL principles and with immersive environments that support storytelling, role-play, and embodied interaction.

2.5 Research Gap

Despite growing interest in immersive technologies, limited qualitative research examines their role in pre-service teacher professional development, particularly within TEYL contexts. This study addresses this gap by foregrounding teacher cognition and identity formation. Although recent research confirms the pedagogical potential of immersive environments for language learning (Çelik & Baturay, 2024; Dhimolea et al., 2022) and highlights the importance of technology integration in teacher education (Scherer et al., 2021), there remains a significant gap in understanding how metaverse-based learning experiences influence pre-service teachers' professional development—particularly within TEYL contexts.

Most studies prioritize learner outcomes or technological acceptance (Hwang & Lee, 2024), leaving unexplored the interpretive processes through which pre-service teachers reconstruct their pedagogical beliefs and identities. Given that professional development is fundamentally a meaning-making and identity-shaping process (Johnson & Golombek, 2016), qualitative inquiry is required to examine how immersive environments mediate this transformation.

Therefore, this study seeks to contribute to the literature by investigating the professional development of 48 third-year pre-service ELT teachers enrolled in a Teaching English to Young Learners course, focusing on how a semester-long metaverse-integrated intervention reshapes their pedagogical beliefs, instructional design practices, and emerging professional identities.

III. METHODOLOGY

3.1 Research Paradigm

This study is grounded in an interpretivist research paradigm, which assumes that reality is socially constructed and that knowledge is generated through individuals' subjective interpretations of their lived experiences (Creswell & Poth, 2018; Schwandt, 2014). Within this epistemological stance, teacher professional development is conceptualized not as a fixed or measurable outcome but as a dynamic, context-dependent process of meaning-making shaped through reflection, interaction, and situated engagement (Johnson & Golombek, 2016).

Accordingly, the present study does not seek to evaluate the technological effectiveness of metaverse environments through quantifiable indicators. Instead, it aims to explore how pre-service ELT teachers interpret, negotiate, and reconstruct their pedagogical beliefs, instructional practices, and emerging professional identities within a metaverse-integrated Teaching English to Young Learners (TEYL) course. Knowledge is therefore understood as co-constructed through dialogic interaction between participants and researcher. To ensure reflexivity, the instructor-researcher systematically documented positionality, assumptions, and analytic decisions through reflective memos (Lincoln & Guba, 1985).

3.2 Research Design

A qualitative case study design was adopted to generate an in-depth, contextually grounded understanding of how pre-service ELT teachers experience and interpret immersive pedagogy within a metaverse-integrated learning environment. Case study methodology is particularly appropriate for investigating complex educational phenomena situated within real-life contexts, as it enables a holistic and nuanced exploration of participants' meaning-making processes (Yin, 2018; Tisdell & Merriam, 2025).

The case was deliberately bounded by a specific institutional and pedagogical context, encompassing a single ELT department at a private university, a compulsory Teaching English to Young Learners (TEYL) course, a defined instructional period of one academic semester (14 weeks), and a cohort of third-year pre-service ELT teachers enrolled in the course. This bounded system provided a coherent and contextually rich setting for examining how immersive pedagogical experiences mediate belief transformation, instructional reasoning, and professional identity negotiation.

Rather than seeking statistical generalization, the study prioritizes analytical depth and theoretical insight, aiming to illuminate the processes through which pre-service teachers construct, reinterpret, and negotiate their pedagogical understandings within a digitally mediated educational context.

3.3 Context and Participants

The study was conducted during a spring semester within a compulsory TEYL course in an ELT undergraduate program. The course emphasizes developmentally appropriate pedagogy, experiential learning, storytelling, materials adaptation, and classroom management strategies for young learners (Cameron, 2001; Pinter, 2017).

The participants consisted of 48 third-year pre-service ELT teachers enrolled in the course. Participation was voluntary, informed consent was obtained, and involvement in the study had no impact on course assessment. The cohort had limited prior exposure to immersive technologies and no formal experience with metaverse-based teaching.

The sample size is considered appropriate for qualitative case study research, which prioritizes depth, contextual richness, and interpretive understanding over statistical generalizability (Creswell & Poth, 2018; Tisdell & Merriam, 2025). Consistent with purposive sampling strategies, participants represented a bounded and relatively homogeneous group, enabling an in-depth exploration of shared experiences and meaning-making processes (Patton, 2015).

In line with research on teacher cognition, many participants initially held transmission-oriented or textbook-centered beliefs about teaching young learners (Borg, 2003). The intervention was therefore designed to create opportunities for experiential reframing of these beliefs through immersive pedagogical engagement.

