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Bridging the Global–Local Divide: University Faculty Perceptions on Adapting International Digital Literacy Frameworks for Teacher Education Programs in Karachi

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Abstract

The study explores the perceptions of the faculty members on the applications of global digital literacy frameworks, i.e., DigCompEdu and ISTE, in the context of teacher education programs in universities of Karachi, Sindh. The teacher education programs (such as B. ED Hons) equip the pre-service teachers with pedagogical competency, providing skilled teachers to the education sector in the province. Adopting the semi-structured interview with 20 faculty members from departments of education, public and private sector universities in Karachi, with an exploratory research design, in addressing a gap between international digital literacy frameworks and local pedagogical practices, connecting to social and cultural realities. The findings suggest that global frameworks for digital pedagogical competencies cannot be totally executed in the current teacher education structure in the universities of Karachi. However, a combined framework using global and local standards to design a suitable framework in connection to the cultural, social, and educational realities can be more effective for teacher education programs in Pakistan. Hence, a direct adoption of these standard frameworks is impractical to train pre-service teachers' exclusion of locally social and cultural practices. A practical and flexible framework is proposed in this study. The future studies shall analyze the critical implications of global-local digital frameworks, and the assessment of the digital training of the prospective teachers in the teacher education programs in Karachi, Sindh.

Keywords: Global-Local Divide, Faculty Perceptions, Digital Literacy Frameworks, Teacher Education Programs

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Introduction

The digital literacy transforms the education position of prospective teachers (pre-service teachers) and training for the effectiveness to generate qualified future teachers for the 21st century, including central pedagogical competency (Ahmed, Hashmi & Zaib, 2025). The globally structured frameworks, i.e., the European Union's DigCompEdu (Aiastui, Arruti & Morillo, 2021), and International Society for Technology in Education (ISTE) (Marwa, Saputra & Herlinawati, 2024), are standard and dominant models with a diverse integration of technological tools and teaching practices with learning approaches (Ahmed, Hashmi & Zaib, 2025).

These digital competency frameworks have pedagogically practical guidelines and standards in advocating the design of collaboration for the digital teaching and learning platforms. Adopting these global frameworks can dominate the social and cultural setting of a particular region, and a conducive infrastructure is hardly met to execute these frameworks of digital teaching-learning standards (Caena & Redecker, 2019). The application of standard digital frameworks in developing countries has diverse challenges, whereas higher education in Pakistan faces a persistent digital divide, issues such as electricity disconnection, unstable internet connection, and scarcity of digital infrastructure (Idowu-Lamid et al., 2021).

Moreover, the teachers' training programs in Pakistan have a limited digitally equipped pedagogical structure, with a lack of advanced technological transformation, hardly connected to social and cultural practices (Akram et al., 2021). Efforts have been made in the digital era for the growth of pedagogical practices, contributing to the Digital Pakistan Vision (Khalid et al., 2024), where HEC collaborated in the capacity-building of the projects of digital literacy and pedagogical skills (Lateef et al., 2024). The digital pedagogical models rarely suit the developing countries' educational structure, due to infrastructure and cultural divide, rather than globally standardized digital frameworks such as DigCompEdu (Kalolo, 2019).

The studies in the context of Pakistan highlight the excessive drawbacks in the execution of the global frameworks, with a lack of technological advancement, issues in stable electricity or internet connections, and infrastructure loopholes in the higher education institutions (Asad, Gul & Lashari, 2020). The study has explored the global-local divide in the execution of the digital competency frameworks for the training of pre-service teachers in the universities of Karachi, Sindh. However, a smaller number of studies contributed in context to observe and target the globally practiced frameworks in the developing country's higher education teacher education programs, preparing future teachers with digital pedagogical skills and competency. These frameworks' applicability has been explored with the aim to critique on global standards in connection to local needs and realities. Therefore, indicating the background and the global-local divide of digital competency frameworks, the study sought to address these research objectives.

