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# ATTITUDES TOWARD ARTIFICIAL INTELLIGENCE AMONG B.ED. STUDENT-TEACHERS IN MANIPUR: A COMPARATIVE ANALYSIS ACROSS DEMOGRAPHIC VARIABLES

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**ABSTRACT**
*This study examines attitudes toward artificial intelligence (AI) among 320 B.Ed. student-teachers in Manipur, India, focusing on demographic variations in age, gender, locality, and subject stream. Using a cross-sectional survey design and the Artificial Intelligence Attitude Scale (Aktay et al., 2024), the research revealed significant differences in AI attitudes. Younger student-teachers (<30 years) exhibited more positive attitudes than older peers ($M = 58.69$ vs. $52.50$; $d = 1.423$, $p < .001$), while urban participants scored higher than rural counterparts ($M = 59.10$ vs. $53.19$; $d = 1.336$, $p < .001$). Science-stream students showed greater AI acceptance than arts students ($M = 59.36$ vs. $53.91$; $d = 1.218$, $p < .001$). No significant gender difference emerged ($p = .627$). The findings highlight the influence of generational, geographical, and disciplinary factors on AI perceptions, suggesting the need for targeted teacher training programs, rural digital infrastructure development, and interdisciplinary AI literacy initiatives in Manipur's teacher education curriculum.*

***Keywords:*** *Artificial Intelligence, Teacher Education, Demographic Differences, Technology Attitudes, India*

## 1. INTRODUCTION

Artificial Intelligence (AI) has emerged as a transformative force across various sectors, including healthcare, transportation, finance, and, increasingly, education. In the context of teacher education, AI is no longer a futuristic concept but a present-day reality, reshaping teaching methodologies, student engagement, and educational administration (Luckin et al., 2016; Holmes et al., 2019). The integration of AI in education offers opportunities to personalize learning, automate administrative tasks, and enhance pedagogical practices (Zawacki-Richter et al., 2019). However, the effective adoption of AI in educational settings is significantly influenced by educators' attitudes and their willingness to engage with such technologies (Hatlevik & Christophersen, 2013).

In teacher education, student-teachers' perceptions and attitudes towards AI are particularly critical. As future educators, their openness to and understanding of AI will likely influence how they incorporate emerging technologies in their professional practice (Pedró et al., 2019). Attitudes towards AI can be shaped by multiple factors, including demographic variables such as age, gender, place of residence, and subject specialization. For instance, previous research suggests that younger individuals and those from urban areas may have more favorable attitudes toward emerging technologies compared to their older or rural counterparts (Teo, 2011; Yuen & Ma, 2008). Similarly, subject stream differences – particularly between science and arts students – may affect perceptions due to varying degrees of prior exposure and comfort with technology-related concepts (Tondeur et al., 2008).

In the Indian context, where digital infrastructure and technological literacy levels vary widely, examining the attitudes of pre-service teachers toward AI becomes essential. Particularly in the state of Manipur, a region with both urban and rural educational institutions, understanding these differences can provide insights for policy development, curriculum design, and professional development programs. While global literature on AI in education is expanding, there is a noticeable gap in localized research that examines how teacher-trainees perceive AI and what factors influence these perceptions.

Against this backdrop, the present study seeks to explore the differences in attitudes toward artificial intelligence among B.Ed. student-teachers in Manipur based on selected demographic variables.

The findings intend to notify teacher education programs and add to the growing discourse on AI integration in education.

## 2. LITERATURE REVIEW

The integration of artificial intelligence (AI) in teacher education has gained momentum in recent years, especially regarding pre-service teachers' perceptions and readiness. Research suggests that B.Ed. student-teachers generally hold positive attitudes toward AI, though concerns related to ethical issues, digital competence, and subject-area disparities remain.

