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Teacher Educators' Perspectives on Integrating AI Tools in Teacher Education Programs: A Symbolic Interactionist Study from Pakistani Universities

Bushra Rasheed [1] **Uzma Shahzadi** [2] **Murtaza Ali Usama** [3]

Abstract

This qualitative research paper investigates how the teacher educators think using artificial intelligence (AI) tools used in pre-service teacher education programmes within the Pakistani universities in the light of an O'Donoghue grounded theory research approach, a symbolic interactionism approach. The paper also acquired a better understanding of how teacher educators conceptualize, enact, and mediate AI technologies towards proceeding with the course of pedagogical innovation. By using the constructivism method in the form of in-depth interviews with twenty-four teacher educators of state-run and private institutions in Punjab, the study examines the symbolic meaning of AI tools, the social mechanisms that support decision-making on the adoption of AI tools, and the nature of interaction between the teachers, students, and AI. The collection of data included semi-structured interviews, observation of participants in AI based instructional lessons and institutional policy frameworks. The comparative analysis of the data conducted indicated subtle negotiations between traditional pedagogical values and the development of technology and created concerns about authenticity, academic integrity, and the shift towards the identity of professionalism. The findings explain how teacher educators create a sense of meaning of AI implementation in the realms of social interaction, institutional pressure, and the culture in the context of Pakistani higher education. Consequently, the research will be able to supplement improved understanding of technology usage amongst teachers in the field of teacher education as well as offer conceptual frames that can be used in policy and professional development program development in some of the emerging economies.

Key Words

Artificial Intelligence, Teacher Education, Symbolic Interactionism, Grounded Theory, Pakistan, Teacher Educators, Professional Development, Technology Integration

Corresponding Author

Bushra Rasheed: Masters of Arts in Elementary Education, Institute of Education and Research, University of the Punjab, Lahore, Punjab, Pakistan. Email: bushra.rasheed3@gmail.com

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Introduction

The rapid growth of technologies of the artificial intelligence (AI) essentially transformed all the fields of education in the world, offering the educating players with opportunities and threats never seen before (Holmes et al., 2019). As schools and universities grow more open to the notion that AI tools may be effectively used to improve the teaching and learning experience, teacher educators find themselves uniquely positioned to ensure a successful

[1] Masters of Arts in Elementary Education, Institute of Education and Research, University of the Punjab, Lahore, Punjab, Pakistan. Email: bushra.rasheed3@gmail.com
[2] Director Academics, University of Sargodha, Punjab, Pakistan. Email: uzma.shahzadi@uos.edu.pk
[3] Coordinator, CS & SE Department, Grand Asian University, Sialkot, Punjab, Pakistan. Email: murtazaali3309@gmail.com

resolution to this technological revolution, as they train teachers to embrace an AI-enhanced teaching and learning experience. In developing nations like Pakistan, where the traditional pedagogical practices are being overlaid with new technology requirements, and a specific dynamic is being created within the higher education environment, the specified change is especially intricate.

Implementing AI mechanisms in pre-service teacher education programmes creates a point concerning the issues of the evolution of the teacher tools and their application in the future, as educators will be conceptualising and adapting technology-supported techniques of teaching (Luckin & Holmes, 2016). However, its success will mostly depend on how teacher educators perceive, interpolate, and negotiate such technological innovations into their current pedagogical models (Tondeur et al., 2017). Because understanding these views is relevant, it is crucial to develop effective cross-cultural implementation strategies addressing these issues of institutional realities of the cultures (Safdar et al., 2025).

There are many examples of integration into teacher education, and the higher education system in Pakistan offers a great opportunity to analyse it, which has a very diverse characteristic of a multilingual, multicultural, and multistage system (Hoodbhoy, 1998; Hoodbhoy, 2017). The teacher education programmes in the country face numerous challenges such as learning resource limitations, unstable technological infrastructures, and poorly balanced and culturally diversified students, making the study of AI integration timely and essential (Imran et al., 2022; Saleem et al., 2025; Waqar et al., 2025). The novelty gap in the research is that research has not been existent concerning AI technologies and coordinate the convoluting social processes of their adoption by teacher educators in Pakistani universities.

