The Significance of Educational Technology in Higher Education: An Hermeneutic Phenomenology Examination for Expanding the Theoretical Bases of Connectivism Theory

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ABSTRACT
Educational technology integration within higher education has significantly changed the teaching and learning environments. However, the theoretical foundations guiding these changes, particularly connectivism theory, suggest that learning occurs through networks facilitated by digital technology and has not been fully developed. Despite its relevance in the digital age, connectivism has faced criticism and skepticism due to a lack of empirical support. This hermeneutic phenomenological study seeks to explore the experiences of educators in higher education to provide empirical evidence for expanding the theoretical foundations of connectivism. Through in-depth interviews, focus groups, and the analysis of letter-writing activities, this research investigates how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education. The study employs a hermeneutic phenomenological approach to interpret these experiences, linking them to the fundamental principles of connectivism learning as a networked process, distributed knowledge, and the role of digital technology in knowledge creation. The findings suggest that educational technology facilitates meaningful connections between learners, which fosters a networked learning environment that aligns with connectivism theory. The study also reveals gaps in the theory, particularly in addressing emerging technologies such as artificial intelligence (AI) and personalized learning platforms. Building on these lived experiences, this research proposes an expanded version of connectivism as a significant contribution supported by empirical evidence from higher education contexts. The study provides implications for educators, administrators, and policymakers in leveraging educational technology effectively and offers theoretical advancements for understanding learning in the digital age.

INTRODUCTION
As educational technology revolutionizes higher education, the frameworks we use to understand learning must evolve accordingly. A significant framework to consider is the connectivism theory, which suggests that learning in the digital age occurs through technology-facilitated networks (Siemens, 2004, 2005). However, due to a lack of empirical research, connectivism is often dismissed and discouraged despite its potential relevance. The lack of empirical research regarding connectivism undermines its ability to serve as a legitimate foundation for understanding modern learning environments. In a world where technology is rapidly transforming education, this research is crucial to expanding the theoretical understanding of how students and educators truly experience learning through digital technology. This study employs a hermeneutic phenomenological approach to explore the lived experiences of educators in higher education using educational technology. It also examines how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education. It addresses the current gap by providing empirical evidence that expands the theoretical foundations of connectivism theory. Through individual interviews, focus groups, and the analysis of letter-writing activities, the research investigates how these experiences reflect and challenge connectivism theory. The findings propose ways to enhance the theory by integrating contemporary technological practices, offering implications for educational policy, teaching practice in the classroom, and future research regarding connectivism theory.

BACKGROUND OF THE STUDY
This study is authenticated by historical, social, and theoretical frameworks of connectivism theory, which inform its investigation. Historically, events such as the COVID-19 pandemic have significantly influenced the current state of higher education, particularly regarding the widespread adoption of online learning. The transition to online learning resulted in nearly all higher education institutions switching to virtual course formats (Li, 2022; Wei & Chou, 2020). The social context of this research encompasses the complex network of connections and interactions that facilitate learning among various stakeholders, including students, faculty, and support personnel in the digital era. Theoretical guidance for the study is drawn from connectivism theory (Siemens, 2004, 2005), which emphasizes the role of networks and technology in knowledge acquisition.

Historically, education has relied predominantly on face-to-face interactions between educators and students to establish meaningful connections and engagement. However, the educational landscape has experienced a paradigm shift by introducing learning management systems (LMS) and other technological innovations during the late 20th century (Karakose & Demirkol, 2021; Li, 2022; Palvia et al., 2018). Early online learning was often characterized by static content, minimal interaction, and low engagement (Palvia et al., 2018; Piccoli et al., 2001). With technological advances, the capacity to create interactive and vibrant learning environments has emerged by enabling more immersive educational experiences. Computers, the internet, and digital platforms have revolutionized how education is presented (Downes, 2019). By the turn of the 21st century, digital technologies were essential in reshaping educational practices, which makes them more flexible and learner-centered (Barabasi, 2003; Siemens, 2006). Over time, educational technology integration in teaching practices has become prevalent in transitioning from fundamental tools such as chalkboards and overhead projectors to sophisticated digital platforms such as Canvas and Blackboard (Dawo & Sika, 2021). The widespread use of the internet and digital technologies has fostered learning modifications, emphasizing networked learning over traditional models (Siemens, 2004). Connectivism theory, introduced by George Siemens, theorizes that learning increasingly relies on external networks, such as digital resources and human interactions, and the effective navigation of these networks is critical to knowledge acquisition. This theoretical framework highlights the transformative potential of educational technology in fostering engagement and collaboration (Downes, 2019).

The surge in online learning, particularly accelerated by the COVID-19 pandemic, has presented new challenges and opportunities for educational institutions (Drigas et al., 2023; Zhu et al., 2023). As educators quickly adapted to remote learning, the significance of technology in maintaining student engagement and fostering meaningful connections became increasingly evident. However, virtual communication tools often lack the subtle and interpersonal effects of in-person interactions, which challenge effective teaching and learning (Bond & Bedenlier, 2019; Vezne et al., 2023). These challenges have raised concerns about how to best employ educational technology to promote academic success and retention, especially in higher education settings (Babincakova & Bernard, 2020; Kardambikis & Donne, 2022). As online education continues to expand, educators have shifted their focus from the novelty of technology to optimizing student engagement and retention (Drigas et al., 2023). The increasing reliance on social media and digital communication platforms has both connected individuals widely and introduced challenges in establishing authentic, networked learning environments (Matee et al., 2023). With many emphasizing the need for authentic strategies to foster meaningful connections and community among students, researchers have been investigating student engagement within virtual settings, with many emphasizing the need for authentic strategies to foster meaningful connections and community among students (Aluko et al., 2022; Eden et al., 2022).