### *2.1 Positive Attitudes and Perceived Benefits*

Several studies report favorable attitudes toward AI among B.Ed. student-teachers. Robby et al. (2024) found a significant positive correlation between student-teachers' attitudes and their intention to use AI tools, indicating a growing acceptance of AI in academic activities. Roth and Tengler (2024) similarly noted positive perceptions of AI, although concerns about data ethics and legal standards were prevalent. Varghese and Selvaraj (2024) observed that 91% of participants use AI occasionally, primarily for research (33%), time management (29%), and assignment completion (29%), with only a minority (9%) citing its use for gaining advanced knowledge.

Abejo et al. (2024) found that Bachelor of Secondary Education (BSEd) students expressed favorable views on the integration of AI in the teaching-learning process and curriculum, though their attitude toward future developments in AI was neutral. Chapagai and Adhikari (2024) reported that B.Ed. student-teachers appreciated AI's capacity to enhance engagement, motivation, and personalized learning experiences, yet voiced concerns about data privacy and the limitations of AI in fostering collaborative and independent learning.

### *2.2 Subject-Stream Differences*

Subject specialization appears to influence student-teachers' perceptions of AI. Aktulun et al. (2024) discovered that STEM student-teachers had more favorable attitudes toward AI and less anxiety compared to their non-STEM counterparts, suggesting that disciplinary background plays a role in AI acceptance and confidence.

### *2.3 Concerns and Ethical Issues*

Despite positive inclinations, ethical and legal concerns persist. Roth and Tengler (2024) emphasized that student-teachers were cautious about trusting AI due to uncertainties surrounding data ethics, privacy, and regulatory frameworks. These concerns must be addressed to ensure responsible and confident use of AI in educational environments.

### 2.4 Confidence, Competence, and Readiness

Studies also point to a gap between perceived benefits and actual readiness to use AI. Sămărescu et al. (2024) indicated that confidence in AI and perceived usefulness – rather than prior experience – was stronger predictors of positive attitudes. Similarly, Sadykova and Kayumova (2024) found that while B.Ed. student-teachers viewed AI as promising, they reported low levels of competence and infrequent use, though many expressed willingness to receive training. Tsankov and Damyanov (2024) further observed a general lack of

preparedness to use generative AI tools, signalling the need for improved digital literacy in teacher training programs.

### *2.5 Mixed Attitudes and Need for Reform*

Sangapu (2018) earlier noted mixed perceptions of AI among B.Ed. student-teachers, viewing it as both a benefit and a threat. Compared to in-service teachers, student-teachers were less adaptive to technological innovations, highlighting a continued need for educational reform to support AI integration in pre-service teacher education.

### *2.6 Summary and Research Gap*

The reviewed studies affirm that B.Ed. student-teachers hold generally positive attitudes toward AI. However, concerns related to ethics, limited competence, and disparities across disciplines and demographics persist. Notably, there is a lack of empirical research from north-eastern India, particularly Manipur, where digital exposure and access may vary significantly. Furthermore, few studies have analyzed how variables such as age, gender, locality, and subject-stream influence attitudes toward AI among pre-service teachers. The present study aims to fill this gap by offering a comparative analysis within this unique regional and educational context.

## 3. RATIONALE OF THE STUDY

The integration of Artificial Intelligence (AI) in education has garnered increasing global attention due to its potential to transform teaching and learning processes. AI-powered tools such as intelligent tutoring systems, automated grading, and adaptive learning platforms are gradually reshaping pedagogical practices (Zawacki-Richter et al., 2019). In this evolving educational landscape, the readiness of future educators to accept and effectively utilize AI is critical. Pre-service teachers' attitudes towards AI influence not only their future classroom practices but also their willingness to engage in lifelong technological adaptation and professional development (Holmes et al., 2019).

