Techno-Pedagogical Orientation and Digigogy Skills among Prospective Teachers

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***Abstract*—The digital transformation of education has significantly altered teaching learning processes, particularly within teacher education programmes. In the contemporary educational landscape, prospective teachers are expected to possess not only content knowledge and pedagogical competence but also the ability to integrate digital technologies meaningfully into classroom practices. This integration is conceptualized as techno-pedagogical orientation. Alongside this, the emergence of digigogy digital pedagogy has emphasized the need for teachers to develop specific skills related to technology-supported teaching, learning, and assessment. The present paper conceptually examines the relationship between techno-pedagogical orientation and digigogy skills among prospective teachers. Drawing upon theoretical perspectives and existing research literature, the study proposes a conceptual framework explaining how techno-pedagogical orientation may influence the development of digigogy skills. The paper further identifies key research gaps and suggests directions for future empirical investigations. The study offers important implications for teacher education curriculum design, professional development, and policy formulation aimed at strengthening digital competencies among future teachers.**

***Index Terms*—Techno-pedagogical orientation, Digigogy skills, Prospective teachers, Teacher education, Digital learning**

I. INTRODUCTION

The rapid advancement of digital technologies has profoundly transformed educational practices across the globe. Teaching learning processes are no longer confined to traditional classroom settings; instead, they increasingly incorporate digital tools, online platforms, and technology-supported instructional strategies (Akram et al., 2022; Yarbro et al., 2016). This transformation has placed new expectations on teachers, requiring them to possess not only strong subject knowledge and pedagogical competence but also the ability to integrate technology effectively into their teaching practices(Ngao et al., 2022). As a result, teacher education programmes are being restructured to prepare future teachers who can respond to the demands of technology-rich learning environments.

In the context of teacher education, the concept of techno pedagogical orientation has gained considerable importance. Techno-pedagogical orientation refers to the readiness, inclination, and competence of teachers to blend technological tools with pedagogical approaches in order to enhance the teaching learning process. It involves an understanding of how technology can be meaningfully aligned with instructional objectives, learner needs, and classroom contexts(Asad et al., 2021). Prospective teachers with a strong techno pedagogical orientation are more likely to adopt innovative teaching strategies, design engaging learning experiences, and utilize digital resources effectively to support student learning(Huang et al., 2024).

Alongside techno-pedagogical orientation, the emergence of digigogy digital pedagogy has become a significant development in contemporary education. Digigogy emphasizes the pedagogical use of digital technologies to promote interactive, learner-centred, and flexible learning experiences(Huang et al., 2024). Digigogy skills encompass a range of competencies, including digital content creation, use of multimedia and online tools, management of virtual or blended classrooms, technology-based assessment, and facilitation of collaborative learning through digital platforms. These skills are particularly relevant in the present educational scenario, where blended learning, online instruction, and flipped classroom models are increasingly adopted(Mulenga & Shilongo, 2024; Pulham & Graham, 2018).

Prospective teachers enrolled in B.Ed programmes represent the future teaching workforce and play a crucial role in shaping the quality of education.

Developing digigogy skills during the pre-service stage is essential, as it enables student-teachers to confidently implement digital pedagogy in real classroom situations. However, the acquisition of digigogy skills is not automatic; it is influenced by various factors, including exposure to technology, institutional support, training opportunities, and, importantly, the techno-pedagogical orientation of the prospective teachers themselves. Without a positive orientation towards integrating technology with pedagogy, the effective development and application of digigogy skills may remain limited(Hauck et al., 2020; Rowston et al., 2021).

Although several studies have highlighted the importance of technology integration and digital competence in education, there is limited conceptual clarity regarding the relationship between techno-pedagogical orientation and digigogy skills, particularly among prospective teachers in teacher education programmes. Understanding this relationship is vital for designing effective teacher preparation curricula and professional development initiatives. Therefore, the present study seeks to conceptually examine techno-pedagogical orientation and digigogy skills among prospective teachers, emphasizing their interconnection and significance in contemporary teacher education(Orakova et al., 2024; Prestridge, 2017; Weisberg & Dawson, 2023).