3.4 Semester-Long Intervention Design

The intervention spanned 14 weeks and followed a structured, design-based and experiential professional development model. Design-based approaches in teacher education promote active engagement, reflective practice, and situated pedagogical experimentation (Tondeur et al., 2012).

The intervention was organized into four interconnected phases:

Phase 1: Pedagogical Grounding (Weeks 1–3): Participants revisited foundational TEYL principles, including developmentally appropriate practice, experiential and play-based learning, multimodal storytelling, and child-centered interaction. This phase encouraged critical reflection on prior textbook-oriented teaching beliefs.

Phase 2: Immersive Pedagogical Orientation (Weeks 4–5): Participants were introduced to the pedagogical affordances of immersive environments, including digital embodiment, avatar-mediated interaction, and spatial presence (Mystakidis, 2022). Hands-on exploration sessions enabled participants to critically evaluate immersive environments as pedagogical spaces rather than purely technological tools.

Phase 3: Collaborative Metaverse-Based Lesson Design (Weeks 6–10): Working in small groups, participants designed immersive TEYL lessons incorporating story-based environments, gamified vocabulary tasks, avatar-mediated role-play, and scaffolded interaction. This phase was grounded in experiential learning theory, emphasizing active experimentation and reflective observation (Kolb, 1984).

Phase 4: Microteaching and Reflective Reconstruction (Weeks 11–14): Participants implemented their lessons through metaverse-based microteaching sessions, followed by peer feedback, guided reflection, and structured journaling. This phase functioned as a mediational space for identity negotiation and pedagogical reframing (Beauchamp & Thomas, 2009; Wenger, 1998).

3.5 Data Collection

Multiple qualitative data sources were employed to ensure triangulation and enhance analytical depth (Denzin, 2012).

Reflective Journals: Participants submitted weekly reflective journals focusing on belief transformation, instructional reasoning, emotional experiences, identity development, and perceived affordances and constraints. Reflective writing is recognized as a key tool for fostering teacher cognition and professional growth (Johnson & Golombek, 2016).

Semi-Structured Focus Group Interviews: Six focus group interviews (8 participants each) were conducted at the end of the semester. Interviews explored belief transformation, instructional design, identity negotiation, and perceived challenges. Probing techniques were used to elicit depth and clarification (Kvale & Brinkmann, 2009).

Instructional Artifacts: Artifacts included lesson plans, immersive environment designs, activity scripts, and microteaching recordings. These provided insight into pedagogical reasoning beyond self-reported data (Tisdell & Merriam, 2025).

Instructor Field Notes: Field notes documented classroom dynamics, emotional engagement, interaction patterns, and observed pedagogical shifts, supporting contextual interpretation and triangulation (Lincoln & Guba, 1985).

3.6 Data Analysis

Data were analyzed using thematic analysis following the six-phase framework proposed by Braun and Clarke (2006), which enables systematic identification, organization, and interpretation of patterns across qualitative datasets. The analysis was conducted iteratively and recursively, allowing for continuous movement between data, codes, and emerging interpretations. In the first phase, all data sources—including reflective journals, focus group interview transcripts, instructional artifacts, and field notes—were read multiple times to achieve deep familiarization with the dataset. During this stage, initial analytic memos were recorded to capture preliminary insights and emerging patterns. In the second phase, open coding was conducted inductively, with codes generated directly from participants' narratives rather than based on predefined categories. Coding focused

on capturing participants' meanings, experiences, and interpretations related to pedagogical beliefs, instructional practices, and identity development. In the third phase, codes were systematically compared and grouped into higher-order conceptual categories through constant comparison. These categories were then refined and organized into candidate themes representing recurring patterns across the dataset, such as pedagogical reframing, identity transformation, and technological tension. In the fourth and fifth phases, themes were reviewed, refined, and defined to ensure internal coherence and distinctiveness. This process involved revisiting the dataset to confirm that themes accurately represented participants' experiences and were grounded in sufficient supporting evidence. Finally, in the sixth phase, themes were synthesized into an interpretive narrative that explains the relationships between pedagogical transformation, identity negotiation, and immersive learning experiences within the metaverse-integrated TEYL context.

To enhance trustworthiness, several strategies were employed (Lincoln & Guba, 1985). Member checking was conducted by sharing preliminary interpretations with participants to confirm credibility. Peer debriefing sessions were held with colleagues to challenge analytic decisions and reduce researcher bias. Thick description was used to ensure contextual richness and transferability, while reflexive memoing allowed the researcher to critically examine positionality and maintain transparency throughout the analytic process.