Educators encountered challenges in engaging students and fostering connections in remote settings, revealing disparities in students' experiences with online learning (Alisemiel et al., 2022; Babincakova & Bernard, 2020) during the COVID-19 pandemic. While some students excelled, others grappled with disengagement and decreased motivation, which impacted retention and graduation rates (Babincakova & Bernard, 2020; Chiemela et al., 2022). The transition to higher education funding models reliant on student contributions has heightened the urgency for institutions to address student engagement and retention issues (Babincakova & Bernard, 2020). Connectivism, introduced by Siemens in 2004, builds upon traditional learning theories by recognizing the significant role of digital technologies in the learning process. Siemens argues that learning in the digital age is interconnected and relies on a network of nodes, including people, digital tools, and information systems. Educational technology supports access to and navigation of these networks while promoting knowledge acquisition and application. It can enhance academic performance and student engagement by fostering cooperation, collaboration, and self-directed learning (Siemens, 2004, 2005).

Recent studies have applied the connectivism theory to explore various aspects of learning environments, such as relationships, engagement, and interaction (Haris et al., 2023; Jung, 2019; Plueger, 2024). These studies have highlighted the complexities of using technology to engage students in meaningful learning experiences, particularly in online settings where personal interaction may be limited (Bond & Bedenlier, 2019; Kostenius & Alerby, 2020; Vlachopoulos & Makri, 2019). The importance of fostering authentic network connections in virtual classrooms has become increasingly critical as institutions continue to invest in technology-driven learning environments (Annansingh, 2019; Eden et al., 2022; Ferrer et al., 2022). Studies exploring student engagement and educational technology have identified practical strategies for enhancing learning outcomes, such as leveraging interactive tools, promoting communication, and fostering collaboration (Bolliger & Halupa, 2018; Fox, 2019; Li, 2022; Turan et al., 2022). The research highlights the importance of educator presence, responsiveness, and the use of synchronous and asynchronous communication channels in maintaining student engagement. This study builds upon these insights by using connectivism principles to investigate how educators in higher education leverage technology to build connections that enhance student engagement and achievement. By aligning

connectivism theory with phenomenological methods, this study provides an understanding of how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education. This research offers valuable insights into improving pedagogical practices and educational frameworks for fostering student engagement and academic success in a rapidly evolving technological landscape.

RESEARCH PROBLEM

The problem is that connectivism theory is not widely acknowledged and is frequently discouraged within the sphere of educational research and practice due to the insufficiency of empirical studies substantiating its efficacy. Connectivism presents a promising theoretical framework for understanding learning in the digital age. However, its limited use and rejection are attributed to insufficient empirical evidence. This study seeks to address a gap by providing empirical insights into the perceptions and anticipations of educators in higher education regarding the evolution of teaching approaches in response to technological advancements and the increasing emphasis on connectivism using educational technology. This research study will contribute to enriching the theoretical foundations of connectivism.

PURPOSE OF THE STUDY

The purpose of this hermeneutic phenomenological research study is to comprehensively explore and interpret the lived experiences of educators. The study provides an understanding of how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education. By examining the educator's personal narratives, this study discovers how the educator's experiences shape their instructional practices while providing prosperous empirical evidence that supports and extends the theoretical framework of connectivism. Specifically, this research seeks to understand how educators' perceptions and anticipations align with or challenge the core principles of connectivism theory. In doing so, the study contributes to the empirical validation of connectivism theory, which offers insights expanding on the comprehensive understanding of learning in the digital age by significantly broadening the theoretical scope to account for contemporary technological advancements and educational contexts.

RESEARCH QUESTION

How do educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education?

LITERATURE REVIEW

The literature review examines educational technology's historical development and integration into higher education. The review outlines the significant transformation that has taken place as higher education institutions have increasingly embraced digital technology and platforms to enhance learning environments. This section traces the evolution of technological advancements, from early implementations to modern systems such as learning management platforms and interactive online resources, and discusses how these tools have reshaped instructional practices and student engagement. The review then transitions to the connectivism theory introduced by George Siemens and Stephen Downes (Siemens, 2004; Downes, 2019). Connectivism theory positions knowledge acquisition as a networked process where information is distributed across various nodes, including digital platforms, databases, and individuals (Siemens, 2004, 2005). The core principles of connectivism emphasize the importance of these networks and the role of technology in facilitating learning by enabling individuals to connect with and navigate diverse sources of knowledge (Siemens, 2004). Despite its relevance in the digital age, connectivism has faced criticism due to the lack of empirical substantiation (Jung, I., 2019). The literature highlights significant theoretical gaps and critiques, particularly concerning the limited empirical research base. As a result, connectivism is often disregarded or discouraged as a framework in educational practice, which emphasizes the need for empirical validation to further develop and legitimize it as a model for higher education learning (Plueger, C., 2024). The review concludes by examining the application of hermeneutic phenomenology in educational research by contending that the methodological approach is particularly suitable for interpreting the authentic experiences of educators in digital technology-driven learning environments. Hermeneutic phenomenology is a valuable means for bridging the gap between theoretical frameworks like connectivism theory and practical educational experiences, offering in-depth qualitative insights to validate and enrich theoretical models.

Educational Technology in Higher Education

Educators in Higher education are increasingly expected to incorporate digital technologies to improve teaching and learning practices (Masenya, 2021). Research shows that many educators lack the necessary skills, knowledge, and confidence to effectively integrate technology into their pedagogy (Lowenahal & Lomellini, 2022; Masenya, 2021). The absence of strong instructional design capabilities poses a significant barrier to the successful

integration of technology (Koh, 2019). Educators also face challenges in selecting the appropriate technological tools that align with the subject matter, learning environment, student characteristics, and cultural contexts (Njiku et al., 2019). Scholars such as Kopcha et al. (2020) emphasize that educators are aware of the importance of aligning technology use with established standards and learning objectives. However, technology adoption continues to present a substantial challenge for many educators, as Kopcha et al. (2020) highlighted.

As educators engage with digital transformation, they are compelled to shift from traditional instructional methods. The integration of e-learning tools such as social media, online games, multimedia, and mobile devices has significantly reshaped the educational landscape (Masenya, 2021; Olusanya, O., 2023). Effective integration of these technologies, however, requires educators to possess digital literacy and a high level of competence in using Information and Communication Technologies (ICTs) to retrieve, evaluate, create, and communicate information (Paul, 2021). By developing technological competencies, educators contribute to informal learning communities and address skill gaps, yet equipping educators with these competencies remains a persistent challenge (Olusanya, O., 2023). This highlights the need for concerted efforts from the global educational and telecommunications sectors to address the digital divide (Masenya, 2021; Paul, 2021).

