



PRE-SERVICE ELEMENTARY TEACHERS' EXPERIENCES IN VIRTUAL REALITY-BASED MICROTEACHING IN A DEVELOPING TEACHER EDUCATION CONTEXT

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Abstract

This study explores the experiences of pre-service elementary school teachers engaging in virtual reality (VR)-based microteaching within a developing teacher education context. While prior research has focused on the effectiveness and acceptance of VR, limited attention has been given to how immersive environments are subjectively experienced as pedagogical spaces shaping professional identity and reflective practice. To address this gap, this study adopts a qualitative phenomenological approach to examine the lived experiences of pre-service teachers in VR-based microteaching. Five pre-service teachers were purposively selected based on their participation in VR-assisted microteaching sessions. Data were collected through in-depth semi-structured interviews and analyzed using thematic analysis with iterative coding and theme development. The findings reveal four interconnected themes: (1) reconstruction of teaching confidence, (2) immersive experience as a quasi-authentic pedagogical simulation, (3) internalization of pedagogical skills through reflective practice, and (4) negotiation of technological constraints. The results indicate that VR provides a psychologically safe and immersive environment that supports repeated practice, enhances pedagogical awareness, and facilitates reflective learning. However, participants also encountered limitations related to technological constraints and interaction realism, requiring adaptive responses. This study highlights VR-based microteaching as a quasi-authentic pedagogical space that mediates the reconstruction of professional identity through immersive experience, reflective practice, and technological negotiation. These findings suggest that VR holds strong potential to enhance teacher education, particularly in developing contexts, though effective implementation requires adequate infrastructure, pedagogical integration, and institutional support.

Keywords: Virtual Reality, Microteaching, Pre-Service Teachers, Pedagogical Skills, Teacher Education

Abstrak

Penelitian ini mengeksplorasi pengalaman calon guru sekolah dasar dalam mengikuti microteaching berbasis virtual reality (VR) dalam konteks pendidikan guru di negara berkembang. Meskipun penelitian sebelumnya banyak berfokus pada efektivitas dan penerimaan VR, perhatian terhadap bagaimana lingkungan imersif dialami secara subjektif sebagai ruang pedagogis yang membentuk identitas profesional dan praktik reflektif masih terbatas. Untuk mengatasi kesenjangan tersebut, penelitian ini menggunakan pendekatan fenomenologi kualitatif untuk mengkaji pengalaman hidup calon guru dalam microteaching berbasis VR. Sebanyak lima calon guru dipilih secara purposif berdasarkan partisipasi mereka

dalam sesi microteaching berbantuan VR. Data dikumpulkan melalui wawancara mendalam semi-terstruktur dan dianalisis menggunakan analisis tematik dengan proses pengkodean iteratif serta pengembangan tema. Hasil penelitian mengungkap empat tema yang saling terkait: (1) rekonstruksi kepercayaan diri dalam mengajar, (2) pengalaman imersif sebagai simulasi pedagogis semi-otentik, (3) internalisasi keterampilan pedagogis melalui praktik reflektif, dan (4) negosiasi terhadap keterbatasan teknologi. Hasil menunjukkan bahwa VR menyediakan lingkungan belajar yang aman secara psikologis dan imersif, yang mendukung latihan berulang, meningkatkan kesadaran pedagogis, serta memfasilitasi pembelajaran reflektif. Namun, peserta juga menghadapi keterbatasan terkait teknologi dan realisme interaksi yang menuntut respons adaptif. Penelitian ini menegaskan bahwa microteaching berbasis VR dapat dipahami sebagai ruang pedagogis semi-otentik yang memediasi rekonstruksi identitas profesional melalui pengalaman imersif, praktik reflektif, dan negosiasi teknologi. Temuan ini menunjukkan potensi besar VR dalam meningkatkan pendidikan guru, khususnya di konteks berkembang, meskipun implementasinya memerlukan infrastruktur yang memadai, integrasi pedagogis, dan dukungan institusional.

Kata Kunci

Virtual Reality, Microteaching, Pre-Service Teachers, Pedagogical Skills, Teacher Education



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INTRODUCTION

The rapid advancement of digital technologies has significantly transformed educational practices, including teacher education. Among emerging technologies, virtual reality (VR) has gained increasing attention due to its immersive and interactive capabilities, enabling users to experience simulated environments that closely resemble real-world contexts (Radianti et al., 2020; Makransky & Petersen, 2019). In recent years, VR has been widely recognized as a promising tool for enhancing experiential learning, fostering engagement, and supporting the development of complex skills in various educational domains (Adam, 2024).

