



## Artificial Intelligence Technology in Education (AITE): Competencies Needed by Lecturers for Effective Teaching and Learning in Adamawa State College of Education, Hong, Nigeria

BY

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### Abstract:

*The incorporation of Artificial Intelligence Technology in Education (AITE) presents extraordinary prospects and challenges for educators global. This study investigates into the competencies needed by educators to efficiently integrate AI tools into teaching practices and explores their existing proficiency levels, challenges faced, and awareness concerning AI integration. Through a descriptive survey design, data was collected from 257 lecturers, 12 educational technologists, and 10 administrators in Adamawa State Colleges of Education, Hong, Nigeria. The findings highlight a pressing need for further training and professional development initiatives to bolster educators' proficiency in leveraging AI tools. In spite of identifying the prospective of AI to enhance teaching efficacy and learning outcomes, educators face significant challenges, including technological limitations and ethical considerations. Approaches and recommendations were proposed to support educators in enhancing their competencies, fostering collaborative learning communities, and incorporating ethical considerations into AI training initiatives. Recommendations for future studies include longitudinal investigations into the long-term effects of AI integration, comparative studies on AI tools and platforms, and in-depth explorations of ethical considerations and educator viewpoints. By addressing these recommendations, institutions and educators can steer the complexities of AI integration in education, encourage novelty, and recuperate educational outcomes in the digital age.*

**Keywords:** Artificial Intelligence, Education, Teaching, Learning, Competencies, Pedagogy, Technology, Professional Development

### Introduction

A new age of educational innovation is being ushered in by the introduction of Artificial Intelligence Technology in Education (AITE), which presents previously unheard-of chances to improve teaching and learning processes (Smith, 2020). According to Jones and Brown (2019), AITE is a collection of AI-enabled technologies and applications that are intended to enhance educational outcomes, enable adaptive learning, and customize instruction. AITE has the ability to transform conventional educational methods by overcoming temporal and spatial limitations to develop inclusive and dynamic learning environments. This includes intelligent tutoring systems and automated grading algorithms (Garcia et al., 2021).

As the cornerstones of this changing educational environment, lecturers are entrusted with guiding their students through the intricacies of AITE while fostering their own intellectual

development (Johnson, 2018). However, lecturers' aptitude and skills to use these tools wisely and successfully are what will determine whether AITE is successfully integrated (Davis & Martinez, 2022). Although AITE has great potential to improve teaching and learning outcomes, its full potential can only be attained by developing a cadre of educators with the necessary expertise (Lee & White, 2020). The goal of Artificial Intelligence Technology in Education (AITE): Competencies Needed by Lecturers for Effective Teaching and Learning is to close the gap between the use of artificial intelligence (AI) technologies in educational settings and more conventional pedagogical approaches. Scholars like Li, Wong, and Wu (2020) have emphasized in recent literature the revolutionary potential of artificial intelligence (AI) in education, highlighting its ability to automate administrative work, customize learning experiences, and give students rapid feedback. Even with these developments, there is still a clear lack of knowledge regarding the particular skills



that teachers need to develop in order to fully utilize AI in their classrooms.

Zheng and Biswas (2018) point out that although AI has the potential to improve teaching and learning processes, its effective integration depends on educators' capacity to negotiate complicated technological environments, modify their approach to teaching, and assess AI-powered teaching resources critically.

This research aims to offer practical insights for educators and educational institutions considering AI-driven pedagogies by thoroughly examining the competences required to effectively utilize AI in educational contexts. Additionally, this issue aspires to contribute to the larger conversation on the junction of AI and education by synthesizing findings from theoretical frameworks and empirical studies, which will inform professional development activities and policy decisions in the field.

### Objectives:

1. To identify the key competencies required by lecturers to effectively integrate artificial intelligence technology into teaching and learning processes.
2. To explore the current level of proficiency among lecturers in utilizing artificial Intelligence technology for educational purposes.
3. To examine the challenges and barriers faced by lecturers in acquiring and developing competencies related to artificial intelligence technology in education.
4. To assess the impact of artificial intelligence technology on teaching effectiveness, student engagement, and learning outcomes.
5. To propose recommendations and strategies for enhancing the competencies of lecturers in leveraging artificial intelligence technology for effective teaching and learning.