Experts argue that integrating technology and fostering connections among learners can significantly enhance student engagement in higher education (Asif et al., 2021; Donham et al., 2022; Masenya, 2021). To achieve this, educators are encouraged to incorporate technology into their teaching strategies and create virtual environments that promote collaboration, communication, and active participation (Donham et al., 2022). Furthermore, Eshelman and Hogue (2023) provide evidence that a comprehensive approach combining TPACK (Technological, Pedagogical, and Content Knowledge), the Triple E Framework (Engagement, Enhancement, and Extension), and the CAFE model (Content, Activities, Facilitation, and Evaluation) effectively enhances the lesson-planning process in educational contexts. Educators can create more personalized, dynamic, and inclusive learning environments by implementing pedagogical approaches that foster interpersonal relationships and employ technology to increase student engagement (Asif et al., 2021). Enhanced communication, collaboration, and reflective practices can enable educators to forge stronger connections with students, resulting in higher engagement levels and improved learning outcomes (Asif et al., 2021; Donham et al., 2022). Consequently, technology is recognized for its potential to elevate student engagement and improve educational quality.

Higher education institutions are increasingly adapting to a digital environment that diverges from traditional educational paradigms (Masenya, 2021; Paul, 2021). Educators now require a deep understanding of digital tools, platforms, and innovative teaching methods to effectively meet the needs of contemporary learners. A study by Kim et al. (2020) highlights the critical importance of digital literacy, e-learning platform knowledge, and familiarity with the technological preferences of today's students. Educators must engage in hands-on technological experiences tailored to educational contexts as society endures significant technological transformations. Expertise in areas such as Learning Management Systems (LMS), virtual pedagogical environments, multimedia content curation, and the use of social media as an educational tool can support educators in integrating digital tools within the educational field (Kim et al., 2020; Masenya, 2021).

The integration of technology in education extends beyond instructional methods to include assessment practices, feedback mechanisms, and broader channels of educational communication. Higher education institutions are driven by the need to remain competitive and relevant globally, prompting the adoption of digital tools. Lee and Kwon (2023) identify an emerging demand to meet the educational expectations of digital natives—students who have grown up in a digital environment and possess distinct learning preferences. While adopting digital technologies in higher education presents challenges and opportunities (Johnson & Welsch, 2020), proficient use of these tools can enhance student engagement, facilitate personalized learning pathways, and broaden the pedagogical scope beyond traditional classroom settings. Continuous professional development, flexibility, and awareness of evolving educational principles are essential for educators to drive the ongoing transformation brought about by the digital revolution (Koh, 2019; Koh & Kan, 2021).

Technology plays a crucial role in instruction, assessment, feedback, and communication (Lee & Kwon, 2023). A variety of factors contribute to the integration of digital technologies (Paul, 2021), including institutional pressure to maintain global relevance (Lee & Kwon, 2023) and the need to accommodate digital-native students (Masenya, 2021), who have distinct expectations shaped by their digital upbringing (Paul, 2021). While implementing digital technologies poses challenges, it also offers opportunities for enhanced student engagement, personalized learning, and expanded educational horizons. However, successful integration of these tools requires ongoing professional development, adaptability, and recognition of the dynamic nature of education (Masenya, 2021; Paul, 2021).

In recent years, the use of technology in education has become more widespread which offers unique avenues for building interpersonal relationships between students and educators (Kostenius & Alerby, 2020; Leslie, 2020). Studies by Kostenius and Alerby (2020) and Leslie (2020) highlight the potential for technology to enhance interpersonal interactions in educational contexts. Kostenius and Alerby (2020) emphasize the importance of fostering the well-being of both students and educators in online and blended learning environments facilitated by tools such as online forums, video conferencing, and social media. Implementing these technologies has the potential to strengthen relationships and promote collaboration between students and educators, ultimately contributing to a more caring, supportive, and engaging learning environment. Leslie's (2020) research focuses on the role of technology in improving student engagement through faculty development programs by demonstrating that the use of technology in educational settings can enhance interpersonal relationships. By utilizing various technological platforms, educators can create more supportive and engaging learning environments that foster empathy and connection between students and instructors. Nevertheless, it is important to note that technology alone cannot fully cultivate meaningful relationships; educators must also foster a culture of inclusivity and support (Kostenius & Alerby, 2020; Leslie, 2020).

As technology advances, its impact on education and interpersonal relationships grows. Educators have access to professional development opportunities that allow them to use technology to enhance academic achievement, motivation, engagement, and communication (Donham et al., 2022). College students, particularly those aged 18–23, are described as highly dependent on technology, having never known a world without it (Asif et al., 2021; Donham et al., 2022). In the present day, living in an increasingly connected and interdependent society is a necessity (Hye et al., 2020; Springett et al., 2022). However, students may experience increased anxiety and stress when separated from their technological devices (Huda, 2019; Parker & Hodgson, 2020). Research indicates that educators who incorporate technology to design interactive and engaging activities requiring student collaboration across different curricula enhance student involvement, collaboration, and communication (Avsec, 2023; Kraiger et al., 2022). For example, educators may use instructional games or simulation software to teach specific topics (Avsec, 2023) or invite students to collaborate on projects using interactive communication platforms. By leveraging the full capabilities of various technological tools, educators foster a sense of belonging among students and successfully balance the benefits of technology with in-person interactions (Huda, 2019; Hye et al., 2020).