In India, especially in the north-eastern state of Manipur, technological penetration and digital literacy levels vary significantly across regions and demographic groups. Factors such as age, gender, place of residence (urban or rural), and academic background (arts or science) may significantly influence perceptions of and engagement with AI tools. However, there remains a scarcity of empirical research that systematically examines these variables among B.Ed. student-teachers. Most existing studies on AI in education have focused on institutional readiness, policy frameworks, or general student perceptions, often overlooking the nuanced attitudes of teacher trainees – particularly in socio-culturally diverse regions like Manipur.

Understanding the attitudes of B.Ed. student-teachers towards AI, and identifying demographic patterns in these attitudes, is crucial for informing curriculum development, designing contextually relevant training modules, and preparing a technologically competent teaching workforce. This study aims to bridge this gap by exploring the differences in AI-related attitudes among B.Ed. student-teachers in Manipur, thereby contributing to both theory and practice in teacher education.

## 4. STATEMENT OF THE PROBLEM

While Artificial Intelligence is increasingly being recognized as a transformative force in education, there is a dearth of context-specific research on how future educators perceive its use, especially in less digitally advanced regions like Manipur. The successful integration of AI into teaching-learning processes depends significantly on teacher attitudes, which are shaped by individual, contextual, and experiential factors. Despite this, little attention has been given to understanding the variation in AI-related attitudes among B.Ed. student-teachers in relation to their demographic characteristics.

In the absence of such understanding, initiatives aimed at incorporating AI into teacher education may not align with the readiness or needs of student-teachers. This gap is

particularly evident in the context of Manipur, where differences in locality, age, gender, and subject specialization could meaningfully affect attitudes toward emerging technologies. Therefore, the central problem addressed in this study is the lack of empirical evidence on whether and how B.Ed. student-teachers' attitudes towards AI differ across demographic categories such as age (more than 30 years vs. less than 30 years), gender (male vs. female), locality (rural vs. urban), and subject-stream (arts vs. science). The study seeks to provide data-driven insights to inform policy, teacher training, and future research.

## 5. OBJECTIVE OF THE STUDY

The objective of this study is to examine the differences in attitudes towards artificial intelligence (AI) among B.Ed. student-teachers in Manipur based on categorical variables such as age (above 30 years vs. below 30 years), gender (male vs. female), locality (rural vs. urban), and subject stream (arts vs. science).

## 6. HYPOTHESES OF THE STUDY

$H_{01}$**:** There is no significant difference in the attitude towards artificial intelligence (AI) between B.Ed. student-teachers aged above 30 years and those aged below 30 years.

$H_{02}$**:** There is no significant difference in the attitude towards artificial intelligence (AI) between male and female B.Ed. student-teachers.

$H_{03}$**:** There is no significant difference in the attitude towards artificial intelligence (AI) between B.Ed. student-teachers from rural and urban localities.

$H_{04}$**:** There is no significant difference in the attitude towards artificial intelligence (AI) between B.Ed. student-teachers from the arts stream and those from the science stream.

## 7. METHODOLOGY

### *7.1 Research Design*

The study employed a cross-sectional descriptive survey design to examine variations in attitudes toward artificial intelligence among B.Ed. student-teachers across different demographic categories including age, gender, locality, and academic stream. This design enabled the collection of quantitative data at a single point in time to identify patterns and relationships.

### *7.2 Population*

The target population consisted of all second-semester B.Ed. student-teachers enrolled in Colleges of Teacher Education in Manipur during the 2024-2025 academic year. A total of 15 NCTE-approved colleges affiliated with Manipur University were included, comprising approximately 1,500 student-teachers.

### *7.3 Sampling*

A two-stage random sampling technique was implemented. In the first stage, eight colleges were randomly selected from the 15 available institutions. In the second stage, 40 student-teachers were randomly selected from each chosen college, resulting in a final sample of 320 participants. The sample size was determined using Slovin's formula with a 95% confidence level and 5% margin of error to ensure representativeness of the population.

