

TRACING THE PHILOSOPHICAL ROOTS OF HUMAN-CENTERED AI DESIGN AND THEIR IMPLICATIONS FOR EQUITABLE EDUCATION IN MULTICULTURAL CLASSROOMS

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ABSTRACT

This study aimed to delve into the philosophical foundations of human-centered Artificial Intelligence (AI) design and their implications for equitable education in multicultural classrooms in Pakistan. The researchers noted that the use of AI in education was often quick and without considering the philosophical underpinnings of the design principles. The researchers suggested that the humanist, pragmatist, phenomenological, inspired the human-centered AI design and care ethics traditions, each of which had different implications for the nature of the relationship between technology and various learners. The study was of mixed method research design in which three hundred participants were surveyed quantitatively and thirty participants from Lahore, Rawalpindi and Islamabad were interviewed qualitatively. The quantitative phase assessed attitudes towards human-centered AI principles and perceived equity in multicultural classrooms, and the qualitative phase examined the lived experiences of educators and technologists. The results indicated that participants were aware of the possibilities of human centered AI for inclusive pedagogy, but there were still many gaps in the practical implementation of the philosophical ideals. The study also revealed that socioeconomic inequality and limited technological infrastructure hindered the equitable implementation of AI tools, while linguistic diversity posed challenges. The researchers concluded that to realize educational equity in Pakistan's multicultural classrooms, a philosophically informed, culturally responsive approach to the design of AI is required. Policy implications, teacher training and future research were discussed.

Keywords: Philosophical Foundations, Human-Centered Artificial Intelligence (AI) Design, Equitable Education, Multicultural Classrooms, Pakistan.

INTRODUCTION

The use of artificial intelligence in education had become more and more integrated into learning systems globally, impacting in various ways how students learned, how teachers taught, and how education systems measured learning outcomes (Tang, 2024). The researchers observed that sometimes, such a quick integration was motivated by technological and economic factors, rather than by a thorough understanding of the philosophical issues that lay behind the design of AI. In response, human-centered AI design came in trend, and its focus is on the importance of integrating human values, dignity and diversity into the development of technology (Gupta, 2024). The researchers noticed, however, that there were still gaps in the philosophical foundations of this approach, especially in non-Western educational and industrial settings (Suryanarayana et al., 2024).

Human-centered design evolved from a number of intellectual streams such as humanism, pragmatism and phenomenology (Ramadani & Sallauka, 2024). Humanism focused on the value and autonomy of the human person, and saw technology as a means to human flourishing, not as a substitute for human judgment (Wulan Sari et al., 2026). Philosophers focused on the consequences of their actions in daily life, and the idea of pragmatism was influential in promoting the design of AI systems that had a direct influence on a variety of communities (Rydenfelt, 2025). Phenomenology added a focus on lived experience and emphasized designers' need to recognize the lived experience of the user and how he or she relates to technology in everyday life (Marchis, 2026). The researchers stated that these practices, collectively, would provide a deep theoretical basis for revisiting the design of AI in education.

An ethics of caring added to this philosophical underpinning emphasized relationship, empathy and sensitivity to vulnerability (Breuer, 2022). The researchers argued that an ethics of care approach was especially important when applied to education, where teachers and learners had continuous interactions and affected one another is learning (Dziubaniuk et al., 2023). In the context of AI design, an ethics of care required systems to be attuned to the needs of learners who are marginalized or underrepresented, and to not just fall back on the standard models. This philosophical perspective made it challenging to conceive of AI systems being neutral or universally applicable in a variety of educational contexts (Grund et al., 2024).

The use of human-centered AI design in multicultural classrooms was challenging yet fruitful. In these classrooms, students came from diverse linguistic, cultural, socioeconomic and previous educational backgrounds (Fatima & Ahmad, 2025). The researchers noted that these AI systems could inadvertently be used to perpetuate inequality, if they are not designed with attention to that diversity. For example, AI systems that are designed to process the majority of the languages often performed well for the majority language, but poorly for the user if they did not speak the majority language (Akram et al., 2021).