Connectivism Theory

Connectivism, introduced by George Siemens (2004) and expanded by Stephen Downes (2019), provides a framework for understanding how learning occurs in a digital age, which emphasizes the role of networks in knowledge acquisition. In contrast to traditional learning theories, connectivism theorizes that knowledge is distributed across a network of human and non-human information sources, such as digital technologies and databases (Siemens, 2004, 2005). According to connectivism, learning is a process of connecting these various nodes of information (Siemens, 2004). As learners engage with these networks, they develop the capacity to navigate, evaluate, and integrate diverse information. The theory highlights the transformative role of digital technology in facilitating learning, as it enables individuals to access, share, and create knowledge more effectively than in traditional learning environments. The theory emphasizes the significance of preserving and fostering these connections, as they serve as the basis for continuous learning in a rapidly evolving information environment (Siemens, 2004, 2005; Downes, 2019)

George Siemens first introduced the Connectivism theory in 2004 to provide an essential framework for addressing challenges such as declining academic performance and increasing student attrition rates in higher education (Siemens, 2004). Connectivism theory is structured around eight core principles of learning: embracing the diversity of opinions, connecting information nodes, facilitating non-human learning, prioritizing capacity over current knowledge, maintaining and nurturing connections, integrating interdisciplinary knowledge, staying current with evolving information, and using decision-making as a learning process (Siemens, 2004). In the digital context, connectivism relies on these eight key principles, which stress the importance of engaging with multiple perspectives, interacts with diverse knowledge sources, and recognizes the value of both human and non-human entities in learning. The approach highlights the necessity of continuously acquiring and integrating knowledge while maintaining active connections that support ongoing learning. The theory also emphasizes the interconnections between different disciplines and concepts. Additionally, it focuses on the importance of staying up to date with the rapid evolution of information and refining decision-making and evaluative skills. Together, these principles highlight the complexity of learning in the digital era and reflect the wide-ranging influence of Connectivism (Siemens, 2004, 2005, 2006). Connectivism principles serve as a foundation for research exploring educators' experiences and perceptions of academic performance and retention. They emphasize that learning extends beyond individual cognition and includes networks and organizations while stressing the critical role of connections, digital resources, and technology as key enablers of the learning process (Siemens, 2004; Siemens,

2005). With understanding Siemens's theoretical framework, connectivism provides valuable insights into how learners acquire, apply, and navigate knowledge in technologically advanced learning environments.

Stephen Downes (2019, 2022) further expanded the connectivism theory to address the digital age's unique challenges and educational demands. The framework offers innovative insights into learning within networked contexts while drawing upon established educational and cognitive principles. Historically, instructional design has relied on three primary learning theories: behaviorism, cognitivism, and constructivism (Siemens, 2004). However, these theories predate the profound impact of technology on education. Over the past two decades, rapid technological advancements have transformed various aspects of life, including communication, education, and everyday activities (Siemens, 2006). Therefore, it is essential to consider the social context in which learning occurs by acknowledging both the principles and processes supporting learning in a digitally interconnected world.

Criticisms and Gaps in Connectivism Theory

Despite its potential as a learning theory for the digital age, connectivism theory has faced considerable criticism, particularly due to the lack of empirical research supporting its claims. Although Siemens and Downes introduced connectivism as a novel theory to address learning challenges in technology-rich environments, critics argue that it has not been sufficiently tested through empirical studies. This lack of empirical validation limits its adoption and recognition as a robust framework in higher education (Dziubaniuk et al., 2023; Jung, I., 2019). Many scholars have pointed out that while the theoretical concepts are compelling, they remain underdeveloped regarding measurable outcomes and evidence-based application (Al-Maawali, 2022; Al-Mutairi & Bin Mubayrik, 2021; Chandrappa, 2018).

A significant critique is that connectivism lacks a clear distinction from pre-existing learning theories such as constructivism and social learning theory, which also emphasize collaborative and networked learning. Scholars argue that connectivism's core concepts, such as learning through networks and distributed knowledge, mirror ideas already present in these established theories, raising questions about its uniqueness as a separate learning paradigm (Dawo & Sika, 2021; Dziubaniuk et al., 2023; Baque et al., 2020). For example, while connectivism stresses learning through human and non-human nodes, constructivist and social learning theories have long highlighted the importance of collaborative learning and social interactions in the knowledge-construction process (Astin, 1999; Jacobsen, 2019; Johnson & Welsch, 2020).

Connectivism has been criticized for its abstract nature and the challenge of putting its principles into practice (Goldie, 2016). Critics argue that while its concepts, such as learning through networks and decision-making as a learning process, are intriguing, the connectivism principles offer limited practical guidance for educators (Jung, I., 2019). The lack of specificity makes it challenging to design empirical studies that can rigorously test its claims (Al-Maawali, 2022; Al-Mutairi & Bin Mubayrik, 2021; Chandrappa, 2018). Additionally, the absence of detailed pedagogical strategies and measurable outcomes hampers its application in educational settings, which leaves educators with little direction on how to implement connectivism principles in practice (Page et al., 2020; Wylie, 2023).

Furthermore, connectivism has been criticized for prioritizing digital technologies as the primary facilitator of learning by potentially overshadowing the human and social elements of education that are fundamental to other educational theories (Dawo & Sika, 2021; Jung, I., 2019). This heavy reliance on technology may limit the understanding of the learning process, particularly in settings with limited digital access and skills. To establish connectivism theory as a recognized framework in higher education, there is a critical need for more empirical research that explores its applicability in practical educational contexts. Studies that examine how learners engage with digital tools, how networks influence knowledge acquisition, and how educators can design effective learning environments based on connectivism principles are essential. Without this empirical evidence, connectivism remains a theoretically intriguing but practically underutilized concept in educational research and practice (Dziubaniuk et al., 2023; Jung, I., 2019).

Hermeneutic Phenomenology in Educational Research

Hermeneutic phenomenology presents a suitable methodology for exploring and interpreting the experiential dynamics of educators and students engaging with educational technology. This approach is centered on comprehending subjective experiences and meanings within specific contexts, thereby enabling researchers to investigate how individuals experience and make sense of educational technology (Husserl, 1965; Moustakas, 1994). Through capturing the lived experiences, hermeneutic phenomenology facilitates the interpretation of how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education, which makes it appropriate for examining the intricate dynamics prevalent in modern learning.

Hermeneutic phenomenology is distinguished by its capacity to bridge the gap between theory and practice (Husserl, 1965; Moustakas, 1994) by making it a valuable methodology in educational research. Unlike traditional educational theories, which often prioritize abstract principles, hermeneutic phenomenology focuses on collecting qualitative data that reflect realistic experiences. By examining how educational technology is experienced in authentic settings, this methodology provides valuable insights into the practical manifestations of theoretical concepts. As a result, educational theories can be refined to better align with contemporary educational practices (Moustakas, 1994).