IV. FINDINGS

Thematic analysis of multiple qualitative data sources—including reflective journals, focus group interviews, instructional artifacts, and field notes revealed four interrelated themes that collectively illustrate a dynamic and developmental process of professional learning. Rather than representing isolated categories, these themes reflect a progressive trajectory through which pre-service ELT teachers reinterpreted pedagogical knowledge, negotiated professional identities, and developed critical awareness within a metaverse-integrated TEYL context.

Epistemic Reframing of TEYL Pedagogy: From Transmission to Experiential Meaning-Making: A central finding of the study was a significant epistemic shift in participants' understanding of effective TEYL pedagogy. At the outset of the course, many participants conceptualized teaching as the structured delivery of textbook-based content. However, engagement with immersive lesson design disrupted these pre-existing beliefs and prompted a reconceptualization of teaching as the facilitation of meaningful, experience-based learning.

Participants increasingly emphasized the importance of contextualized, embodied, and interactive language use, positioning learning as a process of engagement rather than repetition. As one participant noted, "*children need to experience the language, not just repeat it*" (P12, Focus Group). Similarly, reflective accounts highlighted the perceived limitations of static instructional materials, with participants describing textbooks as "flat" compared to the dynamic affordances of immersive environments (P27, Reflective Journal). This epistemic reframing was also evident in instructional artifacts. Early lesson designs were characterized by vocabulary lists and controlled practice activities, whereas later designs incorporated narrative-driven environments, movement-based interaction, avatar-mediated role-play, and problem-solving tasks. These changes indicate a shift from content transmission toward experiential meaning-making, suggesting that immersive environments functioned as mediational spaces that enabled participants to operationalize abstract pedagogical principles in practice.

Negotiation of Digitally Mediated Teacher Identity: A second major theme concerned the emergence and negotiation of a digitally mediated professional identity. Participation in immersive teaching practices prompted participants to re-evaluate their roles as future teachers, moving from traditional notions of authority toward more facilitative and design-oriented identities. Participants frequently described a transition from "information provider" to "learning facilitator," emphasizing guidance, interaction, and co-construction of knowledge. One participant explained, "*I felt like I was guiding them through a world, not just teaching*" (P5, Focus Group). Others articulated a developing sense of agency in digital contexts, positioning themselves as creators of learning environments rather than mere implementers of curriculum (P34, Reflective Journal).

Importantly, identity development was not linear or uniformly positive. Alongside feelings of empowerment, participants also expressed uncertainty and vulnerability, particularly in relation to classroom management and technological control. For example, one participant reported, "*managing avatars was stressful... I questioned if I was ready*" (P19, Focus Group). These tensions highlight the complex and negotiated nature of identity formation, suggesting that immersive environments simultaneously expand pedagogical possibilities and challenge established notions of teacher authority. Overall, identity development emerged as a socially situated and emotionally mediated process, shaped through collaborative design, peer interaction, and reflective engagement.

Development of Pedagogical Self-Efficacy and Creative Professional Agency: A third theme concerned the development of pedagogical self-efficacy and increased willingness to engage in creative risk-taking. Across data sources, participants reported growing confidence in their ability to design and implement child-centered, engaging lessons. This development was closely linked to hands-on design and microteaching experiences, which provided opportunities for mastery and experimentation. Participants described a shift from dependency on pre-

existing materials toward greater autonomy and ownership in instructional design. As one participant noted, “*I realized I can create my own materials instead of depending on a book*” (P8, Reflective Journal).

Instructional artifacts further supported this finding. Later lesson designs demonstrated increased complexity, including structured scaffolding, integrated multimodal interaction, and flexible task design. Participants also reported a heightened willingness to experiment with novel pedagogical approaches, indicating the emergence of creative professional agency. As reflected in one journal entry, “*I started taking risks... I wouldn't have tried this in a normal classroom*” (P22, Reflective Journal). These findings suggest that immersive environments not only support skill development but also foster a sense of pedagogical ownership and innovation, enabling pre-service teachers to move beyond prescriptive teaching models.

Emergence of Critical Awareness: Tensions, Constraints, and Pedagogical Alignment: While participants recognized the affordances of immersive pedagogy, they also demonstrated increasing critical awareness of its limitations. This theme highlights a shift from initial enthusiasm toward more nuanced and reflective evaluations of technology integration. Participants frequently reported technological challenges, including technical disruptions and usability concerns, which were perceived as potential barriers to effective teaching. Concerns regarding classroom management in virtual environments were also prominent, with participants describing immersive contexts as “unpredictable” and difficult to control (P37, Reflective Journal). In addition, issues related to accessibility and sustainability were raised, particularly in relation to institutional resources. One participant questioned the feasibility of implementing such approaches in real educational settings, stating, “*I'm not sure if every school has the resources for this*” (P3, Focus Group). Importantly, these reflections did not indicate rejection of immersive pedagogy, but rather a more critical and balanced understanding of its role. Participants increasingly viewed the metaverse as a complementary pedagogical tool that requires careful alignment with instructional goals, learner needs, and contextual constraints.

