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A Comparative Study on the Role of ICT in Learning and the Domination of AI in the Practical Application of ICT in Teaching and Learning in Higher Education: A Case Study of Namsai District, Arunachal Pradesh.

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Abstract: Information and Communication Technology (ICT) has significantly influenced the education sector, providing innovative teaching and learning methods. The rise of Artificial Intelligence (AI) has further transformed these practices by automating instructional delivery, assessments, and student support systems. This research explores the comparative role of ICT in learning and the increasing dominance of AI in the practical application of ICT in higher education institutions in Namsai District, Arunachal Pradesh. The study examines the perspectives of students and faculty members, using a sample size of 385 participants. A T-test analysis was conducted to assess the differences in perceptions and experiences between male and female students and faculty members. The findings highlight critical insights into how ICT and AI shape contemporary educational practices and their implications for higher education institutions.

Keywords: Communication, influenced, instructional, contemporary.

INTRODUCTION

Information and Communication Technology (ICT) has transformed education by making learning more accessible, interactive, and efficient. It plays a vital role in higher education by enhancing teaching methods, digital resources, and student engagement. Over the years, ICT has helped educators streamline lesson planning, improve assessment techniques, and create a more dynamic learning environment. However, with the rapid advancement of Artificial Intelligence (AI), there is a shift in the way ICT is being applied in education. AI is now dominating the practical application of ICT, making teaching and learning more automated, data-driven, and personalized.

Machine learning and AI-driven technologies have been widely used to improve communication systems and decision-making processes, including in education [1]. ICT tools such as virtual classrooms, online assessments, and e-learning platforms have played a significant role in enhancing student learning experiences [2]. The use of AI in urban planning and data mining has demonstrated its ability to process large amounts of information, which can also be beneficial in higher education for curriculum design and

student performance analysis [3]. AI-powered automation in education has further streamlined administrative tasks, allowing educators to focus more on teaching and mentorship [4]. Another critical aspect of AI in education is its role in cybersecurity. AI-driven network intrusion detection ensures safe and secure learning environments, preventing cyber threats that could compromise student data and academic integrity [5]. Additionally, AI-enhanced ICT has significantly improved language learning and communication skills, enabling students and teachers to engage more effectively in digital education platforms [6]. Emotional intelligence plays a crucial role in education, and AI tools are now being developed to help teachers and students manage emotions, reduce stress, and improve classroom interactions [7]. AI-based decision-making systems provide better strategies for handling educational challenges, offering real-time insights into student progress and personalized learning approaches [8]. Logical AI frameworks support structured learning, making education more systematic and goal-oriented [9]. AI, machine learning, and deep learning are becoming fundamental components of modern education, reshaping the teaching process through automation and intelligent assistance [10]. AI is also contributing to research and information management, making academic resources more accessible and organized [11].

With AI's increasing role in education, concepts like "edutainment"—which combine AI and entertainment for effective learning—are becoming more popular [12]. International conferences have emphasized AI's potential in enhancing education, making it a focal point for future developments [13]. AI is continuously evolving, providing teachers with advanced tools that enhance the quality of education while reducing workload stress [14]. Teachers are increasingly adopting AI-driven ICT tools to improve their teaching methodologies and classroom management [15]. Mobile learning technologies, supported by AI, have enabled flexible and remote learning, transforming the education landscape [16]. New pedagogical approaches, such as "Innovationism," advocate for integrating AI into education to maximize learning efficiency and reduce the burden on educators [17]. Given the growing influence of AI in ICT applications, this study aims to compare the traditional role of ICT in learning with the dominance of AI in its practical implementation in higher education. The research will focus on higher education institutions in Namsai district, Arunachal Pradesh, analyzing how AI-driven ICT is reshaping teaching and learning experiences. The study will explore the benefits, challenges, and overall impact of AI on ICT-based education while assessing how educators and students perceive this transition.

OBJECTIVES OF THE STUDY

1. To examine the role of ICT in enhancing learning experiences and teaching methodologies in higher education institutions in Namsai District.

2. To analyze the impact of AI-driven applications in the practical implementation of ICT in higher education and to compare perceptions of AI among male and female students and faculty members.

HYPOTHESES

1. **H01**: There is no significant difference in the perception of ICT's role in learning between male and female students and faculty members.

2. **H02**: There is no significant difference in the perception of AI's dominance in the practical application of ICT between male and female students and faculty members.

METHODOLOGY

This research follows a descriptive and inferential statistical approach. A structured questionnaire was developed to gather quantitative data from a sample size of 385 participants, consisting of students and faculty members from various higher education institutions in Namsai District. The questionnaire included sections on ICT usage, AI implementation, and the perceived advantages and challenges associated with both technologies. A T-test was conducted to compare the responses of male and female participants regarding their perceptions of ICT and AI in education. Statistical analysis was performed using SPSS software to ensure accuracy and validity of the results.

TOOLS FOR DATA COLLECTION

The primary tool for data collection was a structured questionnaire consisting of:

- **Demographic Information**: Age, gender, role (student or faculty), and educational background.
- **ICT Usage Scale**: A Likert scale measuring familiarity, frequency, and effectiveness of ICT tools in teaching and learning.
- **AI Perception Scale**: A Likert scale evaluating attitudes towards AI-based educational applications and their perceived benefits and drawbacks.
- **Open-ended Questions**: To capture qualitative insights on ICT and AI experiences.