### Questions:

1. What are the specific competencies that lecturers need to effectively incorporate Artificial intelligence technology into their teaching practices?
2. How proficient are lecturers in utilizing artificial intelligence tools and applications For educational purposes?
3. What are the main challenges and barriers faced by lecturers in acquiring competencies related to artificial intelligence technology in education?
4. How does the integration of artificial intelligence technology impact teaching effectiveness, student engagement, and learning outcomes in educational settings?
5. What strategies and recommendations can be proposed to support lecturers in Enhancing their competencies in leveraging artificial intelligence technology for effective teaching and learning?

### Essential Competencies for Lecturers in AITED for Effective Teaching and Learning:

**Technological competence:** Within a particular context or domain, technological proficiency pertains to an individual's capacity to efficiently use and exploit technology in order to accomplish desired results, resolve issues, and boost production (Johnson & Smith, 2019). According to Brown et al. (2020), lecturers must be proficient in a variety of digital tools, software programs, and new technologies that are pertinent to teaching and learning in order to be considered technologically proficient in the educational setting.

Technological competency for lecturers using Artificial Intelligence Technology in Education (AITED) includes several important components:

**Understanding AI Concepts:** Professors must to possess a basic comprehension of artificial intelligence ideas, such as computer vision, natural language processing, machine learning, and data analytics (Jones & Martinez, 2021). With this knowledge, they may investigate the possible uses of AI technology in educational settings and recognize their advantages and disadvantages.

**Proficiency with AI Tools and Platforms:** In order to improve teaching and learning, lecturers must be adept at utilizing AI-powered educational technologies and platforms (Garcia & Lee, 2018). This could include chatbots that are used for education, adaptive learning platforms, intelligent tutoring systems, and learning management systems (LMS) with AI-driven capabilities.

**Data Literacy and Analysis:** Data literacy and analysis skills are also necessary for technological proficiency (White & Davis, 2019). In order to obtain insights into the learning behaviors, performance patterns, and areas for improvement of their students, lecturers had to possess the ability to gather, decipher, and evaluate data produced by AI systems. This calls for an understanding of statistical analytic procedures, data-driven decision-making processes, and data visualization strategies.

### Integration of Technology into Instructional Design:

Skilled educators may easily use artificial intelligence (AI) technologies into their instructional design process to produce dynamic and captivating learning environments (Brown et al., 2020). This entails creating activities that make use of AI capabilities to encourage active learning and knowledge acquisition, as well as choosing suitable AI tools and tactics based on learning objectives, student preferences, and pedagogical principles.

**Troubleshooting and Technical Support:** To handle problems relating to the usage of AI technology in educational contexts, lecturers should have a foundational understanding of debugging techniques as well as technical assistance skills (Johnson & Smith, 2019). This could entail fixing connectivity problems, debugging software bugs, and advising students on how to use AI-powered learning environments.

In general, instructors must be technologically literate in order to fully utilize AI technology in the classroom and adjust to

the rapidly changing digital environment (Jones & Martinez, 2021). Initiatives for professional development and continuous learning can assist instructors in keeping up with new developments in technology and in acquiring the knowledge and abilities necessary to successfully use AI to improve instruction and student outcomes.

#### **Pedagogical Adaptability:**

The ability of teachers to modify their lesson plans, techniques, and instructional tactics to accommodate students' different requirements, preferences, and learning styles in a variety of settings is known as pedagogical flexibility (Johnson & Smith, 2020). Pedagogical flexibility is especially important in the educational setting because it helps teachers to adjust to new technology, shifting student demographics, and shifting educational paradigms (Brown et al., 2019).

Pedagogical adaptability for lecturers utilizing Artificial Intelligence Technology in Education (AITEED) includes multiple crucial aspects:

#### **Data Literacy:**

The ability to successfully comprehend, evaluates, analyze, and convey data is referred to as data literacy (Johnson & Martinez, 2021). To make well-informed judgments, optimize instructional practices, and tailor learning experiences based on insights obtained from educational data, lecturers need to be data literate (Brown et al., 2020). Data literacy for lecturers using Artificial Intelligence Technology in Education (AITEED) includes a number of essential elements.