Synthesis of Findings: A Developmental Trajectory of Professional Transformation: Taken together, the findings reveal a coherent developmental trajectory of professional learning characterized by four interconnected stages: (1) disruption of pre-existing beliefs, (2) experiential pedagogical experimentation, (3) identity negotiation, and (4) emergence of critical professional awareness. This trajectory suggests that the integration of immersive environments does not result in immediate adoption of new practices, but rather initiates a process of gradual pedagogical reinterpretation and identity reconstruction. Pre-service teachers moved from passive acceptance of established teaching models toward active engagement in designing, reflecting on, and critically evaluating their own pedagogical practices.

Consequently, the metaverse functioned not merely as a technological innovation but as a pedagogical catalyst that facilitated reflective practice, creative experimentation, and professional growth, while simultaneously revealing structural and contextual limitations of technology integration.

V. DISCUSSION

The findings of this study demonstrate that a semester-long metaverse-integrated TEYL course operates not merely as a technological intervention, but as a pedagogically transformative and identity-mediating learning environment. The four interrelated themes—epistemic reframing, identity negotiation, pedagogical self-efficacy, and critical awareness—collectively reveal a multidimensional process of professional development that extends beyond skill acquisition toward deeper cognitive and identity transformation.

Pedagogical Reframing and Transformation of Teacher Cognition: The observed shift from textbook-centered instruction to experiential, story-driven pedagogy reflects a fundamental transformation in teacher cognition. In line with Borg's (2003) framework, participants entered the course with pre-existing beliefs shaped by prior schooling experiences, which initially favored structured and transmission-oriented teaching. However, immersive lesson design functioned as a disruptive pedagogical experience, prompting participants to critically reassess these beliefs. This finding supports sociocultural perspectives on teacher learning, which emphasize that cognition evolves through situated practice and reflective engagement (Johnson & Golombek, 2016). The metaverse environment, in this sense, operated as a mediational tool that enabled participants to enact and experience alternative pedagogical approaches, thereby facilitating conceptual change. These results also align with recent research in immersive language learning, which highlights the role of virtual environments in promoting contextualized communication and experiential engagement (Dhimolea et al., 2022; Mystakidis, 2022). However, while previous studies predominantly focus on learner outcomes, such as engagement and vocabulary development (Çelik & Baturay, 2024), the present study extends the literature by demonstrating that immersive environments can reshape teacher pedagogical reasoning, particularly within TEYL contexts.

Identity Negotiation and Digitally Mediated Teacher Selves: A key contribution of this study lies in its examination of professional identity as a dynamic and negotiated construct within immersive environments. Consistent with Beauchamp and Thomas (2009), participants' identity development involved a shift from traditional “content deliverer” roles toward more facilitative, design-oriented, and interaction-focused identities. Immersive microteaching sessions functioned as simulated communities of practice (Wenger, 1998), allowing participants to experiment with new professional roles in a relatively low-risk setting. This finding resonates with

emerging research suggesting that digital and immersive environments can reshape teacher identity by altering perceptions of agency, authority, and instructional presence (Liontas, 2020& Veletsianos, 2021). Importantly, identity development was characterized by both empowerment and tension. Participants reported increased confidence alongside feelings of uncertainty, particularly regarding classroom management and technological control. This duality reflects the complex and non-linear nature of identity negotiation in technology-mediated contexts, supporting the view that professional identity is constructed through ongoing interaction between personal beliefs, contextual constraints, and experiential practice.

Pedagogical Self-Efficacy and Creative Professional Agency: The findings further indicate that immersive pedagogical engagement contributes to the development of pedagogical self-efficacy and creative professional agency. In line with Bandura's (1997) social cognitive theory, participants' involvement in lesson design and microteaching provided authentic mastery experiences, which enhanced their confidence in designing and implementing instructional activities. This finding is consistent with research on design-based teacher education, which suggests that active engagement in pedagogical design fosters both confidence and creativity (Tondeur et al., 2012). Similarly, studies on metaverse-based classroom design report increased self-efficacy and positive attitudes toward technology integration (Hwang & Lee, 2024).