- To explore the university faculty's perceptions on the application of the global digital literacy frameworks in the training of pre-service teachers in Karachi, Sindh.
- To analyze the factors of global digital literacy frameworks in the context of local infrastructure, pedagogical practices, and cultural and social connections for their implementation in teacher education programs.

Literature Review

The Importance of Digital Literacy in Teacher Education Programs

The implication of digital literacy models has become a necessity in equipping the prospective teachers (pre-service teachers) in coming behind the trend of traditional teaching and learning culture or setup (Borthwick & Hansen, 2017). The world is growing with artificial

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intelligence and technological advancement, where the pedagogical format has transformed into digital literacy models, connecting the pre-service teachers with the global teaching and learning standards, skilled in digital pedagogical standards and market demands (Zhang & Zhang, 2024). These digital frameworks bring pedagogically competent teachers in 21st century, communicate and collaborate with advanced digital skills (Yao & Wang, 2024). Nonetheless, the European Union developed DigComp 1.0, with some changes. It was upgraded and launched DigComp 2.0 in 2016; its third version was launched in 2017 as DigCompEdu 2.1, its latest and last version was upgraded and launched in 2022 as DigComp 2.2 (Vuorikari, Kluzer & Punie, 2022). Its Core areas mentioned in the study of Vuorikari et al. (2022), classifying as displayed in the figure 01, such as Information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving.

Figure 1: DigComp 2.2

In the teacher education programs, the evolution of digital literacy is transforming from technical skills to core pedagogical competency, designing the learning patterns with modern standards, collaborating with global models to set a critical and student-centered approach (Asad, Gul & Lashari, 2020). This evolution has supported in adopting digital learning tools, based on the instructional designs, assessing the pre-service teachers, leading to digital integration in training the prospective teachers (Falloon, 2020).

The Standards of Global Digital Frameworks

The global frameworks of digital transformation have changed the developing countries' teachers' education programs, integrating these frameworks in the pedagogical transformation, to skill the pre-service teachers with the modern standards of teaching and learning. The framework of the European Union's DigCompEdu has key standards for educators engaging in professional development and empowering the learning platforms for future educators (Redecker & Punie, 2017).

The ISTE standards bring digital competency among educators, promoting more creative and collaborative practices (Boger, 2025), whereas UNESCO's ICT Competency Framework for Teachers strengthens the policy measures for pedagogical practices to transform an effective education system (Mtebe, 2020). Further elaborated by Moore, Butcher

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and Hoosen (2016). where indicated key indicators and factors the UNESCO ICT CFT model elaborated in the stud