Literature Review

AI Integration in Teacher Education

Usage of artificial intelligence in teaching education has become the crucial field of research, and experts study numerous aspects of this technological shift (Zawacki-Richter et al., 2019). According to the existing literature sources, AI services have enough potential to improve the pre-service teacher training process by providing its employees with personalised learning opportunities, maximising the use of intelligent tutoring systems, enhancing automated assessment systems (Berland et al., 2014). Nevertheless, technology utilization is a complex socio-pedagogical negotiation process, which should be taken into deep consideration.

The attitudes and beliefs of teachers' educators have recently received special focus, being highlighted in the literature as factors that influence the effectiveness of AI implementation programmes. They shape their views and perceptions of the ways that AI tools are conceptualised, implemented, and supported in the pre-service training programmes. The literature indicates that integration is a conceptual matter involving a fundamental change in thinking and professional identity as well as technical ability to enhance successful integration (Mishra & Koehler, 2006).

Symbolic Interactionism and Technology Adoption

Symbolic interactionism is an effective theoretical base on the interpretation of the creating meaning that is tied to the use of technology innovations by individuals and groups (Blumer, 1986). With this view, emphasis has been put on the importance of social interactions, shared meanings, and interpretations in the development of human behaviours and institutional practice. In the context of the AI use, educator training, symbolic interactionism illustrates the way in which teacher educators give up on their professional identity in order to adapt to technological transformations.

According to the symbolic interactionist perspective, it is not linear as the use of technology entails continuous debates among individuals, social groups, and the use of technological artefacts (Pinch & Bijker, 1984). Teacher

educators interact with each other, students, institutional policies, and even wider cultural settings to form intricate webs of meaning that make decisions on the integration of AI in their practices (Orlikowski, 2000).

Grounded Theory in Educational Research

Grounded theory research offers a rational style of understanding of complicated interpersonal procedures in the learning setting (O'Donoghue, 2007). It focuses its interests on developing theoretical reflections about existing empirical data rather than testing given presupposed hypotheses which naturally makes it especially suitable after the discoveries of such novel phenomena as the AI in teacher education (Bryant & Charmaz, 2019; Charmaz, 2016; Morse et al., 2021).

The theoretical rigour of the symbolic interactionist grounded theory developed by O'Donoghue constitutes the integrative action of both methodologic and theoretical understanding which could provide holistic understanding of how social agents make meaning in the complex institutional settings. This method has been effectively used in many learning settings to analyse the technology adoption process rather than the professional development process and the institutional change process.

Pakistani Higher Education Context

The system of higher education in Pakistan has some unique issues and opportunities concerning how to integrate AI in the teacher education programme (Anwar et al., 2022). The heterogeneity of the languages used in the country, unequal technological facilities, and a controversial cultural dynamic make up a singular location in which the adoption of technologies can be analysed. Digitalisation and its roles in educational practices have been identified as key issues in recent policy endeavours such as the digitalisation agenda of the Higher Education Commission.

However, the challenges that are faced in executing such programmes, such as insufficient resources, lack of sufficient training opportunities, and resistance towards change as presented by the conservative institutional setting (Noor et al., 2025; Saleem et al., 2025; Saleem et al., 2025). To create solutions to help AI tools amend the current situation, it is vital to understand how teacher educators cope with these challenges as they strive to provide AI solutions.

Methodology

Research Design

The researchers used the symbolic interactionist grounded theory proposed by O'Donoghue (2007) as a research tool to investigate the perspectives of teacher educators toward AI introduction in pre-service training programmes. The significance of the research design was to gain an understanding of how social processes, meaning-making activities, and interactive dynamics occur naturally (O'Donoghue, 2007). The qualitative method was used to achieve a comprehensive examination of the events and the sensitivity of the issues toward cultural and institutional background of higher education in Pakistan (Farooq et al., 2023).

Participants and Setting

The sample comprised 24 teacher educators in the Punjab province. Purposive sampling followed by theoretical sampling was the most effective technique through which participants were selected as they are the key aspect of the grounded theory methodology; in this approach, the selection of the participants depends on the emerging theoretical consciousness instead of established criteria (Glaser & Strauss, 1967). The sample included teacher educators whose experience working with AI tools is diverse as well as who belong to various disciplines and institutional backgrounds (Bokhari et al., 2025; Muhammad et al., 2024; Muhammad et al., 2024).

The number of years working as participants in teacher education varied between five and twenty-five years, and the education departments and courses focused on a particular subject represented. The varied sample allowed theorising a certain level of saturation and provided rich data on different views regarding the AI integration within any institutional or cultural setting (Corbin & Strauss, 2015).