II. CONCEPTUAL BACKGROUND

The conceptual background of the present study is grounded in contemporary theories of technology integration and digital pedagogy in teacher education. In the rapidly evolving educational landscape, effective teaching requires more than the mere use of technological tools; it demands a thoughtful integration of technology with pedagogical principles. The constructs of techno-pedagogical orientation and digigogy skills provide a comprehensive framework for understanding how prospective teachers engage with technology-supported teaching and learning processes.

2.1 Techno-Pedagogical Orientation

Techno-pedagogical orientation refers to the disposition, readiness, and competence of teachers to integrate technology with pedagogy in a purposeful and meaningful manner. It encompasses cognitive, affective, and behavioural dimensions, including awareness of digital tools, positive attitudes toward technology use, and the ability to apply technological resources to enhance instructional effectiveness. This orientation goes beyond technical proficiency and emphasizes the pedagogical rationale behind technology use in the classroom.

From a theoretical perspective, techno-pedagogical orientation is closely aligned with constructivist learning theories, which emphasize active learning, learner engagement, and knowledge construction through meaningful experiences. Teachers with a strong techno-pedagogical orientation are more likely to design learning environments that encourage interaction, collaboration, and critical thinking through the effective use of digital technologies. They are also better equipped to select appropriate tools that align with learning objectives and student needs.

In the context of teacher education, techno-pedagogical orientation is shaped by various factors, such as exposure to technology-integrated instruction, institutional support, availability of digital infrastructure, and opportunities for hands-on practice during training. Prospective teachers who receive systematic training in technology integration develop greater confidence and motivation to experiment with innovative teaching methods. Consequently, fostering a positive techno-pedagogical orientation during the pre-service stage is essential for preparing teachers who can adapt to the dynamic demands of modern classrooms.

2.2 Digigogy Skills

Digigogy skills refer to the competencies associated with the pedagogical use of digital technologies to facilitate effective teaching and learning. The term “digigogy” combines digital technology with pedagogy and emphasizes learner-centered, flexible, and interactive instructional approaches. Digigogy skills include the ability to design digital learning materials, use multimedia resources, manage online or blended classrooms, conduct technology-based assessments, and promote collaboration through digital platforms.

These skills are particularly important in contemporary educational contexts characterized by blended learning, online education, and flipped classroom models. Teachers with strong digigogy skills can create engaging and inclusive learning environments that cater to diverse learning styles and needs. They are capable of integrating synchronous and asynchronous learning activities,

providing timely feedback through digital tools, and supporting continuous learner engagement beyond the physical classroom.

For prospective teachers, the development of digigogy skills during teacher education programmes is crucial. Pre-service training provides an opportunity to familiarize student-teachers with emerging digital tools and pedagogical strategies before they enter the teaching profession. However, the acquisition of digigogy skills depends largely on the teachers' willingness to adopt technology and their understanding of its pedagogical value. Without a supportive techno-pedagogical orientation, the effective development and application of digigogy skills may remain limited.

2.3 Relationship between Techno-Pedagogical Orientation and Digigogy Skills

Techno-pedagogical orientation and digigogy skills are conceptually interrelated constructs. Techno-pedagogical orientation serves as a foundational element that influences the extent to which prospective teachers develop and apply digigogy skills. A positive orientation towards technology integration encourages student-teachers to explore digital tools, adopt innovative pedagogical practices, and continuously enhance their digital teaching competencies.

Prospective teachers who demonstrate a high level of techno-pedagogical orientation are more likely to perceive technology as an enabler of effective teaching rather than as a challenge. This perception facilitates the development of digigogy skills and supports the implementation of technology-enhanced instructional strategies. Conversely, a lack of techno-pedagogical orientation may hinder the meaningful use of digital pedagogy, even when technological resources are available.

Thus, understanding the conceptual linkage between techno-pedagogical orientation and digigogy skills is essential for strengthening teacher education programmes. By fostering a positive techno-pedagogical orientation, teacher educators can create conditions that support the systematic development of digigogy skills among prospective teachers, ultimately contributing to improved teaching effectiveness and quality education.

III. REVIEW OF RELATED LITERATURE

The integration of technology into education has become paramount in the 21st century, necessitating that prospective teachers develop robust techno-pedagogical orientations and digigogy skills to effectively prepare students for a digitally-driven world (Howard et al., 2021). This literature review explores current research on these critical areas, examining the concepts of techno-pedagogical orientation, digigogy skills, the challenges in their development, and strategies for enhancing them in teacher education programs.