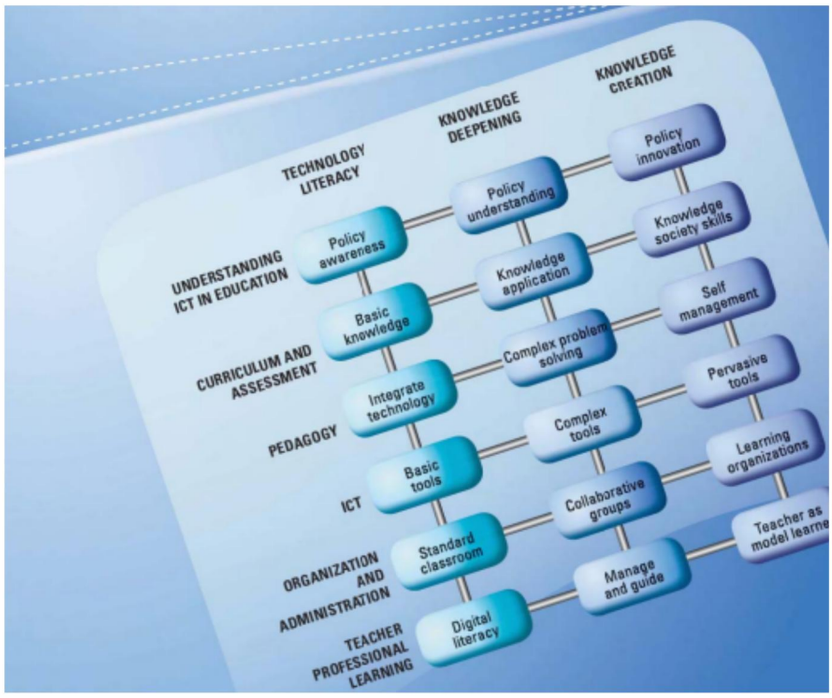

Figure 2: UNESCO's ICT-CFT

However, all such digital frameworks bring competency in the teachers' pedagogical upbringing to connect with the digital world requirements and realities. The structured digital frameworks can set benchmarks for increasing the systematic change in the teacher education programs, in reference to local link and vision of worldwide pedagogical practices.

The Developing Countries, Disconnection, and Global Models

The application of global digital frameworks in the developing countries remain challenging, and problematic, as the studies argue that execution of standard frameworks require stable infrastructure, resources, and cultural connection (Helsper, 2021)), otherwise it shall remain questionable to set with the local educational system in countries like Pakistan and Sri Lanka (Hummel, Aldrian & Sheehan, 2024).

The issue of accessing resources, facilities to educational institutions, and trained or skilled human resource personnel remains difficult to adopt global digital literacy frameworks, due to disconnection to social and cultural norms across the South Asian regions (Mridha et al., 2025). The African regions face similar challenges in adopting these digital frameworks, including insufficient access to infrastructure and constraints in resource availability (Ndibalema, 2025).

The problem lies with the complete adoption of global frameworks, ignoring the localized context of resource accessibility, lack of trained and skilled pre-service teachers, infrastructure inefficiency, and governance mechanisms to manage the key threats in transforming the pedagogical practices (Sharma et al., 2016; Mariana & Nurjanah, 2023).

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Pakistan Policy and Practice Gap

The digital integration reflects the national frameworks of the Digital Pakistan Vision and initiatives of the Higher Education Commission (HEC), in support of digital advocacy and capability in improving the infrastructure and human resource skilled personnel (Happer, 2025; Jamil et al., 2025). However, besides that, global digital literacy adaptation shall hardly remain possible and applicable (Khan & Mahar, 2018). In addition to that the digital divide falls in policy and practice in Pakistan, where public and private sector institutions have varying infrastructure structure and accessibility to digital devices, urban and rural regions differences (Khan et al., 2023), and lack of operationalized skills developing the pedagogical integration for the use of technology into power dynamics towards communication, collaboration and skill development pursuit (Tomczyk & Fedeli, 2021).

The teacher training programs demand skills with pedagogical integration, use of technology, such as digital ethics, critical content creation, and these skills often fall in global frameworks, unfortunately ignored in the local context (Villar-Onrubia et al., 2022). Behind that, the studies claim that scarcity of resources with digital tools leads to weak pedagogical competency, often lacking change to critical engagement to global standards for professional growth in the teaching and learning system (Ameen & Gorman, 2009; Majeed, Ahmad, & Khan, 2025).

Theoretical Framework

This integrated framework acknowledges the multidimensional nature of digital competency and literacy by drawing upon various established models (Martínez-Bravo et al, 2022). This integrated framework offers a holistic perspective, emphasizing not only digital competencies but also broader skills crucial for contemporary education. It guides educators to navigate the digital landscape while enhancing teaching practices and fostering digital literacy among students (Falloon, 2020). Furthermore, it serves as the basis for developing contextually relevant digital competency frameworks tailored to the unique educational needs of Pakistan and similar diverse contexts (Asad, Gul & Lashari, 2020).

As the study guided with the social cognitive theory (SCT) structure of Bandura, engages to dynamic changes to global digital literacy frameworks (Purworini et al., 2024), response to teacher education realities in Pakistan, focus with the Technological Pedagogical Content Knowledge (TPACK) framework concern about the infrastructure constraints, policy practice gap, and institutional global and local divide in context to social and cultural change in the education setup in Pakistan (Aslam et al., 2021). Connecting with the theoretical lens of Kamsker, Janschitz, and Monitzer (2020), who conducted a study to clarify the effects of digital transformation on educational institutions and to outline the challenges that arise and need to be addressed in the pedagogical context. As suggested, teaching and learning processes need to be continuously developed due to changes in educational requirements as well as social and technological changes (Kamsker & Slepcevic-Zach, 2021). First, these technological changes are described, and second, the challenges facing higher education institutions of digital transformation are examined with strategies for the further development of higher education regarding digital transformation.