Additionally, hermeneutic phenomenology provides valuable qualitative insights that can be effectively applied to developing and implementing education (Moustakas, 1994). The detailed, descriptive data obtained through this approach enables researchers to identify practical challenges, opportunities, and the real-life impact of technology on learning and teaching. By interpreting the significance that educators attribute to their use of technology, this methodology reveals trends that can guide instructional design, professional development, and policymaking, ultimately leading to more efficient and meaningful integration of technology in education.

RESEARCH METHODOLOGY

Research Approach: Hermeneutic Phenomenology

Hermeneutic phenomenology offers a profound framework for exploring the experiences of educators and students as they engage with educational technology. Grounded in the philosophical traditions of phenomenology and hermeneutics, particularly the work of Heidegger and Gadamer, this approach seeks to describe experiences and interpret and uncover the deeper meanings individuals attach to their encounters with technology (Suddick, et al., 2020). Unlike transcendental phenomenology, which focuses on identifying the essence of experiences, hermeneutic phenomenology emphasizes the process of interpretation and understands how broader cultural, social, and historical contexts shape experiences (Moustakas, 1994). Interpretive depth is crucial when studying how educational technology is perceived, navigated, and utilized in educational settings.

For educators, integrating educational technology into teaching represents more than a shift in methodology; it often entails reevaluating their roles, responsibilities, and pedagogical values. Hermeneutic phenomenology allows researchers to examine the various ways educators interpret their use of technology. Beyond functional aspects, such as how to operate software or manage digital platforms, educators engage with technology in ways that influence their self-perception as professionals, their sense of competence, and their relationships with students. This approach illuminates how educators make sense of the tensions between traditional teaching practices and the demands of modern, technology-enhanced classrooms. In doing so, it reveals the emotional and intellectual labor involved in adopting new educational technology, whether they experience a sense of empowerment through digital innovation or struggle with the anxiety of insufficient support and training.

Students bring a diverse range of experiences to their interactions with educational technology. Many belong to the category of "digital natives," having grown up in a world where digital technologies are pervasive (Annansingh, F., 2019; Asif et al., 2021). However, their engagement with technology in learning environments is complex and heavily influenced by personal, academic, and social factors (Plueger, C., 2024). Hermeneutic phenomenology enables researchers to discern how educators derive meaning from interactions with technology for student engagement through virtual classrooms, online collaborative tools, or multimedia learning resources. The hermeneutic approach examines beyond mere usage patterns to comprehend how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education. The research study highlights the ways in which technology either enhances or complicates their teaching approaches, facilitating a more human-centered understanding of experiences in the digital age.

Ultimately, hermeneutic phenomenology empowers researchers to bridge the divide between theoretical concepts, such as connectivism theory, and the actual experiences of educators interacting with technology in higher education. By emphasizing interpretation and context, this methodology unveils the profound significance of digital technology, offering valuable insights into how educators can harness technology to cultivate meaningful connections, enrich learning, and navigate the ever-changing landscape of education.

Research Design

A qualitative research methodology was identified as the most appropriate approach for examining the experiences of educators. This approach focuses on how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the growing emphasis on connectivism in higher education at public institutions in the southern region of the United States. A hermeneutic methodology was particularly suitable for

studying the use of educational technology to enhance student engagement and foster academic success (Asif et al., 2021; Bolliger & Halupa, 2018). Qualitative methods allowed researchers to explore participants' lived experiences and perspectives (Maxwell, 2012). Given the rapidly changing landscape of higher education, where technology integration is essential, qualitative research effectively captured educators' intricate and context-dependent perspectives. The study aimed to provide a contextual understanding of these experiences through the lens of connectivism theory (Siemens, 2004).

The researcher opted for hermeneutic phenomenology due to its relevance in examining participants' subjective experiences and obtaining insights into how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education (Moustakas, 1994; Siemens, 2004). The hermeneutic approach facilitated a profound understanding of human experience patterns and the development of themes that provided a philosophical interpretation of the educators' interactions with technology (Moustakas, 1994). In the context of higher education, educators have a crucial role in establishing a conducive learning environment for student success (Tuiloma et al., 2022). Qualitative research has proven to be an invaluable method for comprehensively understanding pedagogical practices and experiences (Maxwell, 2012). The approach immersed researchers in the educators' preferences, behaviors, and challenges while allowing them to consider contextual factors, motivations, and achievements (Hill et al., 2021). By focusing on the perspectives of the participants, qualitative research enabled the identification of unexpected themes and connections that may not have emerged through quantitative analysis alone.

The adaptable nature of qualitative research makes it well-suited for examining the intricate connections between technology, human interaction, and student engagement (Vlachopoulos & Makri, 2019). The qualitative reach approach offered the depth and rigor needed to investigate how educators perceive and adapt to changes in teaching methods due to technological advancements and the growing emphasis on connectivism in higher education. Additionally, it allowed researchers to explore educators' personal experiences with technology and its impact on student participation and academic performance. Using this methodology, researchers gained insights into the complex mechanisms at work in innovative higher education settings and contributed to enhancing teaching practices across various disciplines.

To gain a comprehensive understanding of how technology is used in higher education and its impact on student achievement, it was crucial to explore the participants' beliefs, emotions, perceptions, and experiences. Hermeneutic phenomenology enabled researchers to interpret these experiences in a way that acknowledged the complexity of human interactions and the broader social context (Moustakas, 1994). This approach was vital for examining the intricate dynamics influencing how educators perceive and anticipate using educational technology. The hermeneutic approach provided a framework for investigating individuals' subjective experiences and perceptions in their natural environments while building on the philosophical tradition of phenomenology, which Edmund Husserl developed and later expanded by scholars such as Moustakas (1994).

Ultimately, the approach encouraged researchers to remain open and inquisitive toward participants' experiences, which discovers unexpected insights and perspectives. By maintaining an interest in participants' perspectives and being attentive to their lived experiences, researchers uncovered valuable findings that significantly enhanced the study's validity. In examining complex, subjective experiences, the rigorous and systematic nature of hermeneutic phenomenology ensured the credibility and authenticity of the research (Moustakas, 1994). In alignment with the principles of connectivism and the use of educational technology, the study's findings provide valuable insights into the field of higher education and inform pedagogical practices aimed at improving student engagement and academic achievement.