3.1 Techno-Pedagogical Orientation and TPACK

Techno-pedagogical orientation refers to a teacher's readiness and approach to integrating technology into their pedagogical practices. A key framework in this area is Technological Pedagogical Content Knowledge, which emphasizes the interconnectedness of technology, pedagogy, and content knowledge (Tondeur et al., 2019). Studies highlight the importance of preparing pre-service teachers with the knowledge and skills needed to effectively teach with technology, suggesting that a comprehensive understanding of TPACK is crucial (Özden et al., 2024). Research by Valtonen et al. provides insights into pre-service teachers' self-appraisal of their challenging and confident TPACK areas, offering "fresh perspectives" on this confidence (Valtonen et al., 2020).

The development of technopedagogical competencies among pre-service teachers is a recurring theme in the literature. Ayvacı, Şimşek, and Bebek found that pre-service science teachers often have high perceptions of their active learning and technopedagogical competencies, particularly those who have enrolled in technology-related science courses (Ayvacı et al., 2019). However, the effectiveness of various strategies in developing TPACK, such as using teacher educators as role models, reflecting on technology's role, and authentic technology experiences, remains an area of ongoing investigation (Tondeur et al., 2019). It is argued that teacher education programs need to provide a well-planned sequence of courses and experiences to help teachers understand and apply technology effectively (Afshari et al., 2009).

3.2 Digigogy Skills and Digital Competence

"Digigogy skills" can be understood as encompassing a broader range of digital competencies necessary for effective teaching in the digital age, often including digital literacy, critical evaluation of digital content, creation of digital resources, and digital communication (Ivaniuk et al.,

2020). The ability to utilize various technical tools, internet resources, and engage in global connectivity and cooperation are fundamental for educators (Gulnara et al., 2022). Organizations like the International Society for Technology in Education provide guidance and standards for integrating appropriate pedagogical approaches for technology use by teachers (Özden et al., 2024).

Numerous studies emphasize the urgent need for teachers to adjust to technological transformations by integrating digital technology into classroom learning (Maghfiroh et al., 2023). This includes the development of a certain set of abilities, knowledge, and attitudes for the technical, pedagogical, and didactic integration of Information and Communication Technologies (Maghfiroh et al., 2023). Research indicates that while pre-service teachers may be eager to adopt new digital tools, many still require additional time for inquiry, reflection, and group support to advance their digital competence to an expert level (Maghfiroh et al., 2023). Ivaniuk, Kuzemko, and Novik analyzed the European Digital Competence Framework for Educators to identify essential digital skills for modern educators, highlighting areas like the use of digital devices, critical evaluation of content, and digital communication (Ivaniuk et al., 2020).

3.3 Challenges and Strategies in Developing Skills

Despite the recognized importance, challenges persist in adequately preparing prospective teachers in techno-pedagogical orientation and digigogy skills. Some studies suggest that teacher education programs have struggled to fully prepare student teachers in professional digital competence, with students often relying on personal experiences rather than structured educational interventions (Almås et al., 2021). Dolezal, Motschnig, and Ambros found that a significant portion of pre-service teachers do not feel sufficiently prepared by their study programs to foster digital competence, particularly those not studying STEM subjects (Dolezal et al., 2025)(Dolezal et al., 2025) This highlights a "call for action" for universities to develop holistic concepts to integrate digital skills into teacher education curricula (Dolezal et al., 2025).

Strategies for developing these skills include providing continuous feedback, fostering collaboration with peers, and scaffolding authentic technology experiences (Tondeur et al., 2019). There is a need for robust digital competence frameworks that can guide the preparation of future teachers (Rakisheva & Witt, 2022). Furthermore, research suggests that a concurrent focus on both instrumental and epistemic dimensions of professional digital competence can better support teacher preparation for the digital age (Aagaard et al., 2024). Training programs designed to develop digital competencies, such as those structured around the DigComp framework, have shown promise in enhancing pre-service teachers' skills and their application in future professional careers (Reisoğlu & Çebi, 2020). The integration of technology in teacher training should not merely be about offering instructional technology courses but about infusing technology throughout all courses and instructional practices (Afshari et al., 2009).