The e-learning platforms are revolutionizing the teacher education programs in the higher education system, as they offer tremendous potential to fulfill instructional plans, safeguard pre-service teachers' learning rights, and improve teaching quality (Khan et al., 2021). This research focuses on the theoretical context of a new hybrid multi-criteria decision-making approach on the basis of the fuzzy analytic hierarchy process and the evaluation based

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on distance from the average solution method to select the best e-learning platforms improving teacher education in Pakistan.

Conceptual Framework or Research Model

For this study, after going through the initial literature review, the research has considered elements of digital competency DigComp 2.2, which are: information, digital content creation, safety, problem solving, and communication. Elements of academic engagement are dedication, vigor, and absorption. Elements of digital informal learning: social motivational learning, metacognitive learning, and cognitive learning and digital self-efficacy as explained in the conceptual framework, abstracted from the study of Carretero, Vuorikari & Punie (2017) as illustrated in figure 03.

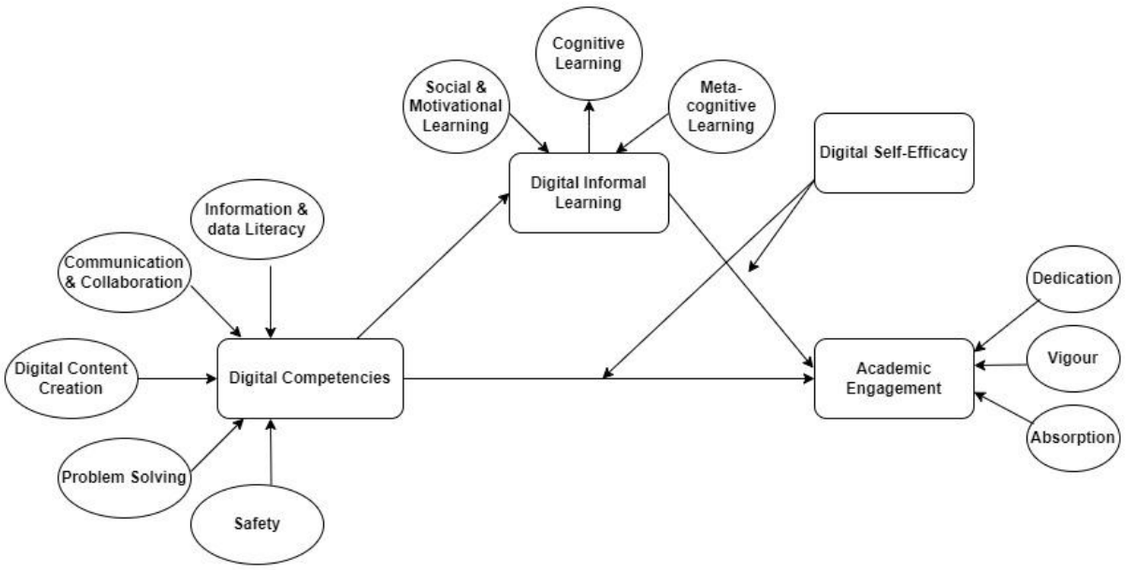

Figure 3: Conceptual Framework for Inductive Insights

Research Methods

The study employed the exploratory qualitative research design, following the interpretivist paradigm to examine the subjective investigation of the university faculty perceptions in adapting the global digital literacy frameworks, application to the teacher education programs in the public and private sector universities in Karachi, Sindh. The purposive sampling strategy was used to reach the relevant sample size, selecting a total of 20 faculty members from departments of education among four universities (two public and private) representing the teacher education programs' competencies in transforming the digital literacy skills among the prospective teachers (pre-service teachers).