In the context of teacher education, the integration of VR offers substantial potential to address long-standing challenges in preparing pre-service teachers for real classroom situations. Microteaching, as a core component of teacher training, is designed to develop fundamental pedagogical skills through structured teaching practice in controlled environments (Allen & Ryan, 1969). However, conventional microteaching often lacks authenticity, variability, and opportunities for repeated practice, limiting its effectiveness in simulating the complexity of real classroom interactions (Amobi, 2005; Kavanagh et al., 2017).

To overcome these limitations, VR-based microteaching has emerged as an innovative pedagogical approach that enables pre-service teachers to engage in immersive, interactive, and repeatable teaching simulations. Prior studies have demonstrated that VR can enhance teaching confidence, engagement, and pedagogical competence by providing safe and flexible environments for practice (Makransky et al., 2019; Jensen & Konradsen, 2018). Furthermore, recent research

highlights that VR-based microteaching can significantly improve pedagogical skills among pre-service elementary teachers, particularly in terms of instructional delivery, classroom management, and reflective practice (Meivawati & Meiliza, 2025).

Despite these promising findings, existing studies predominantly focus on measuring the effectiveness of VR in terms of learning outcomes, user satisfaction, or technology acceptance. There remains a limited understanding of how pre-service teachers subjectively experience and interpret VR-based microteaching, particularly from a phenomenological perspective. Understanding these lived experiences is essential, as it provides deeper insights into how pedagogical competence is constructed, negotiated, and internalized within immersive learning environments (Creswell, 2013; Moustakas, 1994).

Moreover, the implementation of VR in teacher education within developing contexts presents unique challenges and opportunities. Issues such as limited technological infrastructure, varying levels of digital literacy, and institutional readiness can influence how VR is adopted and experienced by pre-service teachers (UNESCO, 2021). Consequently, there is a need for context-sensitive research that not only evaluates the effectiveness of VR but also explores how it is experienced and meaningfully integrated into teacher education systems in developing regions.

Addressing these gaps, this study aims to explore the lived experiences of pre-service elementary school teachers in engaging with VR-based microteaching within a developing teacher education context. By employing a qualitative phenomenological approach, this study seeks to uncover how participants perceive, experience, and reflect on their pedagogical practices in immersive virtual environments.

The novelty of this study lies in its effort to conceptualize VR-based microteaching not merely as a technological intervention, but as a *quasi-authentic pedagogical space* that facilitates the reconstruction of teaching confidence, the development of reflective practice, and the negotiation of technological constraints. In doing so, this study contributes to the growing body of literature by offering a deeper, experience-based understanding of VR integration in teacher education, particularly within underexplored developing contexts.

Virtual Reality in Education

Virtual reality (VR) has emerged as a transformative technology in education, offering immersive, interactive, and real-time simulated environments that enable users to experience learning in ways that closely resemble real-world contexts (Radianti et al., 2020). Unlike conventional instructional media, VR facilitates experiential learning by allowing learners to actively engage with dynamic scenarios, thereby promoting deeper cognitive processing and knowledge construction (Makransky & Petersen, 2019). Recent studies have demonstrated that VR enhances learner engagement, motivation, and conceptual understanding by providing opportunities for active exploration and situated learning (Jensen & Konradsen, 2018). Furthermore, VR creates a psychologically safe learning environment in which learners can experiment, make mistakes, and refine their understanding without facing real-world consequences. This characteristic is particularly important in professional training contexts, where risk-free practice is essential for skill development.

Beyond its role as a technological tool, VR is increasingly conceptualized as a pedagogical space that supports experiential, reflective, and adaptive learning processes. As such, its integration into education extends beyond visualization toward enabling authentic learning experiences that bridge the gap between theory and practice.

Microteaching in Teacher Education

Microteaching has long been recognized as a fundamental component of teacher education, designed to develop essential pedagogical skills through structured and simplified teaching practice (Allen & Ryan, 1969). It provides pre-service teachers with opportunities to practice instructional delivery, classroom management, questioning techniques, and feedback strategies in a controlled setting.

However, despite its pedagogical value, traditional microteaching is often criticized for its limited authenticity and restricted variability of classroom scenarios. The simplified nature of microteaching environments may not adequately represent the complexity of real classroom dynamics, including diverse student behaviors, spontaneous interactions, and contextual challenges (Amobi, 2005; Kavanagh et al., 2017). As a result, the transferability of skills acquired through conventional microteaching to real teaching contexts remains a concern. These limitations highlight the need for more advanced and context-rich approaches to microteaching that can better prepare pre-service teachers for the realities of classroom practice.