### *7.4 Instrument*

The study utilized the Artificial Intelligence Attitude Scale developed by Aktay et al. (2024). This 13-item instrument measured attitudes across three dimensions: benefits of artificial intelligence (items 1-3), risks of artificial intelligence (items 4-7) – negatively worded, and use of artificial intelligence (items 8-13). Responses were recorded on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with total scores ranging from 13 to 65. Higher scores indicated more positive attitudes toward AI. The scale demonstrated good reliability with an overall Cronbach's alpha of 0.802, and subscale reliabilities of 0.781 for benefits, 0.732 for risks, and 0.679 for use dimensions.

### *7.5 Data Collection Procedure*

Data collection commenced after obtaining necessary permissions from institutional authorities and informed consent from participants. The questionnaire administration was conducted during recess periods to minimize disruption to academic activities. Participants completed the self-report measure under supervised conditions to ensure standardized procedures.

### *7.6 Data Analysis*

The analysis incorporated both descriptive and inferential statistical techniques. Descriptive statistics including means, standard deviations, and standard errors were computed to summarize the data. Independent samples t-tests were conducted to examine group differences in attitudes, with Cohen's d effect sizes calculated to determine the magnitude of observed differences. All analyses were performed using IBM SPSS version 22, with the significance level set at $p < 0.05$ for hypothesis testing.

## 8. RESULTS

### *8.1 Attitudinal difference in AI by age*

**Table 1:** Attitude towards AI according to age

| Age | N | M | SD | SEM | t | Sig. (2-tailed) | Cohen's d |
|---|---|---|---|---|---|---|---|
| Less than 30 years | 175 | 58.69 | 4.34 | 0.73 | 5.226 | 0.000 | 1.423 |
| 30 years and more | 145 | 52.50 | 4.36 | 0.93 | | | |

An independent samples t-test was conducted to compare attitudes toward AI between participants under 30 years of age (n = 175) and those 30 years or older (n = 145).

Results revealed a statistically significant difference between the two age groups, t (318) = 5.226, p < .001, with a large effect size (Cohen's d = 1.423).

The younger group (M = 58.69, SD = 4.34) demonstrated significantly more positive attitudes toward AI than the older group (M = 52.50, SD = 4.36). The standard error of the mean was 0.73 for the younger group and 0.93 for the older group. These findings suggest that age is significantly associated with attitudes toward AI, with younger participants showing more favorable views.

### *8.2 Attitudinal difference in AI by gender*

**Table 2:** Attitude towards AI according to gender

| Gender | N | M | SD | SEM | t | Sig. (2-tailed) | Cohen's d |
|---|---|---|---|---|---|---|---|
| Male | 141 | 56.61 | 5.66 | 1.02 | 0.488 | 0.627 | 0.131 |
| Female | 179 | 55.92 | 4.86 | 0.95 | | | |

An independent samples t-test was conducted to compare attitudes toward AI between male (n = 141) and female (n = 179) participants. The analysis revealed no statistically significant difference between genders, t(318) = 0.488, p = .627, with a negligible effect size (Cohen's d = 0.131).

Male participants (M = 56.61, SD = 5.66) showed marginally more positive attitudes toward AI compared to female participants (M = 55.92, SD = 4.86), but this difference was not statistically significant. The standard error of the mean was 1.02 for males and 0.95 for females. These results suggest that gender does not appear to be meaningfully associated with attitudes toward AI in this sample.

### *8.3 Attitudinal difference in AI by locality*

**Table 3:** Attitude towards AI according to locality

| Locality | N | M | SD | SEM | t | Sig. (2-tailed) | Cohen's d |
|---|---|---|---|---|---|---|---|
| Urban | 170 | 59.10 | 3.75 | 0.69 | 5.077 | .000 | 1.336 |
| Rural | 150 | 53.19 | 5.01 | 0.96 | | | |

An independent samples t-test comparing attitudes toward AI between urban (n = 170) and rural (n = 150) participants revealed a statistically significant difference, $t(318) = 5.077$, $p < .001$, with a very large effect size (Cohen's d = 1.336).