A semi-structured interview was employed to collect the data from the faculty members in the four selected universities, applying a face-to-face meeting, with an estimated 45 to 60 minutes interview with each respondent. The thematic analysis method was used, applying Braun and Clarke's (2006) six-phase approach, such as identifying, analyzing, and reporting patterns drawn from the data. This applied transcribing the recorded interviews from 20 faculty members, notetaking the key concepts, followed by coding to develop and name the themes. In addressing the trustworthiness, intercoder reliability was developed based on the dual independent coding patterns. Following the ethical measures, the transcribing of the interview data is free from biases, ensuring written informed consent and confidentiality. This

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exploratory research process offered interpretive guidelines with rich and contextual insights (Ponelis, 2015).

Analysis and Results

The study used the thematic analysis method to interpret the semi-structured interviews collected from the 20 faculty members in the departments of education across four public and private universities in Karachi. The data is all connected to the faculty perceptions on the execution or application of the global digital frameworks in the teacher education programs. The participants acknowledged the global models such as DigCompEdu and ISTE, whereas the factors related to local context were found challenging, as misalignment in the local realities, such as the status of infrastructure, cultural and social ground realities directed a gap between the global and local divide. Executing the thematic analysis patterns to reach valuable themes and sub-themes, as illustrated by the faculty perceptions, and identifying the factors in global digital literacy frameworks in context to local structure.

Table 1: ***Themes and Sub-themes of the Study***

Themes	Sub-themes	Rationale
Foundational Utility vs. Contextual Void	• Provision of a Common Competency Language • Lack of Localized Exemplars & Case Studies • Absence of Culturally Relevant Ethical Guidelines	While frameworks provide a needed structure and professional lexicon, they fail to offer the situated, practical guidance required for implementation in Pakistan's unique socio-cultural and pedagogical environment.
Assumption of Universal Infrastructure	• Presumption of Reliable Technology Access • Expectation of Consistent Digital Connectivity • Uncritical Promotion of High-Bandwidth Tools	Frameworks are designed for technologically stable environments, creating an immediate and practical disconnect in contexts plagued by infrastructural instability, which renders many competencies theoretical.
Rigid Structure vs. Need for Adaptive Implementation	• Linear, Non-Adaptive Progression of Skills • Deficiency in Phased, Low-Resource Roadmaps • Gap in Supporting Incremental Institutional Change	The one-size-fits-all, linear progression from basic to advanced skills does not accommodate the wildly uneven starting points and systemic capacities of Pakistani institutions, offering ideals without feasible pathways.

Table 01 demonstrates what leads to the global-local divide, in the context of the adaptation of the digital literacy frameworks and the factors in nature to local context integration of these frameworks in the teacher education programs.

Theme 01: Foundational Utility vs. Contextual Void (Relevance)

The faculty members have acknowledged the global standard frameworks for integration in the prospective teachers' professional growth to future leaders of the education sector, with

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the vision to integrate the social and cultural context, the participant 04 added "Before it was only technology use, now having such frameworks help the learning more collaborative and assess to digital competency", whereas participant 02 argued that "having global digital literacy frameworks as the foundation, needs to be connected to local structure of the digital pedagogical competency."

The contextual void refers to the lack of local relevance of the global digital frameworks, whereas participants have argued that these models require locally adapted context to strengthen their reliability for training the pre-service teachers in the universities of Karachi, Sindh. The participant 12 articulated that "there is a clear gap in executing the Europea or American frameworks for digital competency, as these regions afford to provide technological facilities and infrastructure, while case is completely different in Pakistan." The participant 01 clearly stated that "preparing a lesson plan for 60 students with one projector, issue of electricity and internet dysconnectivity, finds me hard to justify use of modern technology" and participant 07 explained "we face digital competency issues as the classrooms communication are being operated via WhatsApp groups, a sad dilemma to connect to global frameworks." Hence, these frameworks provide foundations but lack the local efficacy to map the adaptation of global-local models for teacher education programs in Pakistan.