The context of Pakistan is particularly interesting for the following reasons: the country is extremely linguistically and culturally diverse (Andleeb et al., 2025). It is a country of speakers of Urdu, Punjabi, Sindhi, Pashto, Balochi, Saraiki and other languages, as well as wide variations between urban and rural in terms of access to technology and quality education (Ahmad et al., 2020). The researchers pointed out that such diversity has always been a challenge in Pakistan's educational system, where allocation of resources, curriculum development, and teacher training mostly favor urban and English-medium schools over rural and vernacular-medium schools. AI tools added to this inequitable mix led to anxieties that growing up; the use of AI would create further educational divides (Ahmad et al., 2021).

The researchers reported a lack of research that explored the philosophical principles of AI and their implications in educational practices in South Asia, particularly in the context of Pakistani education. Much of the literature available was generated from Western institutions and assumed that infrastructure, language and cultural

homogeneity was prevalent in Pakistan, which was not always the case. This disconnect called for specific empirical research, they said, especially with the rapid emergence of AI tools in Pakistani classrooms with insufficient philosophical or pedagogical analysis.

The aim of this study is to trace the philosophical foundations of human-centered AI design and to review the implications of the same in the context of multicultural classrooms in Pakistan. The researchers attempted to answer this question in a mixed methods study, which included both quantitative measurement of attitudes and perceptions and qualitative exploration of lived experiences of educators, technologists, and policymakers. The combination of these made it possible for the researchers to get a large number of responses and to obtain in-depth information from detailed interviews.

Research Objectives

1. To follow the path of the philosophical roots of human-centered AI design, such as humanistic, pragmatic, phenomenological and care ethics approaches.
2. To explore the perceptions of human-centered AI principles among Educators and Technologists in multicultural classrooms in Pakistan.
3. To examine the ramifications of human-centered AI-design for equitable education in linguistically and culturally diverse classrooms in Pakistan.

Research Questions

1. What were the philosophical backgrounds for the evolution of human-centered AI design?
2. What were the attitudes of teachers and technologists in Lahore, Islamabad and Rawalpindi towards the use of human-centered principles of AI in multicultural classrooms?
3. What were the implications of human-centered AI design on equitable education in multicultural classrooms in Pakistan?

Significance of the Study

The findings of this study have important impact for policy makers, educators, and AI developers when they were considering the design of equitable educational technologies in multicultural contexts. The researchers offered a philosophically based framework, which links abstract design concepts with practical realities in the classroom in Pakistan. Findings provided guidance for culturally responsive incorporation of AI tools within a variety of classrooms, and added to a small number of literature on human-centered AI within the South Asian education context.

LITERATURE REVIEW

The philosophical underpinning of human-centered design has been studied in many fields, such as computer science, philosophy and design studies, for a long time (Ramadani & Shishko, 2024). Humanism was one of the earliest philosophies that influenced human-centered design. The scientists found that humanist thought was concerned with the individual's dignity, rationality, and self-determination and that technology was seen as an extension of human capability, not a replacement for human judgment (Régis et al., 2024). In the educational context, humanism translated to the need for systems that fostered the learning autonomy and critical thinking of the learner, rather than systemizing the learning process with algorithmic determined pathways (Oviatt, 2021). The Pragmatist philosophy also influenced the design of human-centric AI, with its focus on the real-world implications of technology decisions. The researchers pointed out that pragmatist scholars promoted examining AI systems in an iterative, context-dependent manner, and that there is no universal design that would be suitable for all users (Schmager et al., 2025).

Phenomenology added another dimension to this philosophical basis by shifting focus to lived experience (Dodgson, 2023). The researchers examined research that showed that phenomenological design approaches

had to consider and account for the user experience of technology in real life, and not just abstract specifications. This experiential context was significant to education, as students' cultural background, prior exposure to technology, and socioeconomic context shaped their relationship to technology in the classroom. Ethics of care further developed this discussion by foregrounding the relational responsiveness, specifically towards vulnerable and marginalized populations that the researchers considered highly relevant to educational equity (Woroniecki et al., 2024).