Integration of Virtual Reality in Microteaching

The integration of VR into microteaching represents a significant innovation in teacher education, offering the potential to transform traditional training practices into immersive and contextually rich learning experiences. Through VR-based microteaching, pre-service teachers can engage in simulated classroom environments that are dynamic, interactive, and responsive, allowing them to practice teaching in more realistic and diverse scenarios.

Empirical evidence suggests that VR-enhanced microteaching can improve teaching confidence, engagement, and reflective capacity by enabling repeated practice and exposure to varied instructional situations (Makransky et al., 2019; Kavanagh et al., 2017). Moreover, VR allows for iterative learning processes, where pre-service teachers can continuously refine their pedagogical strategies based on feedback and self-reflection.

Importantly, recent research by Meivawati and Meiliza (2025) demonstrates that VR-based microteaching significantly contributes to the development of pedagogical skills among pre-service elementary school teachers, particularly in instructional delivery, classroom interaction, and reflective thinking. This finding reinforces the potential of VR not only as a simulation tool but also as a medium for pedagogical transformation.

Nevertheless, while prior studies have emphasized the effectiveness of VR in improving learning outcomes, less attention has been given to how pre-service teachers experience and interpret these immersive environments. This gap underscores the importance of exploring VR-based microteaching from an experiential and phenomenological perspective.

Pedagogical Skills of Pre-Service Teachers

Pedagogical skills constitute a core competency in teacher professionalism, encompassing the ability to design, implement, and evaluate effective learning processes. Shulman's (1987) concept of pedagogical content knowledge (PCK) highlights the integration of subject matter expertise and pedagogical strategies as essential for meaningful teaching. In teacher education, the development of pedagogical skills is closely linked to practical teaching experiences. Activities such as microteaching provide opportunities for pre-service teachers to translate theoretical knowledge into practice. However, the effectiveness of these experiences depends on the authenticity and contextual richness of the learning environment. With the integration of technologies such as VR, the development of pedagogical skills can be enhanced through immersive, situated, and reflective learning experiences. VR enables pre-service teachers to engage in complex teaching scenarios that

foster not only skill acquisition but also adaptive and reflective competencies required in real classroom settings.

Learning Experience from a Phenomenological Perspective

This study is grounded in a phenomenological perspective, which emphasizes the exploration of individuals' lived experiences and the meanings they construct from those experiences (Creswell, 2013). Phenomenology seeks to understand how individuals perceive, interpret, and make sense of their experiences within specific contexts. In the context of VR-based microteaching, a phenomenological approach is particularly relevant for capturing how pre-service teachers experience immersive learning environments and how these experiences influence their pedagogical development. According to Moustakas (1994), phenomenological research aims to uncover the essence of experience through deep reflection on participants' perceptions and interpretations. By adopting this approach, the study moves beyond measuring effectiveness and instead provides a nuanced understanding of how VR functions as an experiential and transformative learning space. This perspective allows for a more comprehensive exploration of the interplay between technology, pedagogy, and individual meaning-making processes in teacher education.

RESEARCH METHOD

Research Design

This study employed a qualitative approach with a phenomenological design to examine the lived experiences of pre-service elementary school teachers engaging in virtual reality (VR)-based microteaching. A qualitative approach was considered appropriate as the study aimed to explore how participants construct meaning from their experiences within an immersive, technology-mediated learning environment, rather than to measure predefined variables or outcomes (Creswell & Poth, 2018; Moustakas, 1994).

Through this approach, the study focused on how pre-service teachers perceived, experienced, and reflected on their pedagogical practices in a virtual environment. Thus, the research was not limited to describing the phenomenon, but also sought to reveal the essence of the learning experiences emerging from VR-based microteaching.

Time and Place of Research

This study was conducted from October to November 2025 at the Microteaching Room of the Primary School Teacher Education Study Program (PGSD), Universitas Sulawesi Barat, Indonesia. The research site was selected due to its relevance to the focus of the study, as it represents a teacher education setting in a developing context that has begun to integrate virtual reality technology into microteaching practice. This setting provided an appropriate context for examining how pre-service teachers experienced the use of innovative technology in pedagogical training.