Theme 02: Assumption of Universal Infrastructure

The use of technologically stable frameworks creates assumptions to disconnect tangible measures where participants viewed that "infrastructure blindness" abrupt the digital competency. Participant 03 briefed that "the DigCompEdu mode is more theoretical in the situations where a complete department faculty shares one single multimedia, with an outdated version, under operation" and participant 16 assumed that "availability of resources makes it challenging to adopt global frameworks in teacher education context, assumptions to choice of tools, make it difficult to formulate ISTE-like frameworks." However, it requires global collaboration to adapt a comprehensive global-local digital literacy model in the universities of Karachi, Sindh. Participants 04 and 10 have similar arguments, stating that global digital models require a rural-urban divide, with infrastructure improvements to fit with the local context assumption, and participant 18 claimed that "the system of education requires more offline works as due to internet and electricity issues than executing the cloud-based collaborations to reality-based demands." Thus, the pedagogical reliance to work in constraint frameworks requires local frameworks besides the assumptions of universal infrastructure.

Theme 03: Rigid Structure vs. Need for Adaptive Implementation

The faculty perceptions reviewed where they critically argued that global digital literacy models fail to fit Pakistan's context, due to the current structural instability in the educational landscape or infrastructure of teacher education programs. P06 critique on "use of artificial intelligence is yet too far, and global digital frameworks are not a suitable fit, they require adaptive implementation besides the rigid structure."

The participant 08 elaborated that "DigCompEdu and other frameworks cannot work here in context to Pakistan's teacher education programs" while participant 05 narrated that "very few faculty has the competency to adapt global digital models, while others have traditional approach and skills" and participant 17 pointed "the traditional system of teaching competency, training the pre-service teachers are more manual, using outdated technological instruments, such as writing board, outdated projector use, and lack of modern resources." All these contexts argue that minimum facilities, lack of digital resources require proper

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adaptation of global frameworks, in building proper infrastructure, internet stable connectivity, and vision to digitally equip the teacher education departments in the universities of Karachi, Sindh.

Discussion

After the systematic analysis of the primary data, the findings explored a link between global digital literacy frameworks and local practices in leading teacher education programs to develop competency among the prospective teachers to lead better education quality in serving schools and colleges in Karachi, Sindh. The analysis reveals insights into the study objectives, in a complex and broader nature of the digital literacy to transform the grooming of the pre-service teachers across the universities of Karachi. However, faculty perceptions explored critical dialogue on the application of these global models, identifying the structural power of these frameworks, while criticism on genuinely implementing with no localized plans or measures. The study of Redecker and Punie (2017) argued that for professional discourse, it is important to observe the strengths and limitations of adapting these global frameworks.

In addressing the first research objective, the DigCompEdu and ISTE frameworks have strong vision to transform the pedagogical competency with the skills of digital literacy, whereas the application to teacher education programs, training the pre-service teachers via these domains cannot be justified due to ineffective infrastructure, social and cultural factors, the lack of technological facilities to the local educational structure in Karachi, Sindh. The contextual void and relevance to these frameworks are questionable, where studies, i.e., (Majeed, Ahmad & Majeed, 2024; Mridha et al., 2025) explored how Western-centric models are more theoretical than practical in the grounds for implication. The faculty members question the relevance of these global models to the current resource scarcity in the teacher education departments, and classroom teacher and learning processes in the universities of Karachi, Sindh. The dilemma with Pakistan's higher education, specifically with the teacher education programs meet shortcomings of infrastructure facilities, scarcity in providing the latest digital resources for the training of pre-service teachers (as prospective teachers), unable to justify the foundational factors to meet global standards of digital literacy. The specific ethical dilemma in the classrooms is a key factor pointed by the faculty members in relevance to adopting these frameworks justly, ignoring the local classrooms to well-resourced classrooms in the teacher education departments in Karachi, Pakistan. This traces back to the assumption of theoretical vs. practical gaps, where global models are more theoretical due to universal infrastructure, while the current status of educational facilities for teacher education programs is limited, lacks operationalization of these frameworks with justification, and is irrelevant to specific needs and standards.