There are a number of publications that explored the use of AI in the education environment, highlighting the opportunities as well as risks (Karan & Angadi, 2023). The researchers discovered that, when designed properly, AI-based personalized learning systems, intelligent systems of tutoring, and automated assessment systems have shown some promise in enhancing learning outcomes. There are also concerns about algorithmic bias, data privacy, and the potential for AI systems to perpetuate inequities (Pikhart & Al-Obaydi, 2025). The researchers especially concerned about natural language processing tools, which tend to be inconsistent in their performance across languages, thus harming speakers of underrepresented languages or languages with fewer speakers (Ramadani & Krasniqi, 2023).

The study of multicultural and equitable education contributes to the understanding of problems that AI systems encounter in diverse classrooms (Asllani & Ramadani, 2025). The authors reviewed literature that highlighted the importance of attending to students' language and cultural identities as well as unequal access to resources in order to achieve an education that is equitable. Proponents of technology in multicultural classrooms suggested that the technology might inadvertently marginalize other cultures and languages in the classroom while favoring others (Ramadani, 2024). This literature highlighted the need for culturally responsive pedagogy, an approach that called for ways of teaching that include technological tools, and are adapted to students' diverse cultural backgrounds.

In the Pakistani context, the researchers made a relatively small discovery of literature on the interconnections between AI, philosophy, and education (Nizami et al., 2025). Past studies on the educational system in Pakistan often emphasized the differences between the educational system in the cities and villages and between the system of education based on English-medium and vernacular-medium instruction, as well as between the educational systems in the different provinces of Pakistan with varying levels of educational resource allocation (Iqbal et al., 2026). The researchers pointed out that the linguistic diversity of Pakistan, including Urdu, Punjabi, Sindhi, Pashto, Balochi, and other languages, posed unique challenges for AI systems that are mainly developed in English or Urdu. Not many studies had looked into how the tenets of human centered design could be applied to solve these particular problems (Lodhi et al., 2026).

The literature review clearly showed that the philosophical vision of human-centered AI design and its application in various resource-limited educational settings like Pakistan were still not addressed in a comprehensive way. The researchers opined that this situation warranted the present study to follow the philosophical trail and empirically investigate the perceptions and implications in multicultural classrooms in Pakistan.

RESEARCH METHODOLOGY

The researchers adopted mixed methods research design to explore, analyze and understand philosophical underpinnings of human-centered orientation of the artificial intelligence design and its implications for equity in education in multicultural classrooms in Pakistan. The researchers chose this method as a way to marry the insights of qualitative research that would have been shallow with the generalizability of quantitative research that would have been very broad.

Research Design

The researchers used explanatory sequential mixed methods design which involves data collection and analysis in quantitative methods first, followed by qualitative methods to explain and contextualize the quantitative results which were statistical. This design provided the researchers with a way to collect data on not just measurable patterns of AI use, but also nuanced insights into the different contexts in which it was being applied.

Sampling and Participants

For quantitative part, three hundred respondents comprising faculty members, educational technologists and secondary school teachers were selected through a stratified random sampling technique from Lahore, Rawalpindi and Islamabad. The researchers then utilized purposive sampling to choose thirty participants from this group for the qualitative phase, as they possessed a relevant experience with the implementation of teaching practices with AI.

Data Collection

A structured questionnaire was used to collect quantitative data on the attitudes of respondents toward human-centered AI principles and multicultural classrooms. The researchers then interviewed the participants using semi-structured interviews that lasted between 30 and 45 minutes, in order to gain a deeper understanding of their point of view. All interviews were recorded audio and transcribed for analysis with the interviewees' consent.

Data Analysis

The quantitative data were analyzed descriptively and inferentially using SPSS software. The qualitative data was analyzed using thematic analysis and the six stages proposed by Braun and Clarke were followed to elicit themes.

Ethical Considerations

The researchers received ethical clearance from the respective institutional review board. All of the researchers ensured the informed consent and maintained confidentiality and voluntary participation throughout the study.

RESULTS AND DATA ANALYSIS

Results and Data analysis presented the findings of the study, along with the quantitative and qualitative data analysis. The quantitative results were presented in four tables and followed by thematic presentation of the qualitative results.