Research Participants

The participants of this study were selected using purposive sampling, which involves intentionally choosing individuals who meet specific criteria relevant to the research objectives (Palinkas et al., 2015). The study involved five pre-service teachers enrolled in the PGSD program who had participated in VR-based microteaching activities. The inclusion criteria were as follows: (1) active students of the PGSD study program, (2) direct experience in using VR during microteaching activities, and (3) willingness to participate in in-depth interviews. The participants

were selected because they were considered capable of providing rich, reflective, and meaningful accounts of their experiences in VR-based learning. In phenomenological research, a small number of participants is considered appropriate, as the primary objective is to obtain depth and richness of description rather than broad generalization (Creswell & Poth, 2018; Moustakas, 1994).

Research Procedure

The research procedure was carried out systematically in several stages. First, the preparation stage included reviewing relevant literature, formulating the research focus, and developing as well as validating the interview guidelines. Second, data collection was conducted through in-depth interviews with the participants to explore their experiences comprehensively. Third, data analysis was conducted simultaneously with the data collection process in order to identify emerging patterns and preliminary themes from participants' narratives. Finally, the conclusion-drawing stage involved interpreting the meaning of participants' experiences based on the patterns and themes that had been identified. The entire process was conducted recursively and reflectively to ensure the depth, credibility, and accuracy of the findings (Creswell & Poth, 2018).

Instruments and Data Collection Techniques

The data were collected through in-depth interviews using semi-structured interview guidelines. This technique was chosen to explore participants' experiences, perceptions, feelings, and reflections related to the use of virtual reality in microteaching. The semi-structured format provided flexibility for participants to express their views openly while still allowing the researcher to maintain alignment with the research focus. The main research instrument was the interview guide, which was developed based on the objectives of the study and validated through consultation with experts in the field. During the interview process, probing techniques were also employed to elicit deeper and more detailed information from participants.

To enhance the trustworthiness of the data, the study applied several strategies, including source triangulation and member checking. Source triangulation was conducted by comparing responses across participants to identify patterns of convergence and divergence, while member checking was used to confirm that the researcher's interpretations accurately reflected the participants' intended meanings (Flick, 2018). In addition, the researcher maintained reflective awareness throughout the process to minimize bias and preserve analytical rigor.

Data Analysis Technique

The data were analyzed using thematic analysis within a phenomenological framework. The analytical process followed the procedures proposed by Braun and Clarke (2006), which included: (1) familiarization with the data through repeated reading of interview transcripts, (2) generating initial codes to identify meaningful units, (3) searching for broader themes, (4) reviewing and refining the themes, and (5) interpreting the meaning of participants' lived experiences in depth. As illustrated in Figure 1, the thematic analysis process was conducted in an iterative and recursive manner, allowing continuous movement between data, codes, and emerging themes. This cyclical process enabled the researcher to refine interpretations and ensure that the themes accurately represented participants' experiences.

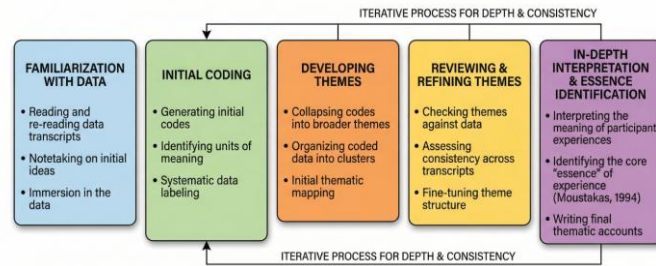


Figure 1. Thematic Analysis Within a Phenomenological Framework

In addition, the analysis was informed by phenomenological principles, particularly the effort to identify the essence of participants’ lived experiences (Moustakas, 1994). This involved not only identifying patterns across the data but also capturing the deeper meanings and subjective interpretations expressed by participants. The analytical process was conducted iteratively, enabling the researcher to engage deeply with the data until a coherent and comprehensive understanding was achieved. By integrating thematic analysis with a phenomenological perspective, this study was able to uncover both recurring patterns and the underlying essence of participants’ experiences in VR-based microteaching.

RESULTS AND DISCUSSION

RESULTS

Familiarization with Data, Initial Coding, and Developing Themes

The data analysis process began with the stage of familiarization, in which the researcher engaged in repeated and in-depth readings of the interview transcripts to develop a comprehensive understanding of participants’ experiences. This stage involved immersion in the data, allowing the researcher not only to interpret explicit statements but also to capture emotional nuances, contextual meanings, and implicit interpretations embedded in participants’ narratives. During this phase, analytic memos were systematically developed as a reflective and interpretive tool to document emerging insights, patterns, and preliminary conceptual linkages. These memos functioned as an intermediary layer between raw data and thematic development, supporting the researcher’s reflexivity and analytical depth throughout the process.