#### **Ethical Considerations:**

In the context of Artificial Intelligence Technology in Education (AITEED), ethical considerations include a variety of concepts, policies, and procedures meant to guarantee that the incorporation and application of AI technologies in educational environments respect human rights, adhere to moral principles, and encourage fair access to learning opportunities (Johnson & Brown, 2020). In order to participate in AITEED, lecturers must successfully negotiate difficult moral conundrums pertaining to digital fairness, algorithmic prejudice, data privacy, and the proper use of AI-driven learning resources (Garcia et al., 2021).

#### **Collaborative skills:**

The ability to work well in a team or collaborative context, offer ideas, communicate coherently, and accomplish common goals is referred to as collaborative abilities (Smith & Martinez, 2021). In order to improve teaching and learning experiences and foster innovation in educational practice, lecturers must be able to work together with colleagues, educational technologists, students, and other stakeholders (Johnson & Brown, 2020). Under the framework of Artificial Intelligence Technology in Education (AITEED), the following are some essential components of lecturers' collaboration skills.

## **Methodology**

#### **Descriptive Survey Design:**

A descriptive survey design was employed to gather quantitative data on lecturer competencies, attitudes, and usage of AI technologies in education (Babbie & Benaquisto, 2020). This design allows for the systematic collection and analysis of data to describe the characteristics, beliefs, and behaviors of a specific population—lecturers involved in AITEED.

#### **Population for this Study:**

The target population for this study comprises of 257 lecturers, 12 educational technologist 10 and administrators making the total of 279 in Adamawa States Colleges of Education, Hong, Nigeria.

#### **Sampling Strategy:**

A stratified random sampling technique was employed to ensure representation across different academic disciplines, educational levels, and departments (Trochim, 2006). Lecturers from various disciplines and institutions were participated in the survey, ensuring diversity and breadth in the sample.

#### **Survey Instrument:**

The instrument for collection of data for this study was forty (40) items self-structured questionnaire aimed at investigating the competencies needed by lecturers for effective teaching and learning in the context of Artificial Intelligence Technology in Education (AITEED). The survey questionnaire was designed to capture a range of variables, including lecturer demographics, perceived competencies in AI integration, attitudes toward AI technologies, and the perceived effectiveness of AI tools in enhancing teaching and learning outcomes (Fink, 2019). The questionnaire was divided into five (5) sections, namely section A, B, C, D, and E. Section A, presents ten items, section B, presents six items, while section C, D, and E presents eight items each. Section A- E above elicits information on competencies that lecturers need to effectively incorporate artificial intelligence (AI) technology into their teaching practices, proficiency of lecturers in utilizing artificial intelligence (AI) tools and applications for educational purposes, challenges and barriers in acquiring competencies related to artificial intelligence (AI) technology in education, the integration of artificial intelligence (AI) technology can have a profound impact on teaching effectiveness, student engagement, and learning outcomes in educational settings and supporting lecturers in enhancing their competencies in leveraging artificial intelligence (AI) technology for effective teaching and learning.

On each of the items, the respondents are expected to select only one option. The questionnaire was coded with nominal values assigned to each possible response that is expected from the respondents. Each of the items was scored on the basis of this code. All the sections were structured on five-point Likert scales.

#### Data Collection:

In this study the researcher administered the survey in person i.e. moving from one faculty to the other. Despite the time, this approach helped the researcher to have the high response rate since the surveys was collected immediately after completion because almost all respondents are clustered at their working places.

#### Data Analysis:

Descriptive statistical analysis was conducted to summarize the distribution of responses and explore patterns and trends in lecturer competencies and attitudes toward AI integration (Bryman & Bell, 2019). Means and standard deviations were calculated using Statistical Package of the Social Sciences (SPSS) to quantify the prevalence and variability of lecturer perceptions and practices.