Sampling Strategy

The research encompassed a diverse group of participants, including both tenured and non-tenured faculty members at public four-year universities in the southern region of the United States. These individuals possessed varying levels of knowledge and experience in educational technology and connectivism theory. The study emphasized demographic factors such as age, gender, university role, teaching experience, and technological proficiency to comprehensively understand the participants. The primary objective was to provide valuable insights into each participant's unique attributes and experiences. The research delved into the application of educational technology and connectivism across different academic disciplines. Faculty members with differing levels of proficiency and familiarity were purposefully selected from various universities in the southern region of the United States. The study considered various cultural and ethnic backgrounds and different teaching career stages. The overarching goal was to offer comprehensive insights into using educational technology and connectivism theory across institutions from diversified viewpoints.

The participant sample intentionally comprised both tenured and non-tenured individuals to ensure diverse experiences and perspectives were captured. The study specifically targeted academic departments affiliated with selected public universities to recruit participants. Formal requests were made to senior research compliance coordinators at multiple universities across the southern United States region to obtain permission to engage directly with faculty members. These requests included a letter of intent outlining the study's objectives and ethical considerations. Individual interviews were conducted at public universities within the southern United States region while maintaining the highest ethical standards to ensure precision, reliability, and confidentiality. A criteria screening form was employed to identify and validate suitable participants from public four-year universities in the southern United States who met specific criteria, such as possessing varied knowledge and experience in educational technology and connectivism theory relevant to teaching and utilizing technology to enhance student engagement. Each participant received a recruitment email containing a link to the criteria screening form, which was designed to collect essential information confirming their eligibility based on predefined criteria.

Data Collection Methods

A well-structured data collection plan was pivotal to the research process (Yin, 2017). This plan ensured ethical, methodical, and effective data gathering while leading to dependable, credible, and comprehensive research findings. The data collection plan provided guidance to researchers in selecting specific methods and strategies to gather pertinent data for their research inquiries (Lincoln & Guba, 1985). By integrating various data collection methodologies, researchers gained a profound understanding of the subject under investigation (Lincoln & Guba, 1985; Merriam, 2002; Patton, 2014). Various data collection methods were imperative when investigating intricate phenomena, such as educators' perceptions and anticipation of the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education. This research study collected data through individual interviews, focus groups, and letter-writing activities. The sequence began with individual interview questions, followed by focus group session questions, and finally, the participants were provided with letter-writing prompts via email. This chosen sequence maximized the benefits of each method to gain a comprehensive understanding of how educators use educational technology to enhance student engagement and academic performance while applying connectivism principles and technological skills to improve student learning processes.

Data Analysis

The data collection methodology for this study encompassed individual interviews, focus groups, and letter writing with the subsequent synthesis of results aimed at obtaining a comprehensive understanding of the findings. The transcription process entailed using sophisticated transcription software, such as Otter.ai, complemented by manual reviews to accurately capture verbal and non-verbal nuances, including tone, pauses, and non-verbal cues such as facial expressions. This meticulous approach was indispensable for fully representing the emotional and psychological states of the participants. Within focus groups, the utilization of timestamps and speaker identification served to preserve contextual relevance, particularly in multi-participant interactions. During the analysis phase, hermeneutic phenomenology was applied to interpret participants' lived experiences by providing an in-depth exploration of educators' perceptions of technology integration in their teaching practices. Through hermeneutic reflection, the study delved into educators' complex and subjective experiences, which yielded valuable insights into their perspectives on technological advancements and their impact on educational practice.

Educators perceive the evolution of teaching methods in response to technological advancements as a significant and inevitable shift toward more networked, adaptive, and student-centered learning environments. The findings indicate that educators anticipate that AI-driven tools, adaptive learning platforms, and collaborative technologies will continue to reshape education by providing personalized learning experiences, enabling real-time feedback, and fostering greater engagement. The increasing emphasis on connectivism, where learning is viewed as a process of forming connections between diverse information sources and peers, is also seen as central to this evolution. Educators recognize that technology facilitates this shift by enabling students to interact with global networks, co-create knowledge, and access a broader range of resources. As technology advances, educators foresee a growing emphasis on collaborative learning, networked knowledge-building, and the ability to adapt teaching strategies to meet the needs of diverse learners in increasingly digital and globalized classrooms. This expectation reflects their understanding that technology is not just a tool but a key driver in transforming how education is delivered and experienced in higher education.

Trustworthiness

In this qualitative study, our aim was to investigate how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing emphasis on connectivism in higher education. To ensure reliability and rigor, the research adhered to the principles of credibility, transferability, dependability, and confirmability, as outlined by Lincoln and Guba (1985). By meeting the trustworthiness

standards set forth by Lincoln and Guba, the study made meaningful contributions to understanding how technology is reshaping educational practices and pedagogical strategies. The research focused on educators' insights into how teaching is evolving through integrating digital tools, networked learning, and adaptive technologies framed within the connectivism theory. Comprehensive design and methodological precision were prioritized to produce credible and reliable findings, while reflexivity was employed to address potential researcher bias by acknowledging the researcher's role in interpreting the data. This reflexive approach helped ensure that the findings were grounded in participants' authentic experiences and minimized the influence of the researcher's preconceptions.

FINDINGS

In the analytical approach, the use of Atlas.ti allowed for a comprehensive synthesis of how educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education. By aligning the findings with the central research question, I identified four key themes through data triangulation using the reduction process (Moustakas, 1994). The emerging themes were identified as (1) Integration of Technology in Teaching, (2) Connectivism as a Guiding Framework for Learning, (3) Adapting Teaching Methods for Lifelong Learning, (4) Transformative Potential of Educational Technology. Educators incorporating technology into teaching is considered inevitable, as online platforms and digital tools have become integral to delivering education. Connectivism, as a guiding framework, promotes collaborative, networked learning, while adaptive teaching methods emphasize the development of critical thinking and lifelong learning skills. The transformative potential of educational technology presents both exciting opportunities and significant challenges by necessitating thoughtful consideration of ethical, practical, and equity-related issues as educators navigate this evolving landscape.