Following this stage, the analysis proceeded to initial coding through a line-by-line examination of the data to identify meaningful units. This inductive process ensured that the codes were grounded in participants’ narratives rather than predetermined theoretical constructs. The resulting codes reflected multiple dimensions of experience, encompassing emotional, cognitive, pedagogical, and technological aspects. For example, the statement “*I feel like I am really teaching, but at the same time I know it is just a simulation*” (P3) was coded as *sense of presence* and *awareness of simulation*, capturing the dual perception of immersion and detachment.

To illustrate the coding process, Table 1 presents selected excerpts along with their corresponding initial codes and categories.

Table 1. Initial Coding Process

Participant Excerpt	Initial Codes	Category
“At first, I felt confused and a bit awkward using VR, but also curious...” (P1)	feeling confused, feeling awkward, curiosity toward VR	Emotional response, initial adaptation
“I feel like I am really teaching, but at the same time I know it is just a simulation.” (P3)	sense of presence, awareness of simulation	Immersive experience, cognitive awareness

“In VR I can try without being afraid of making mistakes.” (P4)	safe learning environment, reduced fear, experimentation	Psychological safety, learning process
“I became more aware of how I teach.” (P5)	self-reflection, awareness	pedagogical Reflective practice
“Sometimes there are technical disturbances.” (P3)	technical limitation	system Technological constraints

The coding process extended beyond surface-level interpretation by grouping codes into broader categories that reflect the multidimensional nature of participants’ experiences. These categories served as the foundation for the development of higher-order themes. The analysis then progressed to theme development, in which patterns across participants’ experiences were identified through iterative comparison and conceptual mapping. This process resulted in four major themes: (1) reconstruction of teaching confidence, (2) immersive experience as a quasi-authentic pedagogical simulation, (3) internalization of pedagogical skills through reflective practice, and (4) negotiation of technological constraints.

Importantly, these themes did not emerge as discrete categories but as interconnected dimensions of a unified experience. For instance, the theme of confidence reconstruction was closely linked to repeated exposure within immersive environments, while reflective practice functioned as a mechanism through which pedagogical awareness was internalized. This interconnectedness indicates that participants’ experiences in VR-based microteaching are dynamic, relational, and continuously evolving rather than static or fragmented.

Figure 3 illustrates the conceptual model of VR-based microteaching experience as a dynamic and interconnected system consisting of four main dimensions: confidence reconstruction, immersive experience, reflective practice, and technological negotiation. These dimensions are not isolated; rather, they interact reciprocally in shaping pre-service teachers’ pedagogical development. Confidence reconstruction emerges through repeated engagement in immersive environments, while immersive experience provides a quasi-authentic space that simulates real classroom situations.

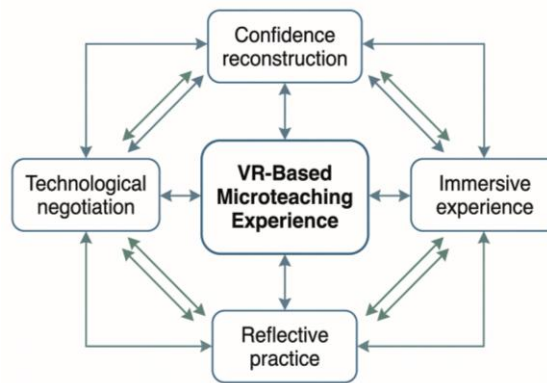


Figure 2. Conceptual Model of VR-Based Microteaching

Reflective practice enables participants to evaluate and internalize their teaching performance, thereby reinforcing pedagogical awareness. At the same time, technological negotiation reflects the participants’ adaptive responses to technical constraints, which also influence the overall learning experience. The bidirectional relationships among these components indicate that VR-based microteaching functions not merely as a technological tool, but as an integrative pedagogical ecosystem that supports experiential, reflective, and adaptive learning processes.

Reconstruction of Teaching Confidence

The findings indicate that participants did not simply report increased confidence but underwent a process of confidence reconstruction through repeated engagement in the virtual environment. VR functioned as a transitional space that mediated the shift from initial uncertainty to emerging teaching readiness. At the early stage, participants experienced hesitation and lack of clarity in structuring their teaching practices. However, as they engaged repeatedly with the VR environment, they began to develop a sense of control and familiarity with instructional processes. One participant explained, “At first I was unsure and confused about where to start, but after several practices in VR, I began to feel more prepared and understood how to manage the lesson” (P2).