Data Collection

Several data collection methods were employed in the data collection as a means of coming up with a comprehensive knowledge on the phenomenon of research. The semi-structured interviews served as the key tool of collecting primary data as the interviews persisted between sixty and ninety minutes. The interview questions aimed to examine whether the participants encounter the AI tool usage, their attitudes to its advantages along with the difficulties, and to discover the views concerning the institutionally based supportive solutions (Patton, 2015).

The observations were carried out in teaching sessions being used with AI in order to obtain the information about the actual practices and behaviours that is not reported in the interviews. The observations helped to identify this discrepancy between intentions and practice, hence, demonstrating salient content related to the process of social integration of AI integration (Hammersley, 2023; Hammersley & Atkinson, 2019).

The analysis of documents was the perfect supplement to the information on interviews with specialists and observation, as it enabled the analysis of institutional policy and curriculum recommendations and training resources associated with AI implementation. The mentioned data sources contributed to the increased credibility and totality of the study results (Denzin & Lincoln, 2018).

Data Analysis

The results were analysed through the constant comparative method of the grounded theory methodology (Charmaz, 2014). Researchers performed preliminary coding through line-by-line review of transcripts of interviews, recording notes made during observations and records of interviews and meetings to receive meaningful capabilities and title trends. The most salient codes were then condensed into possible categories that summarised the nature of experiences participants underwent during focused coding.

Theoretical coding involved pairings of categories to formulate an overarching outline of the social processes that underlie AI use in educator training. The memo-writing during the analysis process followed the formation of new knowledge and evaluations of theory, so that the conclusion of theory was based on practicable data (Corbin & Strauss, 2015).

Findings

Core Category: Negotiating Professional Identity in the Digital Age

The key phenomenon observed, as a result of the data analysis, was the negotiation that teacher educators were repeatedly engaged in in their quest to define their professional identity as they were introduced to AI technologies in their pre-service training programmes. It was a complex process of identity reconstruction that created tensions between individual beliefs and individual expectations and technological proficiencies on one side and between these and the current institutional requirements on the other, where every part of AI integration was influenced.

The respondents explained that they felt strain between their mentoring duties of being an important transmitter of knowledge and their new roles of facilitating using technology and being a digital mentor. The latter type of identity negotiation was especially very high among the experienced teachers who had formed good professional identities by the traditional pedagogical methods.

Theme 1: Symbolic Meanings of AI Technologies

The teacher educators assigned various symbolic representations to AI technologies, including empowerment and professional control tools, as well as difficult-to-serve threats. These meanings were created in response to social relationships with colleagues, students, and institutional administrators and have been oriented to the principle of symbolic interactions that hold that meanings do not exist in objects of reality but are created through social interactions.

The positive symbolic meanings were: the idea of AI as a digital assistant, which can complement, but not substitute human knowledge, the facilitator of the next phase which is the use of AI, and a leveller, which can help overcome geographical and other economic barriers to find the necessary educational materials. Individuals with these positive meanings were better placed to try AI tools and support their use in pre-service programmes.

Negative symbolic meanings, in turn, comprised the view of AI as a kind of a threat to its authenticity, the perception that it could be a kind of a Trojan horse that might eradicate the existing educational values and principles, and the perception that it could create a digital divide that could only multiply the existing disparities in access to and quality of education.

Theme 2: Social Processes of Technology Adoption

The implementation of AI technologies on pre-service training course programmes was a socially intricate process that entailed the aspects of negotiation, adaptation, and resistance. Institutional cultures, collegiality, and the general social contexts that facilitated this mediation in the approach of teacher educators to technological innovation.

The important aspect that has turned out to define the process of adoption is institutional support. Members of institutions with established AI integration policies and sufficient technical support had an increased probability of utilising such technologies. However, there had been continuous compromise of individual whims and pedagogical ideals with institutional demands even in cordial situations.

Interaction with colleagues was also largely influential in the decisions regarding the adoption. Informal networks were an important source of information for teacher educators to share their experiences, trouble-shoot technical problems and devise implementation strategies. These interactions also led to communities of practice which enabled them to share their knowledge for emotional support as they encountered the difficult task of adapting to the technological changes.

Theme 3: Cultural and Contextual Negotiations

Pakistan cultural background was one of the factors that specifically affected how teacher educators undertook the task of adopting AI, providing a set of challenges and opportunities uncommon to the Western literature. The issues of language, mainly pre-eminence of Urdu and other language of the region, during the education, posed difficulties to use AI devices developed in English languages settings.