Participants from urban areas (M = 59.10, SD = 3.75) demonstrated significantly more positive attitudes toward AI than their rural counterparts (M = 53.19, SD = 5.01). The standard error of the mean was 0.69 for urban respondents and 0.96 for rural respondents.

These findings suggest that locality is strongly associated with attitudes toward AI, with urban residents showing substantially more favorable views than rural residents. The very large effect size ($d > 0.8$) indicates this difference is not only statistically significant but also practically meaningful.

### *8.4 Attitudinal difference in AI by subject stream*

**Table 4:** Attitude towards AI according to subject stream

| Subject stream | N | M | SD | SEM | t | Sig. (2-tailed) | Cohen's d |
|---|---|---|---|---|---|---|---|
| Arts | 165 | 53.91 | 5.04 | 0.89 | 4.487 | .000 | 1.218 |
| Science | 155 | 59.36 | 3.83 | 0.77 | | | |

An independent samples t-test was conducted to compare attitudes toward AI between students from arts (n = 165) and science (n = 155) streams. The analysis revealed a statistically significant difference between groups, $t(318) = 4.487$, $p < .001$, with a very large effect size (Cohen's d = 1.218).

Science stream students (M = 59.36, SD = 3.83) demonstrated significantly more positive attitudes toward AI compared to arts stream students (M = 53.91, SD = 5.04). The standard error of the mean was 0.77 for science students and 0.89 for arts students. These results indicate that academic discipline is strongly associated with AI attitudes, with science students showing substantially more favorable views.

## 9. DISCUSSION

This study examined AI attitudes among 320 B.Ed. student-teachers in Manipur, revealing significant variations by age, locality, and academic stream. These findings align with broader trends in teacher technology adoption while highlighting region-specific nuances.

**KEY FINDINGS**

1. **Age Differences (d = 1.423)**: Younger teachers (<30 years) showed markedly more positive AI attitudes, consistent with global studies on "digital native" educators (Prensky, 2001). Similar generational gaps in technology acceptance have been documented in Indian teacher populations (Goswami & Dutta, 2016).
2. **Urban-Rural Divide (d = 1.336)**: Urban participants' stronger AI alignment mirrors India's documented rural-urban digital gap (Singh & Kumar, 2022). Manipur's geographical challenges (e.g., infrastructure limitations in rural areas) may exacerbate this disparity (Sharma, 2021).
3. **Stream-Based Differences (d = 1.218)**: Science-stream teachers' more favorable attitudes resonate with studies showing STEM educators' greater technological confidence (National Education Policy [NEP], 2020). This suggests curricular exposure influences AI receptivity (NCERT, 2021).

4. **No Gender Gap (p = .627)**: The null result contrasts with earlier gender studies but aligns with recent Indian research showing narrowing gender divides in educational technology (Patel & Chatterjee, 2023).

**IMPLICATION FOR MANIPUR'S TEACHER EDUCATION**

- **Targeted Training**: Older and rural teachers may need hands-on AI workshops (NEP, 2020).
- **Interdisciplinary Integration**: Arts-stream curricula should embed AI literacy (NCERT, 2021).
- **Infrastructure Investment**: Bridging rural-urban gaps requires policy support (Singh & Kumar, 2022).

**LIMITATIONS AND FUTURE RESEARCH**

While providing important baseline data, this study has limitations. The sample was restricted to one Indian state, and self-report measures may be subject to social desirability bias. Future research should employ mixed methods to explore:

- The relationship between AI attitudes and actual classroom practices
- The impact of hands-on AI training on attitude change
- Longitudinal tracking of attitude evolution during teacher careers

**8. CONCLUSION**

As AI becomes increasingly embedded in education, understanding teacher attitudes is crucial for successful implementation. This study provides the first systematic evidence of AI attitude patterns among Manipuri teachers, highlighting significant demographic variations that should inform policy and professional development initiatives in India's north-eastern region.

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