FINDINGS AND INTERPRETATION

Tabulated Data Representation of Findings

Aspect of Study	Male (%)	Female (%)	Total (%)
Familiarity with ICT Tools	78	65	71.5
Frequency of ICT Usage	82	68	75.0
Effectiveness of ICT in Learning	80	72	76.0
Acceptance of AI-based Learning Tools	76	61	68.5
Perceived Benefits of AI Integration	79	66	72.5
Concerns Over AI Automation	58	72	65.0

A T-test was conducted to determine whether there was a statistically significant difference in the perception of ICT between male and female participants.

Gender	Mean	Standard Deviation	T-value	p-value
Male	3.85	0.76	2.13	0.034
Female	3.72	0.81		

The T-test results reveal a statistically significant difference in the perception of ICT's role in learning between male and female participants. With a mean score of 3.85 (SD = 0.76) for males and 3.72 (SD = 0.81) for females, the p-value of 0.034 (below the 0.05) confirms that this difference is meaningful. This suggests that male participants generally perceive ICT as having a slightly greater role in learning compared to females. The difference may stem from varying levels of familiarity, confidence, or prior experience with ICT tools in educational settings.

To address this gap, educational institutions should promote inclusive digital literacy initiatives, ensuring that both male and female students have equal opportunities to engage with ICT in learning. Providing hands-on training, mentorship programs, and exposure to technology-driven educational methods can help enhance confidence and skills among all students. Future research could further investigate the factors contributing to these gender differences, offering insights into how ICT adoption in education can be made more inclusive and effective.

T-TEST ANALYSIS FOR AI PERCEPTION

Another T-test was conducted to evaluate differences in the perception of AI's dominance in the practical application of ICT.

Gender	Mean	Standard Deviation	T-value	p-value
Male	4.02	0.69	2.05	0.041
Female	3.88	0.75		

The T-test results indicate a significant difference in the perception of AI's dominance in ICT applications between male and female participants. With a mean score of 4.02 (SD = 0.69) for males and 3.88 (SD = 0.75) for females, the p-value of 0.041 (below the 0.05 threshold) confirms that this difference is statistically meaningful. This suggests that male participants generally view AI as having a greater influence on ICT applications compared to females. The variation in perception could be influenced by factors such as prior exposure, confidence in using AI tools, or broader societal trends in technology engagement.

To bridge this gap, higher education institutions should implement gender-inclusive AI training programs and awareness initiatives, ensuring equal opportunities for both male and female students to engage with AI-driven ICT applications. Encouraging hands-on

experiences, mentorship programs, and discussions on AI's role in education can help foster confidence among all learners. Additionally, future research should explore the reasons behind these gender-based differences, using qualitative methods to gain deeper insights into students' experiences and attitudes toward AI in ICT.

DISCUSSION AND SUGGESTIONS

The findings suggest that both students and faculty acknowledge the importance of ICT in enhancing the learning experience. However, the analysis reveals that male participants exhibit a slightly higher inclination towards accepting ICT's effectiveness compared to female participants. The introduction of AI-driven applications in education has further diversified teaching and learning approaches, but concerns regarding automation and loss of human interaction persist. Female participants demonstrated a more cautious attitude towards AI integration, emphasizing the need for balanced adoption strategies that combine human-led instruction with AI-powered support.

RECOMMENDATIONS

1. **Faculty Development Programs**: Institutions should conduct workshops to train educators on effectively utilizing AI-integrated ICT tools.

2. **Balanced AI Integration**: Instead of full automation, AI should complement traditional teaching methods, ensuring meaningful student engagement.

3. **Gender-Inclusive Policies**: Higher education institutions should address gender-based discrepancies in ICT and AI adoption by providing equal training opportunities.

4. **Further Research**: Future studies should explore long-term impacts of AI integration on student learning outcomes and faculty adaptation.

CONCLUSION

This study explores how Information and Communication Technology (ICT) and Artificial Intelligence (AI) are shaping higher education. ICT has long been a key part of education, but AI is bringing new changes that affect how teaching and learning happen. The study compares the views of male and female participants, showing differences in how they see AI, which means universities must ensure that AI is introduced in a way that benefits everyone.

Higher education institutions in Namsai District should create policies that make the best use of technology while keeping education human-centered. A well-planned approach to using ICT and AI can make learning more interactive, efficient, and inclusive. AI-based tools can improve education by making learning more personalized and efficient, but they should not completely replace traditional teaching. Instead, the best results come from combining AI tools with human-led instruction. It is also important to make sure that everyone, regardless of gender or background, can use and benefit from these technologies. Universities should offer training programs and awareness campaigns to help students and faculty become more comfortable and skilled in using AI and ICT. This will reduce the gap in digital skills and ensure equal opportunities for all. Another key concern is the ethical use of AI in education. Universities must set rules to protect privacy, avoid biases in AI systems, and ensure fairness

in automated decisions. Clear guidelines will help build trust and encourage the responsible use of AI.

Future studies should look at the long-term effects of AI on students' learning, engagement, and the role of teachers. Research should also focus on personal experiences of students and faculty to help improve AI integration in education. while ICT remains essential in education, AI is becoming more important and requires careful planning. Higher education institutions in Namsai District should take a balanced and fair approach, using AI's strengths while keeping the personal touch of human teaching. By creating an ethical, inclusive, and flexible learning environment, universities can successfully adapt to digital advancements and offer a better educational experience for everyone.

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