IV. CONCEPTUAL FRAMEWORK

A conceptual framework provides a systematic explanation of the key variables involved in a study and illustrates the assumed relationship between them based on theoretical understanding and previous research(Johnson, 2017; Koehler et al., 2013). In the present study, the conceptual framework is developed to explain the relationship between techno-pedagogical orientation and digigogy skills among prospective teachers. The framework is grounded in the assumption that effective integration of technology in teaching depends not merely on access to digital tools, but on teachers' orientation toward combining technology with pedagogical practices. Techno-pedagogical orientation represents prospective teachers' readiness, attitudes, and competence in using technology as an instructional resource. It includes awareness of digital tools, confidence in technology use, pedagogical understanding of technology integration, and willingness to adopt innovative teaching strategies (Aldhilan et al., 2024; Prestridge, 2017).

Digigogy skills, on the other hand, refer to the practical application of digital pedagogy in teaching–learning processes. These skills involve designing digital learning materials, using multimedia and online platforms, managing virtual or blended classrooms, conducting technology-based assessments, and facilitating interactive and collaborative learning through digital tools. Digigogy skills reflect the extent to which prospective teachers can translate their techno-pedagogical orientation into effective instructional

practices(Akram et al., 2022; Mishra & Koehler, 2006; Taliak et al., 2024).

The conceptual framework proposes a direct relationship between techno-pedagogical orientation and digigogy skills. It assumes that prospective teachers who possess a higher level of techno-pedagogical orientation are more likely to develop and demonstrate stronger digigogy skills(Mgeladze & Kapanadze, 2025). A positive orientation toward technology integration encourages experimentation, innovation, and continuous learning, which enhances digital pedagogical competence. The framework acknowledges that teacher education programmes play a crucial role in shaping both techno-pedagogical orientation and digigogy skills. Exposure to technology-integrated instruction, opportunities for hands-on practice, and institutional support may strengthen techno-pedagogical orientation, thereby facilitating the development of digigogy skills. Although these contextual factors are not examined empirically in the present study, they provide important directions for future research.

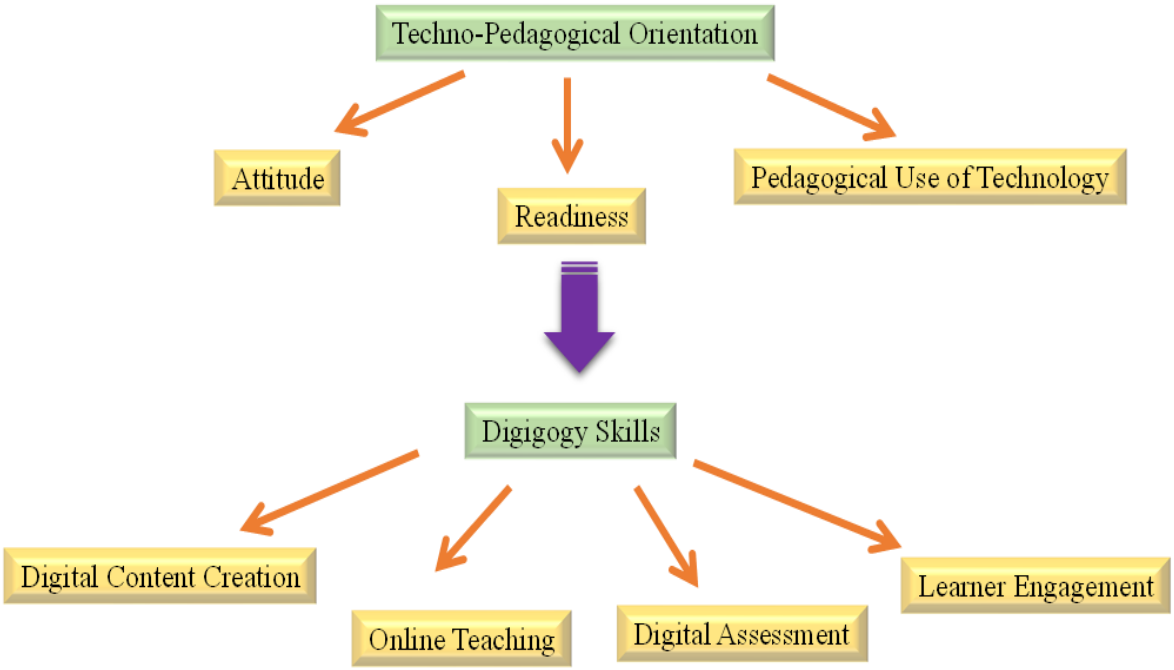

Figure: Conceptual Framework showing the influence of Techno-Pedagogical Orientation (attitude, readiness, and pedagogical use of technology) on Digigogy Skills (digital content creation, online teaching, digital assessment, and learner engagement)