Integration of Technology in Teaching

Educators are increasingly realizing the transformative potential of technology in higher education. The widespread adoption of online platforms, such as learning management systems (LMS), digital tools, and technology-enhanced learning environments, is revolutionizing the dissemination of education. Platforms, like Blackboard, Canvas, and Moodle facilitate a seamless blend of asynchronous and synchronous learning, which provides students with greater flexibility in engaging with course content. These technologies have broadened access to education, particularly for non-traditional learners such as working professionals and military personnel which allowed them to participate in learning on their own schedules. Essential tools like Zoom and Microsoft Teams enable real-time interaction, while digital resources such as multimedia, simulations, and interactive modules enhance student engagement. This technological shift has also made education more inclusive by providing accessibility features such as captioning and screen readers while ensuring all students can fully participate in the learning process.

Looking to the future, educators anticipate that advancements in artificial intelligence (AI), adaptive learning systems, and online collaboration tools will continue to reshape pedagogical practices. AI-powered systems are already being used to provide personalized feedback and tailor learning experiences to individual student needs. These adaptive learning platforms allow for real-time adjustments based on student progress to ensure that each learner receives the appropriate level of challenge and support. By integrating AI-driven analytics, educators can monitor student performance and intervene proactively when needed, thereby improving learning outcomes. Additionally, online collaboration tools, such as Slack and Google Workspace, are expected to enhance student engagement and teamwork further, which supports collaborative learning across geographic boundaries. While challenges such as the digital divide and data privacy persist, the opportunities for creating more flexible, personalized, and responsive learning environments are unlimited while positioning technology as a crucial component of the future of education.

Connectivism as a Guiding Framework for Learning

Connectivism is increasingly recognized as an essential framework for comprehending the evolution of teaching in higher education. The research indicates that connectivism is progressively serving as a guiding framework in developing teaching methodologies in higher education. Connectivism reflects the growing prevalence of digital technologies and globalized learning environments by emphasizing learning through networks and connections between diverse information sources. Educators recognize that students now have unlimited access to information through online platforms, digital tools, and collaborative spaces. Consequently, the conventional role of educators as the primary source of knowledge is transitioning into more of a facilitator. Educators are responsible for assisting students in navigating digital communication networks, facilitating the connection of information sources, and fostering critical thinking skills to enable the innovative application of knowledge. This transformation reshapes classroom dynamics by fostering an environment where students are encouraged to participate in peer-to-peer

learning, co-create knowledge, and engage in collaborative projects that transcend geographical and disciplinary boundaries.

Educators anticipate that networked learning and digital collaboration will be central to teaching in the future. Platforms such as discussion forums, social media, and online communities allow students to participate in global discussions and learn from diverse perspectives. This pedagogical approach aligns with connectivism, where knowledge derives from connections between various sources rather than from a single origin. Additionally, educators anticipate a growing focus on teaching students how to gather and utilize information from interconnected networks effectively. This learning process will equip students with the necessary skills to thrive in a rapidly evolving, information-driven world. As digital literacy becomes increasingly crucial, educators are expected to adjust their teaching approaches further to assist students in constructing learning networks and participating in collaborative, self-directed learning.

Adapting Teaching Methods for Lifelong Learning

The research findings emphasize that educators increasingly recognize the need to adapt teaching methods to foster lifelong learning in response to rapid technological advancements. Traditional education models, which often focus on content delivery and rote memorization, are now considered insufficient for preparing students for the challenges of an unpredictable and rapidly evolving world. Instead, educators see a growing demand for teaching strategies that promote adaptability, critical thinking, and problem-solving skills. With the rise of automation, artificial intelligence, and the constant emergence of new technologies, students must develop the ability to learn and adapt to dynamic environments continuously. This shift requires a focus on teaching students specific content and how to learn effectively, think critically, and solve complex problems in diverse contexts.

Educators anticipate that future teaching practices will increasingly focus on equipping students with the skills necessary to navigate evolving technologies and apply their knowledge across various fields and industries. Active learning approaches, such as project-based learning, collaborative problem-solving, and real-world applications, will become more prevalent as they encourage students to engage critically with the content and develop practical solutions to challenges. Additionally, adaptive learning technologies, which offer personalized instruction and feedback, are seen as valuable tools for fostering lifelong learning. By creating learning environments that prioritize adaptability and continuous skill development, educators aim to better prepare students for the demands of a rapidly changing global workforce, where the ability to learn, unlearn, and relearn will be essential for success.

Transformative Potential of Educational Technology

The research findings indicate that educators recognize the potential of educational technology to transform teaching and learning practices significantly. Technological advancements, such as artificial intelligence, virtual reality, and adaptive learning platforms, are seen as powerful tools that can revolutionize pedagogy by creating more interactive, personalized, and engaging educational experiences. Educators who leverage educational technology tools have the potential to enhance student learning outcomes through customized instruction, immediate feedback, and immersive learning experiences not previously possible in traditional educational settings. Educators view this shift as a driving force to transition from passive knowledge transfer to more student-centered, active learning approaches to foster deeper engagement and critical thinking skills. Additionally, the flexibility and accessibility of technology create an inclusive learning environment catering to various learning styles and preferences.

The potential advantages of technology in education are substantial, but they also present challenges that educators must confront. One major concern is the issue of digital equity and access, as not all students have equal access to the technology required for advanced learning. The digital divide, particularly for students from underrepresented or disadvantaged backgrounds, poses a risk of increasing educational inequalities. Additionally, educators must navigate the ethical implications of relying on data-driven technologies, including concerns about student privacy and the use of personal data. As technology continues to evolve, educators are tasked with ensuring that its integration into education is impartial, ethical, and supportive of all learners while also managing the complexities and uncertainties associated with the ongoing rapid changes.