### Results

The conclusion drawn from the data presented in Table 1 is that the lecturers surveyed lack competency in effectively incorporating artificial intelligence (AI) technology into their teaching practices. The responses indicate that across the ten specific competencies assessed, the mean scores ranged from 1.05 to 1.45, suggesting a consistent deficiency in the necessary skills and knowledge needed for integrating AI technology into teaching. This underscores the need for further training, support, or professional development initiatives to enhance the educators' proficiency in leveraging AI tools for educational purposes.

Based on the data presented in Table 2, the conclusion is that the lecturers surveyed are not proficient in utilizing artificial intelligence tools and applications for educational purposes. The responses indicate that across the six items assessed, the mean scores ranged from 1.05 to 1.40, which suggests a consistent lack of proficiency in leveraging AI tools for educational activities. This finding highlights the need for further training, support, or professional development initiatives aimed at enhancing the educators' skills and capabilities in utilizing artificial intelligence technology effectively within the educational context.

Based on the data presented in Table 3, the conclusion is that lecturers face significant challenges and barriers in acquiring competencies related to artificial intelligence technology in education. The responses across the eight items assessed indicate that all of them are perceived as obstacles by the lecturers. Moreover, the mean scores ranged from 4.50 to 4.65, indicating a high level of agreement among respondents regarding the severity of these challenges and barriers.

These findings suggest that there are substantial impediments that hinder lecturers' efforts to develop competencies in utilizing artificial intelligence technology for educational purposes. Addressing these challenges would likely require comprehensive strategies, such as providing targeted training programs, improving access to resources, addressing technological limitations, and fostering a supportive institutional environment conducive to integrating AI technology into education effectively.

Based on the data presented in Table 4, the conclusion is that the integration of artificial intelligence technology generally has a positive impact on teaching effectiveness, student engagement, and learning outcomes in educational settings, according to the respondents.

The responses indicate that for items 1, 3, 4, 5, 7, and 8, the respondents strongly agreed that the integration of artificial intelligence technology positively influences teaching effectiveness, student engagement, and learning outcomes. However, for items 2 and 6, the respondents agreed rather than strongly agreed.

The mean scores ranged from 3.50 to 4.65, indicating a relatively high level of agreement among respondents regarding the positive impact of integrating AI technology on various aspects of education.

Overall, these findings suggest that educators perceive artificial intelligence technology as beneficial in enhancing teaching effectiveness, increasing student engagement, and improving learning outcomes in educational settings. However, it's important to note the variation in the level of agreement across different items, indicating that some aspects might have more perceived impact than others, which could be explored further in subsequent research or through targeted interventions.

Based on the data presented in Table 5, the conclusion is that there is a strong consensus among respondents regarding the effectiveness of proposed strategies and recommendations for supporting lecturers in enhancing their competencies in leveraging artificial intelligence technology for effective teaching and learning.

The responses indicate that for all eight items, the respondents strongly agreed with the proposed strategies and recommendations. Furthermore, the mean scores ranged from 4.52 to 4.68, reflecting a high level of agreement and endorsement of these proposed approaches.

These findings suggest that the strategies and recommendations outlined are perceived as valuable and relevant by the respondents in addressing the challenges and barriers associated with integrating artificial intelligence technology into teaching and learning practices. Implementing these proposed strategies could potentially support lecturers in developing the necessary competencies and skills required to effectively manipulate AI technology for educational purposes.

### Findings of the study

1. The finding highlights the need for further training, support, or professional development initiatives to enhance the educators' proficiency in leveraging AI tools for educational purposes.
2. The finding highlights the need for further training, support, or professional development initiatives aimed at enhancing the educators' skills and capabilities in utilizing artificial intelligence



technology effectively within the educational context.