V. RESEARCH GAP

A critical review of existing literature reveals that the integration of technology in education has been widely explored from multiple perspectives, including techno-pedagogical competence, digital literacy, and the use of educational technology in teaching–learning processes. Several studies have examined teachers' attitudes toward technology, their technological skills, and the effectiveness of technology-supported instruction. Similarly, a growing body of research has focused on digital pedagogy and the development of digigogy skills among teachers and learners (Gao et al., 2011; Li, 2024; Taliak et al., 2024).

However, despite the increasing emphasis on technology integration in teacher education, significant gaps remain in the existing literature. Most studies have primarily focused on in-service teachers, while relatively fewer studies have examined prospective teachers enrolled in B.Ed programmes, who represent the future teaching workforce. This lack of focus on pre-service teachers limits the understanding of how techno-pedagogical competencies and digital pedagogical skills are developed during the formative stage of teacher education (Demissie et al., 2022; Große-Heilmann et al., 2022; Tomczyk, 2024). Furthermore, existing research often treats techno-pedagogical orientation and digigogy skills as independent constructs. While studies have examined these variables separately, there is a scarcity of research that conceptually and systematically explores the interrelationship

between techno-pedagogical orientation and digigogy skills. Limited attention has been given to understanding how a teacher's orientation toward integrating technology with pedagogy influences the practical application of digital pedagogy(Loveless, 2011; Rodés et al., 2021). Another notable gap in the literature is the lack of conceptual frameworks that synthesize theoretical perspectives and empirical findings to explain the linkage between techno-pedagogical orientation and digigogy skills within the context of teacher education. Most existing studies are empirical in nature and do not adequately address the underlying conceptual relationships that can guide curriculum design and instructional practices in B.Ed programmes(Abedi, 2023; Foulger et al., 2019).

Moreover, there is limited research conducted in the Indian teacher education context, particularly in relation to policy initiatives such as NEP-2020, which emphasize digital competence and technology integration in teaching. The absence of context-specific conceptual studies restricts the development of localized strategies for enhancing digital pedagogy in teacher education institutions(Hauck et al., 2020; Kaur, 2024; Vaithianathan et al., 2024).

In view of these gaps, the present study attempts to conceptually examine the relationship between techno-pedagogical orientation and digigogy skills among prospective teachers. By proposing a conceptual framework and synthesizing existing literature, the study aims to contribute to the existing body of knowledge and provide a foundation for future empirical research in teacher education.

VI. PROPOSED METHODOLOGY

The present study proposes to examine the relationship between techno-pedagogical orientation and digigogy skills among prospective teachers. As the study is conceptual in nature, the following methodology is suggested for future empirical validation of the proposed framework.

6.1 Research Design

The proposed study may adopt a descriptive and correlational research design. This design is considered appropriate as it enables the researcher to describe the levels of techno-pedagogical orientation and digigogy skills among prospective teachers and to examine the relationship between the two variables without manipulating them.

6.2 Population and Sample

The population of the proposed study may consist of prospective teachers enrolled in the B.Ed programme offered by teacher education institutions. A representative sample may be selected using random sampling or stratified random sampling techniques to ensure adequate representation of gender, subject specialization, and type of institution. The proposed sample size may range from 200 to 300 prospective teachers, depending on feasibility and availability.

6.3 Variables of the Study

- Independent Variable: Techno-Pedagogical Orientation
- Dependent Variable: Digigogy Skills

6.4 Tools for Data Collection

The following tools may be used for collecting data in the proposed study:

a. Techno-Pedagogical Orientation Scale

A standardized or researcher-constructed tool may be used to measure the level of techno-pedagogical orientation among prospective teachers. The scale may include dimensions such as technological awareness, pedagogical application of technology, attitude towards technology use, and instructional readiness.

b. Digigogy Skills Scale

A standardized or validated scale may be employed to assess digigogy skills. The tool may measure competencies related to digital content creation, use of online teaching platforms, digital assessment, classroom management in virtual environments, and learner engagement through digital tools.