The second objective was addressed with the cataloging of limitations to specific infrastructure of resource scarcity, lack of classroom facilities, and insufficient resources. The social and cultural void, pedagogical practices, and infrastructure are insufficient question the adoption of a global framework to Pakistan's pre-service teachers' training, via teacher education programs such as B. ED Hons. degree programs in the universities. It is challenging to justify the ethical measures while practically adopting these global frameworks, while faculty members emphasized a framework with global-local standards, attain contextual relevance to strengthen the teacher education programs, and prepare future teachers for the education sector in Karachi, Pakistan.

The use of universal digital citizenship models is ethically ineffective, which hardly address the local platforms, a mismatch to infrastructure requirements (Curran & Ribble, 2017), whereas a gap between pedagogical practices, and digital resources fall in the training

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of the pre-service teachers via teacher education programs, Mishra & Koehler (2007) emphasized the technological knowledge to be linked with pedagogical context, and local requirements for instance, social and cultural realities. In integrating the TPACK model can be suitable in conditions to frame cultural void and relevance to local needs of education and practice. Imposing a rigid structure of global frameworks can only be ineffective in providing fruitful outcomes of training the pre-service teachers.

As directed by Khan & Azhar (2024), policy frameworks are required to guide the leadership and institutional capacity in strengthening the teacher education programs in Pakistan. In connection with social development theory, the faculty perceptions indicated their judgments on limitations of global frameworks such as TPACK and DigCompEdu if no link to local void is developed in the process.

Theoretical and Practical Implications

The findings of the study guide key implications, both in the theoretical lens and practice context, about the educational realities in teacher education programs in Pakistan. However, the research contributes to the theoretical understanding of key digital competency frameworks such as DigCompEdu, Technological Pedagogical Content Knowledge (TPACK), and Bandura's Social Cognitive theory implications. However, the global standards in digital competency support in providing an effective model of infrastructure for transforming the existing educational realities in Pakistan. Theoretically, these ground facts cannot meet the practical implications to support the empirical findings of the study, but alarmingly, they provide a foundational concept in leading to the practical induction of the global-local divide of these recommended digital frameworks in the teacher education programs in the universities of Karachi, Sindh.

In a practical lens, the policy makers can develop a framework of digital competency in addressing the standards of global models, and the edition of local ground realities and factors such as infrastructure status, social and cultural dimensions, and the current educational structure of Pakistan. The institutional leaders can be guided with an adapted model to address the teacher education departments, equipping the pre-service teachers with global-local competency of digital literacy, in the pedagogical practices to be executed in the classroom practices, via teaching practicum, lesson plans, and digital instructions. The teacher education programs' curriculum guidelines require practical transformation from the competent authorities to promote the transformation of training and curriculum.

Conclusion

The study explored the complex nature of the global digital literacy framework and its implications in the national teacher education programs in the metropolitan city of Karachi, Pakistan. The in-depth exploration of the faculty perceptions and identifying the factors of global frameworks in strengthening the pedagogical skills of pre-service teachers, making digitally skilled educators for the country. The study revealed that DigCompEdu, ISTE, TRACK, and other global frameworks cannot be a direct fit to the local context of educating the pre-service teachers with digital capacity, it requires to be adapted with local relevance, enhancing a global-local embedded framework, to address the gap for an effective policy model in the teacher education programs in higher education in Karachi, Sindh. The study proposed a glocalized hybrid model adaptation for re-engineering a resilience-based pedagogical training program in the province of Sindh, Pakistan. Contrary to that, the study findings provide in-depth faculty perceptions on the global-local divide of the digital literacy framework to the pedagogical skills development among the educators (pre-service teachers), but the findings cannot address the rural-urban divide, institutional competency gap between the capital cities

of other provinces in Pakistan. A more comprehensive study is required to represent evolving digital policy measures, implementation gaps, and governance blueprints.

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