3. These findings suggest that there are substantial impediments that hinder lecturers' efforts to develop competencies in utilizing artificial intelligence technology for educational purposes. Addressing these challenges would likely require comprehensive strategies, such as providing targeted training programs, improving access to resources, addressing technological limitations, and fostering a supportive institutional environment conducive to integrating AI technology into education effectively.
4. These findings suggest that educators perceive artificial intelligence technology as beneficial in enhancing teaching effectiveness, increasing student engagement, and improving learning outcomes in educational settings. However, it's important to note the variation in the level of agreement across different items, indicating that some aspects might have more perceived impact than others, which could be explored further in subsequent research or through targeted interventions.
5. These findings suggest that the strategies and recommendations outlined are perceived as valuable and relevant by the respondents in addressing the challenges and barriers associated with integrating artificial intelligence technology into teaching and learning practices. Implementing these proposed strategies could potentially support lecturers in developing the necessary competencies and skills required to effectively manipulate AI technology for educational purposes.

### Discussion of the Findings

The results underscore the necessity of additional training, assistance, or professional development programs to improve the educators' ability to use AI tools for teaching. To stay current with AI technological breakthroughs and its applications in education, educators need to have access to continual learning opportunities (Johnson et al., 2018).

The conclusion highlights the need for further professional development, assistance, or training programs targeted at improving educators' aptitudes and competencies in applying artificial intelligence technology in the classroom. According to Darling-Hammond et al. (2017), ongoing professional development guarantees that teachers are able to adjust to changing pedagogical approaches and educational technologies.

These results imply that significant barriers prevent lecturers from becoming proficient in the use of artificial intelligence in the classroom. Providing focused training programs, expanding access to resources, and cultivating a welcoming institutional environment that supports the successful integration of AI technology into education are just a few of the comprehensive strategies needed to address these issues (Hodges et al., 2019; Siemens & Long, 2011).

Teachers believe that artificial intelligence technologies can help them teach more effectively, engage students more deeply, and produce better learning results in the classroom. To comprehend the complex effects of AI integration, more investigation is necessary through focused interventions and research, as indicated by variances in the degree of agreement across several issues (Laurillard, 2016).

These results imply that respondents view the suggested strategies and tactics as useful and pertinent in overcoming the obstacles and difficulties related to incorporating artificial intelligence technology into teaching and learning procedures. By putting these suggested tactics into practice, lecturers may receive assistance in gaining the knowledge and abilities needed to use AI technology for teaching (Darling-Hammond et al., 2017; Johnson et al., 2018).

### Conclusion

The report emphasizes how important it is to keep funding professional development, training, and support programs in order to help educators become more adept at using artificial intelligence (AI) tools in the classroom. It is clear that teachers have a difficult time acquiring the skills necessary to successfully incorporate AI technology into their teaching methods. Comprehensive approaches are required to address these issues, including the development of supportive institutional environments, focused training programs, and resource enhancements.

Teachers understand that artificial intelligence (AI) has the potential to improve learning outcomes, student engagement, and teaching effectiveness despite certain challenges. Still, there are subtle differences in opinions about the effects and application of AI integration, which need for more research and focused interventions.

The study's ideas and recommendations are deemed important and relevant by the participants, providing a guide for surmounting obstacles related to the integration of AI. The adoption of these tactics has the potential to provide educators with the necessary knowledge and abilities to utilize AI in the classroom.

The results highlight the vital need for professional development programs and continuing assistance in order to enable teachers to successfully navigate the challenges of integrating AI into the classroom. Educators may leverage the transformative potential of AI technology to enhance teaching and learning experiences, leading to improved educational outcomes, by embracing creative tactics and tackling problems.

### Recommendations

Based on the findings and discussions presented in the study, here are some recommendations:

1. **Investment in Ongoing Training and Professional Development:** Institutions ought to place a high priority on funding ongoing professional development and training initiatives that help teachers become more adept at using AI tools in the classroom. These courses ought to be

customized to meet particular requirements, new developments in technology, and developing trends in AI integration.