Table 1: Demographic Profile of Quantitative Participants (N = 300)

Variable	Category	Frequency	Percentage
Gender	Male	168	56.0%
	Female	132	44.0%
City	Lahore	110	36.7%
	Islamabad	95	31.7%
	Rawalpindi	95	31.6%
Role	University Faculty	105	35.0%

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Variable	Category	Frequency	Percentage
	Educational Technologists	90	30.0%
	Secondary School Teachers	105	35.0%

Table 1 showed the demographic profile of the three hundred quantitative participants. There were more males than females in the sample, which was reflective of the overall gender imbalance in higher education and technology sectors of Pakistan. The sample was geographically balanced with participants being spread across Lahore, Islamabad and Rawalpindi in a relatively even distribution. The researchers also obtained a balance in terms of the quality of educational technologists, university faculty members and teachers in secondary schools each accounting for 35 percent of the sample, while the remaining 30 percent was made up of university faculty members.

Table 2: Attitudes toward Human-Centered AI Principles

Item	Mean	SD
AI should prioritize learner dignity and autonomy	4.32	0.61
AI systems should adapt to students' cultural backgrounds	4.18	0.68
AI tools should support, not replace, teacher judgment	4.41	0.55
AI design should reflect diverse linguistic needs	4.05	0.74
Current AI tools adequately reflect human-centered principles	2.87	0.89

Table 2 showed descriptive statistics regarding participants' attitudes toward human-centered AI principles, on a five-point Likert scale. The highest mean score was found for the statement that AI tools should complement rather than replace teacher judgment. The great consensus was that AI tools should complement rather than replace teacher judgment, with the highest mean score. Participants also strongly agreed that learner dignity, cultural adaptability and linguistic diversity should be key design considerations. However, there was a moderate lack of consensus that existing AI tools represented these human-centered principles well, suggesting a mismatch between the concepts and what is actually being practiced.

Table 3: Perceived Equity in Multicultural Classrooms

Item	Mean	SD
AI tools perform equally well across languages spoken in my classroom	2.64	0.81
Students from all backgrounds have equal access to AI-enabled tools	2.51	0.93
AI-based assessment reflects cultural fairness	2.79	0.85

Item	Mean	SD
My institution provides adequate infrastructure for equitable AI use	2.58	0.88

Participants' perceptions of equity in AI-enabled multicultural classrooms are summarized in Table 3. Overall, mean scores across all the items were below the middle of the scale, suggesting that there was a high level of concern about equity. The level of agreement was also low among participants regarding equal access to tools enabled by AI among students from different backgrounds. Likewise, participants raised questions about the cultural fairness of AI assessment and the lack of robust institutional infrastructure to facilitate equitable use of AI, highlighting ongoing structural challenges.

Table 4: Correlation Between Human-Centered AI Attitudes and Perceived Equity

Variable	Human-Centered AI Attitudes	Perceived Equity
Human-Centered AI Attitudes	1.00	0.47**
Perceived Equity	0.47**	1.00

Table 4 displayed the Pearson correlation coefficient analysis of the associations between the attitudes towards human-centered AI principles and perceived equity in multicultural classrooms. The study revealed a moderate, statistically significant positive correlation ($p < .01$) between the two variables. The relationship between endorsement of human centered AI principles and perceived equity in the classroom was moderate, suggesting that there were other factors that influenced perceptions of equity as well as philosophical endorsement of human centered AI principles.

QUALITATIVE FINDINGS: THEMATIC ANALYSIS

Thirty semi-structured interviews were conducted in the qualitative phase of the study that resulted in six main themes after thematical analysis.

Theme 1: Balancing Standardization and Cultural Responsiveness

Participants consistently discussed the tension between the standardized format of the various available AI tools and the cultural responsiveness that is needed in multicultural classrooms. The researchers discovered that many of the participants believed current AI systems were developed for homogeneous and English-speaking populations, which is not representative of the linguistic diversity in Pakistan. Participants reported that they were not satisfied with the tools' ability to recognize the linguistic, cultural and pedagogical norms in a truly diverse classroom, and those tools were not effective in authentic classroom context.