Another participant emphasized the role of psychological safety: “In VR, it feels like a safe space to practice, so I can try without being afraid of making mistakes. That’s how my confidence gradually increased” (P4).

These findings suggest that confidence is not an immediate outcome but a gradually constructed process, shaped by iterative practice in a low-risk environment. VR, therefore, acts as a scaffold that supports the development of teaching self-efficacy through experiential engagement.

Immersive Experience as a Quasi-Authentic Pedagogical Simulation

Participants perceived VR as a pedagogical environment that enabled them to embody the role of a teacher through a strong sense of presence. This immersive quality distinguished VR-based microteaching from conventional practices by creating a learning experience that approximates real classroom conditions.

One participant stated, “I felt like I was actually in a classroom. When virtual students responded, I had to think quickly, just like in real teaching” (P1), illustrating how immersion triggered authentic pedagogical responses.

However, this experience was not perceived as fully equivalent to real classroom interaction. Participants also recognized limitations in the responsiveness and unpredictability of virtual students. As noted by another participant, “It feels real, but sometimes the responses are predictable and not as complex as real students” (P3).

This dual perception reflects a dialectical experience in which VR is simultaneously experienced as real and simulated. Therefore, VR can be conceptualized as a quasi-authentic learning environment—one that provides sufficient realism to support pedagogical training while still retaining the limitations of simulation.

Internalization of Pedagogical Skills through Reflective Practice

The findings further reveal that VR-based microteaching facilitates not only practical engagement but also deep reflective processes. Participants demonstrated increased awareness of their teaching practices through continuous self-evaluation during and after their interactions in the VR environment.

For example, one participant noted, “I became more aware of how I explain things—whether I speak too fast or not clearly—because I can reflect on my performance” (P5).

In addition, participants reported improvements in key pedagogical domains, including classroom management, instructional delivery, and student interaction. Another participant stated, “In VR, I learned how to respond to students who are not paying attention. Even though they are virtual, it trains me to be more responsive” (P2).

These findings indicate that learning in VR is not passive but actively constructed through reflection. The integration of experiential engagement and reflective evaluation enables participants to internalize pedagogical skills in a more meaningful and contextually grounded manner.

Negotiation of Technological Constraints

Despite the benefits of VR, participants also encountered technological challenges that required adaptation and negotiation. These challenges were particularly evident during the initial stages of use, when participants were still unfamiliar with the technology.

One participant stated, “At the beginning, I found it difficult because I was not used to the device, so it took time to adjust” (P1).

Technical issues such as system lag and delayed responses were also reported, affecting the flow of teaching practice. As one participant explained, “Sometimes there is lag or delayed responses, which slightly disrupts concentration while teaching” (P3).

However, rather than viewing these challenges as barriers, participants tended to interpret them as part of the learning process. One participant reflected, “Even with the challenges, I still see this as an important experience for me as a future teacher in the digital era” (P4).

This finding highlights that participants actively negotiated technological limitations, positioning themselves as adaptive learners. Thus, technological constraints did not merely hinder the experience but became an integral component of the learning process itself.

DISCUSSION

The findings of this study indicate that pre-service elementary school teachers’ experiences in VR-based microteaching extend beyond mere technical interaction, encompassing intertwined psychological, pedagogical, and reflective transformations. These transformations are reflected in participants’ evolving confidence, heightened pedagogical awareness, and increased capacity for reflective practice, suggesting that engagement with immersive environments facilitates deeper processes of professional learning (Radianti et al., 2020; Makransky & Petersen, 2019; Parong & Mayer, 2021).

Importantly, this study contributes to the growing body of literature by positioning VR not merely as an instructional tool, but as an experiential learning space that mediates the development of professional identity among pre-service teachers.

Virtual Reality as a Space for Confidence Reconstruction

The findings indicate that VR functions as a transitional pedagogical space that facilitates the reconstruction of teaching confidence through repeated and low-risk practice. This supports Bandura’s (1997) concept of self-efficacy, particularly the role of mastery experiences in building confidence. However, unlike traditional interpretations that view self-efficacy development as a relatively direct outcome, this study demonstrates that confidence emerges through a gradual and iterative process shaped by continuous interaction with immersive environments.