Research Question Response: Expanding and Empirically Supporting Connectivism

How do educators perceive and anticipate the evolution of teaching methods in response to technological advancements and the increasing focus on connectivism in higher education? The research study's findings reveal that educators perceive the inevitable and transformative nature of the evolution of teaching methods in response to technological advancements. Educators in higher education view technology as fundamentally reshaping educational approaches, transitioning from traditional, instructor-led models to more student-centered and flexible approaches. Educational technological tools, such as learning management systems (LMS), online platforms, and

multimedia resources, are considered essential in creating interactive and engaging learning environments. Participants emphasized the increasing role of artificial intelligence (AI) and adaptive learning platforms in providing personalized learning experiences. These technologies enable real-time feedback, content adjustments based on individual student progress, and the increase of student engagement in the learning environment tailored to each student's needs. Educators anticipate that AI-driven tools will significantly enhance the accessibility and customization of education, ultimately leading to improved student engagement and academic performance.

In the context of connectivism, educators are increasingly recognizing learning as a networked process. Students are expected to establish connections between diverse sources of information, peers, and digital communities. The transition from traditional classroom-based teaching to online collaboration and global learning networks is essential to this transformation. Educators anticipate that the emphasis on collaborative learning environments will continue to expand, aided by platforms such as Zoom, Microsoft Teams, Slack, Discord, and social media, which support peer interaction and the co-creation of knowledge. Implementation of these technologies aligns with the principles of connectivism, where knowledge is formed through engagement in interconnected digital spaces. Educators anticipate that as students become more engaged in global learning communities, the emphasis will shift from delivering content to guiding students in navigating and synthesizing information from various disseminated sources. Educators maintain an optimistic outlook on the future of teaching methods, which recognizes the essential role of educational technology and connectivism in transforming the evolution of adaptable, collaborative, and networked learning experiences in higher education.

DISCUSSION

The findings of this research have significant implications for higher education practice, particularly in the design and implementation of educational technology to enhance learning outcomes. Educators are encouraged to integrate adaptive learning systems and AI-driven platforms, which provide real-time, personalized feedback and enable tailored learning experiences. These educational technology tools can adjust content delivery based on individual student progress and foster more engaged and effective learning. Administrators should focus on creating technology-rich learning environments by incorporating platforms such as learning management systems (LMS), which centralize resources and facilitate both synchronous and asynchronous learning. Additionally, implementing online collaboration tools, such as Microsoft Teams and Zoom, allows for more dynamic student interaction, particularly in networked learning contexts. Policymakers must prioritize digital equity, which ensures all students have access to the necessary technology and resources. This will require investment in infrastructure and support systems to bridge the digital divide, ensuring that technology-enhanced learning is inclusive and equitable for all learners.

The research also contributes to the theoretical development of connectivism by providing empirical support for its relevance in contemporary education. The findings align with connectivism's emphasis on learning through networks, where students build knowledge by engaging with digital tools and collaborating with peers across diverse platforms. The study suggests that AI-driven adaptive learning can be considered an extension of connectivism. AI enables the formation of personalized learning networks, where technology mediates connections and actively adapts content to learners' needs, further reinforcing the concept of distributed knowledge. This adaptation adds a layer of complexity to connectivism by expanding its scope to account for the evolving role of artificial intelligence and personalized learning in modern educational environments.

The use of hermeneutic phenomenology in this study was essential for understanding educators' complex, subjective experiences as they navigate digital learning environments. By focusing on participants' lived experiences, this approach provided insights into how educators interpret and adapt to the use of educational technology. Hermeneutic phenomenology helps bridge theory and practice by revealing how theoretical concepts, such as connectivism, manifest in real-world educational settings. This method allows for a deeper understanding of how educators and students interact with technology while ensuring that theoretical frameworks remain grounded in the practical realities of teaching and learning. By interpreting individual experiences, hermeneutic phenomenology offers a more nuanced view of how educational technologies can be designed and implemented to meet users' needs, ultimately fostering more effective and meaningful learning outcomes.

CONCLUSION

The study offers valuable insights into how educators perceive and anticipate the changes in teaching methods due to technological advancements and the increasing focus on connectivism in higher education. The main findings reveal that educators consider integrating educational technology, such as learning management systems (LMS), AI-driven platforms, and collaborative digital technology as essential for creating adaptable, personalized, and interconnected learning environments. Educational technologies are seen as necessary for promoting student-centered approaches, enabling learners to actively, adaptively, and collaboratively construct knowledge.

Additionally, educators recognize that digital technology is reshaping their roles, transitioning from being the primary sources of knowledge to facilitators who navigate students through intricate digital information networks. The implications of these findings for higher education are substantial, which emphasizes the importance of integrating technology to enhance student engagement, learning outcomes, and academic achievement to equip students for the demands of a rapidly evolving world.

The research study contributes significantly to the field of connectivism theory by expanding its application in modern educational contexts. While connectivism traditionally emphasizes learning through human and informational networks, this research introduces the role of educational technology and adaptive learning platforms as active participants in the knowledge-creation process. Technology, such as AI systems, can offer personalized learning paths and real-time feedback by extending the networked learning environment to help learners connect with the most relevant information and resources. The expansion of connectivism emphasizes the dynamic and evolving nature of learning in technology-enhanced settings, where students must navigate increasingly complex digital ecosystems. In practical terms, the research findings emphasize the importance of educators and institutions adopting technologies that align with connectivism principles, ensuring students acquire the skills to synthesize information from diverse sources.

To further explore the evolving relationship between educational technology and connectivism, future research should prioritize the empirical study of refining the connectivism framework within diverse educational contexts and with emerging technologies. Studies could examine how adaptive educational technologies impact students' capacity to form knowledge networks and how AI-driven systems influence the learning process across various disciplines, including STEM, social sciences, and the arts. Additionally, researchers should explore the role of virtual and augmented reality in enhancing connectivism learning environments, particularly in fields that heavily rely on experiential learning. Comparative studies across educational levels (e.g., K-12, higher education) and global regions could generate valuable insights into how technological and cultural factors impact the integration of educational technology and connectivism practices. Further exploration of digital equity and the ethical implications of digital technology in education is also critical to ensuring that educational technology fosters inclusive and equitable learning environments. By expanding the empirical base of connectivism and exploring its practical applications, future research can continue to inform both theory and practice in higher education.

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