Theme 2: Teacher as a Facilitator between Technology and Students

The role of the teacher as the bridge between the tool and students was reiterated. The researchers found that participants found human-centered AI more effective when teachers had interpretive authority, in which they interpret the AI-generated content to fit the context of their classroom. The participants did not think that AI would replace teachers, but rather should be used in conjunction with them as an additional resource, and that teachers should engage in active decision making when using AI to ensure cultural relevance, linguistic appropriateness and pedagogical soundness in multicultural contexts.

Theme 3: Infrastructural and Resource Constraints

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One of the common challenges highlighted was the lack of infrastructure, such as access to the internet, outdated technology, and inadequate institutional resources, which impedes the equitable adoption of AI. The researchers discovered that these restrictions had a disproportionate impact on schools in less urbanized areas, increasing, rather than reducing disparities. Participants said that it seemed that the philosophical approach towards human-centered design was more of a dream than anything else, without the necessary investment in basic technological infrastructure in various educational institutions in Pakistan.

Theme 4: Understanding without Doing Philosophical Principles

Many participants had conceptual understanding of human centered design principles such as learner dignity and cultural responsiveness, but had difficulty articulating specific examples of how these principles could be applied. The researchers noted this disconnect between the philosophies and practice was partly due to the lack of training opportunities and guidance from institutions or AI providers on how to put human-centered principles into practice when implementing and using classroom technology.

Theme 5: Linguistic Marginalization

The participants in the group who worked with students whose first language was Punjabi, Pashto, Saraiki or Balochi reported marginalization in the AI learning environment. The researchers noted that the participants considered the current Natural Language Processing tools to be quite biased towards Urdu and English, and not being of any use for the speakers of other regional languages. One of the most serious equity issues addressed during the qualitative interviews was this linguistic marginalization.

Theme 6: Pessimistic Optimism for Future Development

While there were known issues, participants had some guarded optimism about the potential of human-centered AI to enhance educational equity in the future. The researchers observed that thoughtful design, philosophically motivated, and with local development and investment, would usefully solve existing problems. They requested a more active involvement of AI producers, educators and policymakers in terms of co-creative collaboration for developing tools that truly represent the variability of Pakistani classrooms.

DISCUSSION

This study revealed that there remains a gap between the ideal and real examples of human-centered AI design in Pakistani classrooms, which are culturally diverse. The researchers found that the participants were largely supportive of humanistic and pragmatic, phenomenological and ethical principles, but felt that these were not sufficiently integrated into current AI tools. Quantitative results showed a weak positive correlation between attitudes towards human-centered AI and perceived classroom equity, and qualitative results shed light on the specific processes through which AI influenced classroom equity, such as linguistic marginalization, infrastructure and limitations, and the role of teachers as mediators. They concluded that "philosophical commitment," without any investment in infrastructure, teacher training and the development of technology at the local level, was not enough.

CONCLUSION

This study explored the philosophical background of human-centered design of AI and its implications in the context of inclusive education for multicultural classrooms in Pakistan. The researchers identified that although there was a general acceptance by educators and technologists about the principles of human centered approach, there were significant gaps in implementing the principles into equitable practice in the classroom in the study locations of Lahore, Islamabad, and Rawalpindi. Linguistic marginalization and lack of: infrastructural restrictions and limited practical training were identified as major barriers. The study found that successful implementation of AI for genuine educational equity would depend on the philosophically supported design of

AI, ongoing investments in infrastructure, language support at the local level, and teacher training across the educational institutions of Pakistan.

RECOMMENDATIONS

The researchers suggested that AI developers need to focus on more localized language support for the language speakers for whom the AI is underutilized, such as Punjabi, Pashto, Saraiki and Balochi speakers, to alleviate linguistic marginalization. The researchers also suggested greater investment in the technological infrastructure of both urban and rural institutions and the development of structured courses for teachers that would transform the philosophical principles into practical classroom practice. It was advised to the policymakers to set guidelines that mandate cultural and linguistic responsiveness in the AI tools implemented in the educational institutions of Pakistan.

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