Recent studies suggest that immersive simulations can reduce anxiety and enhance learner confidence by providing psychologically safe environments that support experimentation and risk-taking (Makransky et al., 2019; Hamilton et al., 2021). The findings of this study not only support this perspective but also extend it by illustrating how such psychological safety is experienced and interpreted by pre-service teachers within a VR-based microteaching context.

Participants perceived VR as a learning space in which mistakes were not socially penalized, thereby reducing fear of negative evaluation and enabling more open exploration of pedagogical strategies. This sense of safety appears to play a crucial role in fostering confidence and encouraging active engagement, as participants felt more willing to experiment, reflect, and adjust their teaching approaches without the pressure typically associated with real classroom settings.

However, this study extends prior research by showing that confidence reconstruction is not merely a product of immersion but is dynamically linked to repeated practice, reflection, and adaptation. This suggests that VR should be understood not only as a confidence-enhancing tool but as a scaffold for the gradual development of teaching self-efficacy.

Immersive Experience and the Notion of Quasi-Authentic Learning

The findings highlight that participants experienced a strong sense of presence, a key characteristic of immersive learning environments. This aligns with recent research suggesting that immersion enhances engagement and situational learning by simulating real-world contexts (Radianti et al., 2020; Parong & Mayer, 2021).

Nevertheless, this study reveals a more nuanced perspective by identifying a duality in participants' experiences: they simultaneously perceived VR as realistic while recognizing its limitations as a simulation. This supports emerging discussions in the literature that authenticity in VR is not absolute but constructed through user perception and interaction (Makransky & Petersen, 2019; Jensen & Konradsen, 2018).

By conceptualizing VR as a *quasi-authentic learning environment*, this study contributes to the theoretical understanding of immersive learning by emphasizing that authenticity is negotiated rather than inherent. This perspective challenges the assumption that technological sophistication alone guarantees realistic learning experiences, highlighting instead the role of user interpretation in shaping perceived authenticity.

Internalization of Pedagogical Skills through Reflective Practice

Another significant finding is that VR-based microteaching promotes deep reflective practice, enabling participants to critically evaluate and refine their teaching strategies. This aligns with Schön's (1983) framework of reflection-in-action and reflection-on-action, which emphasizes reflection as a core component of professional learning.

Recent studies further indicate that immersive simulations can enhance reflective capacity by allowing learners to revisit and analyze their performance in context-rich environments (Ferdig & Kosko, 2020; Makransky et al., 2019). In this study, participants demonstrated heightened pedagogical awareness, particularly in areas such as instructional delivery, classroom management, and responsiveness to student behavior.

However, this study extends previous findings by showing that reflection in VR is not merely retrospective but embedded within the experiential process itself. The integration of immersive engagement and reflective evaluation suggests that VR supports both *learning by doing* and *learning by reflecting*, thereby fostering deeper pedagogical internalization.

Negotiating Technology in a Developing Educational Context

The findings also reveal that participants engaged in an active process of negotiating technological constraints, particularly in relation to technical issues and initial unfamiliarity with VR systems. This is consistent with recent studies highlighting that the effectiveness of VR in education is influenced by contextual factors such as infrastructure, digital literacy, and institutional readiness (Radianti et al., 2020; UNESCO, 2021).

However, unlike studies conducted in technologically advanced contexts, this research demonstrates that in developing settings, technological limitations are not merely barriers but become integral to the learning experience. Participants interpreted these challenges as opportunities for adaptation and skill development, reflecting a more agentic and resilient engagement with technology.

This finding contributes to the literature by emphasizing the importance of context in VR implementation. It suggests that successful integration of VR in teacher education depends not only on technological sophistication but also on users' capacity to adapt and meaningfully engage with technological constraints.

CONCLUSION

This study concludes that the implementation of virtual reality (VR)-based microteaching in pre-service elementary teacher education offers a potentially transformative learning experience, particularly in shaping participants' confidence, pedagogical awareness, and reflective capacity. These transformations are evidenced in how participants gradually reconstructed their teaching confidence through repeated practice, engaged more deeply with pedagogical decision-making, and developed greater awareness of their instructional approaches.

Beyond its practical benefits, this study contributes to the literature by conceptualizing VR-based microteaching not merely as a technological tool, but as a pedagogical space that mediates the reconstruction of pre-service teachers' professional identity. The interaction between immersive experience, reflective practice, and iterative engagement highlights the role of VR as an integrative learning ecosystem that supports experiential, reflective, and adaptive learning processes, particularly within developing educational contexts.