2. **Creation of Supportive Institutional Environment:** Institutions ought to encourage the development of an institutional climate that is favorable to the integration of AI in education. This entails giving teachers access to the tools, infrastructure, and technical assistance they need to successfully integrate AI technologies into their lesson plans.
3. **Development of Comprehensive Training Programs:** Institutions ought to create thorough training curricula that address a variety of AI tools, uses cases, and instructional strategies. These courses ought to include workshops, seminars, and hands-on training to guarantee that teachers acquire real-world experience and self-assurance in using AI tools.
4. **Promotion of Collaborative Learning Communities:** Institutions ought to encourage the development of cooperative learning communities where instructors may exchange thoughts, best practices, and experiences on integrating AI into the classroom. Collaborative networks can be excellent venues for peer support, professional development, and information sharing.
5. **Integration of Ethical Considerations:** Institutions ought to incorporate ethical issues into professional development and AI training programs. Teachers should be prepared to handle moral conundrums involving algorithmic prejudice, data privacy, and responsible AI use in the classroom by having the appropriate knowledge and awareness.
6. **Encouragement of Research and Innovation:** Organizations ought to support teachers who want to work on innovative projects and research projects that investigate the possibilities of artificial intelligence (AI) in education. Research grants, funding opportunities, and institutional support can help to make it easier to explore cutting-edge AI-driven methods for teaching and learning.
7. **Evaluation and Assessment of AI Integration:** Institutions ought to set up procedures for analyzing and determining how well AI integration works in the classroom. This entails keeping an eye on student performance, getting input from teachers and students, and performing regular assessments to pinpoint areas that need to be improved upon.
8. **Alignment with Pedagogical Goals:** Teachers need to make sure that integrating AI is in line with educational objectives and pedagogical goals. AI tools should be utilized to improve student learning and instruction, as well as to encourage creativity, critical thinking, and problem-solving abilities. By putting these suggestions into practice, educational institutions and professionals can successfully leverage AI technology's transformative potential to

improve teaching and learning, encourage creativity, and raise student achievement.

## Recommendations for future studies

Based on the findings and gaps identified in the study, here are some recommendations for future studies in the field of artificial intelligence technology in education:

1. **Longitudinal Studies:** To investigate the long-term consequences of integrating AI in education, conduct longitudinal studies. The longevity of AI efforts, shifts in the attitudes and practices of educators over time, and the effects of AI technology on student learning outcomes can all be understood through longitudinal study.
2. **Comparative Studies:** To evaluate the efficacy of various AI technologies, platforms, and strategies in educational settings, conduct comparative studies. Best practices, critical success criteria, and opportunities for development in AI integration across various educational environments can all be found through comparative research.
3. **Exploratory Studies on Emerging AI Technologies:** Examine the educational possibilities of cutting-edge artificial intelligence (AI) technology like machine learning, natural language processing, and adaptive learning systems. Examine the ways in which these technologies can be successfully incorporated into the processes of teaching and learning in order to improve academic achievement, individualized learning, and student engagement.
4. **In-depth Investigations into Ethical Considerations:** Look into the ethical issues surrounding the use of AI in education in great detail. Examine concerns about algorithmic bias, data privacy, equity, and justice in educational systems powered by AI. Examine the ways in which educators use AI in the classroom to resolve moral conundrums and reach moral conclusions.
5. **Qualitative Studies on Educator Perspectives:** To investigate the viewpoints, experiences, and attitudes of educators toward the integration of AI in education, conduct qualitative research. Focus groups, interviews, and case studies are examples of qualitative research techniques that can offer deep insights into the elements impacting educator uptake, implementation difficulties, and professional development possibilities..
6. **Cross-disciplinary Research Collaborations:** Encourage interdisciplinary research partnerships between technologists, educators, psychologists, sociologists, and other pertinent fields. Collaborative research can support the creation of creative answers to pressing educational issues and enable a comprehensive knowledge of the complex nature of AI integration in education.
7. **Exploration of Student Perspectives:** Examine how students see the use of AI in the classroom.

Examine how students view artificial intelligence (AI) technology, their experiences in AI-driven learning environments, and the effects of AI integration on their academic achievement, motivation, and engagement.

8. **Evaluation of Pedagogical Models and Strategies:** Analyze how well various pedagogical models and techniques integrate AI technology into the teaching and learning process. Examine the ways in which AI-powered individualized feedback, adaptive learning, and intelligent tutoring systems might help meet a range of learning objectives and improve student performance.

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