6.5 Procedure of Data Collection

Permission may be obtained from the heads of the selected teacher education institutions before data collection. The tools may be administered to the prospective teachers during regular class hours with prior consent. Clear instructions may be provided to the respondents to ensure accurate and honest responses. Confidentiality of responses may be maintained.

6.6 Statistical Techniques

The collected data may be analyzed using appropriate statistical techniques such as:

- Mean and Standard Deviation to determine the level of techno-pedagogical orientation and digigogy skills

- Pearson's Product Moment Correlation to examine the relationship between the variables
- Regression Analysis to study the predictive influence of techno-pedagogical orientation on digigogy skills
- *t*-test or ANOVA to analyze differences based on selected demographic variables, if included

6.7 Ethical Considerations

The proposed study will adhere to ethical standards of educational research. Participation will be voluntary, informed consent will be obtained from the respondents, and anonymity and confidentiality of data will be ensured. The data will be used solely for academic research purposes.

VII. EDUCATIONAL IMPLICATIONS

The conceptual analysis of techno-pedagogical orientation and digigogy skills among prospective teachers offers several important implications for teacher education programmes, curriculum planners, teacher educators, and educational policymakers. In the context of rapid digital transformation in education, these implications are particularly relevant for strengthening the quality and effectiveness of pre-service teacher preparation.

1. Teacher education curricula should emphasize the integration of technology with pedagogy. Educational technology courses should focus on practical and pedagogical applications of digital tools rather than limiting instruction to theoretical aspects.
2. B.Ed programmes should provide structured opportunities for prospective teachers to develop digigogy skills through digital lesson planning, multimedia content creation, online teaching simulations, and technology-based assessment practices.
3. Teaching practice components should incorporate technology-enabled instruction. Student-teachers should be encouraged to use digital tools during practice teaching to gain real-world experience in applying digital pedagogy.
4. Teacher educators should model effective techno-pedagogical practices in their classrooms. Regular professional development programmes should be organized to enhance faculty competence in digital pedagogy and innovative instructional strategies.
5. Teacher education institutions should ensure the availability of adequate technological infrastructure, such as smart classrooms, reliable internet connectivity, learning management systems, and access to digital learning resources.
6. Educational policymakers and accrediting bodies should include techno-pedagogical competence and digigogy skills as essential components of teacher education standards, in alignment with national educational initiatives such as NEP-2020.
7. Strengthening techno-pedagogical orientation and digigogy skills among prospective teachers will better prepare them to adapt to emerging teaching–learning modes, including blended, online, and technology-enriched classrooms.

VIII. CONCLUSION

The rapid integration of digital technologies into educational practices has significantly reshaped the role of teachers in contemporary classrooms. In this context, the present conceptual study examined the relationship between techno-pedagogical orientation and digigogy skills among prospective teachers. By synthesizing theoretical perspectives and existing research literature, the study highlighted the importance of preparing future teachers who are capable of effectively integrating technology with pedagogy.

The analysis emphasized that techno-pedagogical orientation serves as a foundational element for the development of digigogy skills. Prospective teachers who demonstrate positive attitudes, readiness, and competence in integrating technology are more likely to acquire and apply digital pedagogy skills in meaningful ways. The proposed conceptual framework illustrates how a strong techno-pedagogical orientation can facilitate the development of digigogy skills, enabling student-teachers to design engaging, learner-centered, and technology-supported instructional practices.

The study also identified significant research gaps in the existing literature, particularly the limited focus on prospective teachers and the lack of conceptual models linking techno-pedagogical orientation with digigogy skills in teacher education programmes. By addressing these gaps, the present paper contributes to the theoretical understanding of digital pedagogy and offers a foundation for future empirical research in this area.

Furthermore, the educational implications of the study underscore the need for teacher education institutions to prioritize techno-pedagogical training and systematic development of digigogy skills. Strengthening these competencies during the pre-service stage can enhance teaching effectiveness and ensure that future teachers are well-prepared to meet the demands of technology-rich learning environments.

In conclusion, fostering techno-pedagogical orientation and digigogy skills among prospective teachers is essential for improving the quality of teacher education and supporting sustainable educational development. The present conceptual study provides valuable insights for educators, curriculum designers, and policymakers and serves as a guide for future research aimed at empirically validating the proposed framework.

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