Issues of cultural values concerning authority of teachers and respect to students had to be negotiated vigilantly when adopting AI tools that focused on student autonomy and self-guided learning. Respondents reported having to adopt AI-based pedagogic strategies to meet local cultural norms and still offer the advantages of technological change.

There were also economic and infrastructure constraints that formed more contextual challenges that impacted on the implementation strategies. The teacher educators invented resource constrained innovations such as shared access models, offline AI applications, and a hybrid way of adopting digital and traditional techniques.

Theme 4: Pedagogical Transformation and Student Engagement

The introduction of AI induced more profound educational changes than the use of the tools could, as it implied not only the use of tools but also the implementation of additional changes in the teaching methodology and strategies to engage the learners. The participants also stated that changes have occurred towards more individualised teaching, informed decision-making, and learning with the help of AI technology.

Depending on the answer to the question of AI-based teaching, students with more advanced education levels were less enthusiastic and flexible than children that happened to represent technological advancement more. This is where this generational difference needed teacher educators to adopt differentiation steps that could enable them to meet the needs and interests of different students.

Profiling of digital literacy between teacher educators and pre-service teachers also demonstrated the disparity in digital literacy levels among teacher educators that was evident within both teaching experiences or matched between teacher educators and pre-service teachers.

Discussion

Theoretical Implications

The present study adds to the expanding scope of literature on the integration of technologies in teacher education by providing a clearer picture of the social mechanisms underlying the use of AI in Pakistani universities. Building on symbolic interactionist theories, which perceive human behaviour and institutional practices as products of meaning-making processes, the findings are consistent.

The classification of professional identity negotiation as the primary category is consistent with the currently available body of research on the development of the professional identity of teacher educators but contributes to a broader understanding of the issue in relation to the context of integrating AI. The calculations indicate that the effective implementation of AI use must be not only technically trained but also provided with identity reconstruction processes that could help teacher educators balance their traditional pedagogical values with technological change.

Practical Implications

The findings of the research are important to policy making and institutional practice in the Pakistani higher education. This kind of focus on symbolic meanings implies that the implementation programs on AI applications should focus on not only the technical but also cultural and symbolical elements of integration technology adoption.

The creation of professional development programmes must be orientated toward developing the identity negotiation process through providing the teacher educators with the opportunity to understand the way the AI tools can transform into a better teacher, instead of endangering their professional knowledge and skills. This strategy requires a shift towards more intensive training rather than technical training, which should be more reflection-oriented, involving co-workers, and support systems.

The policy should be accepted by the institutions that recognise the intricate social machinery of the AI integration of the organisations and the complex set of frameworks that can freely accommodate multiple adoption trends and integration approaches. The research indicates that the top-down mandate appears to be inefficient compared to the methods encouraging grassroots innovation among teacher educators.

Limitations and Future Research

The overall limitations in generalising the findings of the research on Pakistani universities also lie in the fact that the study focuses on the universities of this country. However, the theoretical knowledge in the domain of social

processes and meaning-making can be more globally applicable in analogous emerging-economy scenarios facing like issues in technology incorporation.

Future studies are needed to explore how AI integration or incorporation has affected teacher educator identity and the scope of practise, how AI has affected pre-service teacher training and deployment into the classroom. The observation conducted in diverse cultural settings should shed light on universal and context-specific issues affecting the adopted AI in the teaching education field.

Conclusion

This paper helped to get a better understanding of the multifaceted social processes that are inherent in the Pakistani education programme on teacher training and development; it helped to see how teacher educators can have a negotiating stance regarding professional identity formation as they adjust to technological change. The results show that effective AI implementation should consider the symbolic meaning, the process, and the culture instead of being focused on the technical facet of implementation.

The study is relevant to the achievement of the concept of technology adoption in educating a teacher and provides practical implications related to the formation of policies and practice within the institution. Innovations in AI technologies will necessitate assistance to teacher educators in negotiating their identities and other communal building efforts in future sustainable integration that may promote quality teacher preparation.

The symbolic interactionist lens was useful to evaluate the subtle ways in which teacher educators both employ AI technologies to gain meaning and in which they establish meaning in educational circumstances using socially situated methodologies in the implementation of technologies in instruction. These lessons have both research and practice implications in the rapidly developing artificially intelligent teacher education field.

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