However, the study also identifies several challenges, including limited technological literacy during initial use, technical issues such as system instability and restricted interaction features, and the lack of optimal integration of VR within instructional design. Additionally, constraints related to infrastructure and institutional readiness remain significant factors influencing the effectiveness of VR implementation in teacher education.

Based on these findings, several strategic implications are proposed. These include strengthening pre-service teachers' capacity through integrated VR training, enhancing the design of VR-based microteaching to be more interactive and contextually relevant, and improving institutional support in terms of infrastructure and technological resources. Furthermore, the development of adaptive VR-based learning models that align with the specific needs of teacher education in developing contexts is strongly recommended.

For future research, further studies are needed to develop and validate pedagogically grounded VR-based microteaching models, as well as to examine their effectiveness through quantitative approaches. Longitudinal studies are also essential to investigate the long-term impact of VR on pre-service teachers' professional readiness and identity formation, thereby providing a more comprehensive understanding of its role in contemporary teacher education.

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AUTHOR CONTRIBUTIONS

Sigit Tri Nova contributed to the conceptualization of the study, data collection, data analysis, and manuscript drafting. Prita Sridelia contributed to data collection, data organization, and initial data analysis. Danti Indriastuti Purnamasari contributed to the research design,

methodological guidance, and critical revision of the manuscript. Eli Meivawati supervised the overall research process, contributed to conceptual development, and provided final approval of the manuscript. All authors have read and approved the final version of the manuscript.

REFERENCES

- Adam, W. (2024). Penerapan Media AR (Augmented Reality) pada Pembelajaran IPA di Kalangan Mahasiswa Prodi IPA Universitas Sulawesi Barat. *Saqbe: Jurnal Sains dan Pembelajarannya*, 1(2), 97-103.
- Allen, D. W., & Ryan, K. (1969). *Microteaching*. Addison-Wesley.
- Amobi, F. A. (2005). Preservice teachers' reflectivity on the sequence and consequences of teaching actions in a microteaching experience. *Teacher Education Quarterly*, 32(1), 115–130.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Sage Publications.
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.
- Ferdig, R. E., & Kosko, K. W. (2020). Using virtual environments to support teacher reflection and practice. *Journal of Technology and Teacher Education*, 28(2), 215–230.
- Flick, U. (2018). *An introduction to qualitative research* (6th ed.). Sage Publications.
- Hamilton, D., McKechnie, J., Edgerton, E., & Wilson, C. (2021). Immersive virtual reality as a pedagogical tool in education: A systematic literature review. *Educational Technology Research and Development*, 69(2), 1–32.
- Jensen, L., & Konradsen, F. (2018). A review of the use of virtual reality head-mounted displays in education and training. *Education and Information Technologies*, 23(4), 1515–1529. <https://doi.org/10.1007/s10639-017-9676-0>
- Kavanagh, S., Luxton-Reilly, A., Wuensche, B., & Plimmer, B. (2017). A systematic review of virtual reality in education. *Themes in Science and Technology Education*, 10(2), 85–119.
- Makransky, G., & Petersen, G. B. (2019). Immersive virtual reality and learning: A meta-analysis. *Educational Psychology Review*, 31(2), 391–417. <https://doi.org/10.1007/s10648-018-9436-3>
- Makransky, G., Terkildsen, T. S., & Mayer, R. E. (2019). Adding immersive virtual reality to a science lab simulation causes more presence but less learning. *Learning and Instruction*, 60, 225–236. <https://doi.org/10.1016/j.learninstruc.2017.12.007>
- Meivawati, E., & Meiliza, Z. (2025). Transforming microteaching with virtual reality: Impacts on pre-service elementary school teacher education students' pedagogical skills. *Al-Asbr: Jurnal Pendidikan dan Pembelajaran Dasar*, 10(2), 280–293.
- Moustakas, C. (1994). *Phenomenological research methods*. Sage Publications.
- Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, 42(5), 533–544. <https://doi.org/10.1007/s10488-013-0528-y>
- Parong, J., & Mayer, R. E. (2021). Learning science in immersive virtual reality. *Journal of Educational Psychology*, 113(4), 785–797.
- Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education*, 147, 103778. <https://doi.org/10.1016/j.compedu.2019.103778>
- Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.
- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1–22.
- UNESCO. (2021). *Reimagining our futures together: A new social contract for education*. UNESCO Publishing.