However, the present study extends these findings by demonstrating that self-efficacy development is not limited to technological competence, but is closely tied to pedagogical innovation and ownership. Participants moved beyond reliance on prescribed materials toward more autonomous and creative instructional practices, indicating the emergence of a more agentive and reflective teacher identity.

Critical Awareness and Pedagogical Alignment in Immersive Contexts: While participants acknowledged the affordances of immersive pedagogy, they also demonstrated increasing critical awareness of its limitations. This shift from initial enthusiasm to more nuanced evaluation suggests the development of critical digital literacy, which is essential for effective technology integration. Participants identified challenges related to technological reliability, classroom management, and institutional feasibility, highlighting the importance of contextual factors in shaping pedagogical decisions. These findings align with Scherer et al. (2021), who argue that meaningful technology integration requires alignment between technological tools, pedagogical goals, and contextual constraints. Moreover, the findings resonate with research indicating that immersive environments, while enhancing engagement and presence, do not automatically guarantee deeper social or pedagogical transformation (Çelik & Baturay, 2024). In this study, participants recognized that the metaverse should not be viewed as a replacement for traditional teaching, but rather as a complementary pedagogical space that requires careful scaffolding and instructional alignment.

This study makes three significant contributions to the literature.

First, it extends existing metaverse and VR research beyond learner-centered outcomes by foregrounding teacher professional development. While prior studies emphasize engagement, motivation, and language gains (Çelik & Baturay, 2024; Dhimolea et al., 2022), this study highlights the transformative impact of immersive environments on teacher cognition and identity. Second, the study conceptualizes immersive environments as mediational spaces within a sociocultural framework, demonstrating how such environments facilitate belief transformation and identity reconstruction (Vygotsky, 1978; Johnson & Golombek, 2016). Third, it bridges the gap between TEYL pedagogy and immersive instructional design by illustrating how experiential learning principles (Kolb, 1984) can be operationalized in digitally mediated environments.

The findings suggest that teacher education programs should integrate immersive, design-based learning experiences into TEYL curricula, with a strong emphasis on reflective practice and pedagogical alignment. Rather than focusing solely on technical skills, programs should support the development of critical digital literacy and classroom management strategies in virtual environments. Furthermore, structured scaffolding is needed to help pre-service teachers navigate the complexities of immersive teaching, particularly in relation to interaction management and learner engagement. These findings indicate that immersive technologies are most effective when embedded within pedagogically grounded and critically informed instructional frameworks.

VI. CONCLUSION

This study demonstrates that the integration of metaverse-based pedagogical design into a Teaching English to Young Learners (TEYL) course can foster multidimensional professional development among pre-service ELT teachers. The findings indicate that immersive environments support not only pedagogical innovation but also deeper processes of teacher cognition, identity construction, and reflective practice. Importantly, the metaverse emerged not merely as a technological tool, but as a mediational pedagogical space in which pre-service teachers could actively experiment with instructional approaches, critically reflect on their practices, and reconstruct their pedagogical beliefs. At the same time, the findings highlight that such transformation is neither automatic nor linear; it requires sustained engagement, contextual sensitivity, and alignment between technological affordances and pedagogical goals.

Overall, the study suggests that the value of immersive technologies in language teacher education lies less in their novelty and more in their capacity to facilitate meaningful, experience-based professional learning. By integrating cognition, identity, and practice, immersive environments hold significant potential to support transformative teacher education when embedded within theoretically grounded and pedagogically informed frameworks.

6. Limitations and Suggestions for Future Research

While this study provides important insights into the role of immersive environments in pre-service teacher development, several limitations should be acknowledged. First, the study was conducted within a single institutional context involving one cohort of pre-service ELT teachers. As a qualitative case study, the findings are context-specific and not intended for statistical generalization (Yin, 2018). Future research could adopt multi-site or cross-cultural designs to enhance transferability. Second, the study relied primarily on self-reported data. Although triangulation strengthened credibility (Lincoln & Guba, 1985), participants' responses may have been influenced by social desirability or the novelty effect associated with immersive technologies. Longitudinal studies are needed to examine the sustainability of the observed pedagogical and identity transformations. Third, the study focused on teacher development without directly examining student learning outcomes. Future research could employ mixed-methods or quasi-experimental designs to explore the relationship between teacher transformation and learner achievement in immersive TEYL contexts. Finally, technological and contextual constraints were identified as significant factors shaping participants' experiences. Future studies may investigate the impact of different platforms, access levels, and institutional conditions, as well as explore additional dimensions such as emotional labor, digital well-being, and ethical considerations in immersive teaching (Dwivedi et al., 2022; Mystakidis, 2022).

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