

PRE-SERVICE BIOLOGY TEACHERS PERCEIVED-USEFULNESS AND PERCEIVED EASE OF USE OF ARTIFICIAL INTELLIGENCE BASED TUTORING IN NIGER STATE COLLEGE OF EDUCATION

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ABSTRACT The study investigated the pre-service biology teachers' perceived-usefulness and perceived ease use of artificial intelligence tutoring in Niger State College of Education. Descriptive survey design was used for the study. Four research questions were raised and two hypotheses were formulated to guide the study. Population for the study was 531 pre-service biology teachers. The target population was made up of entire 100 to 300 levels of pre-service biology teachers. The sample for this study were made up of 162 pre-service teachers (male = 89 female = 73) in Niger State. A random sampling technique was used for the study, Instruments used for data collection named Questionnaire on Perceived usefulness and Perceived ease of use artificial intelligence questionnaire (PPAIQ), it was five point likert scale with decision mean of 3.0. The reliability of the research instruments conducted on the sample of 10 pre-service biology teachers and the data obtained were analyzed using Cronbach Alpha with average reliability coefficient of 0.78. Mean and standard deviation were used to answer research questions and while t-test was used to analyze research hypotheses. Results obtained revealed that there was no significant difference between the mean scores of male of and female pre-service teachers on perceived usefulness on artificial intelligence tutoring based for learning in college of education Minna, while there was significance difference on perceived ease use on gender. The study established that pre-service perceived usefulness and ease of use could influence usage of artificial intelligence in the learning of biology. It is recommended that artificial intelligence should be used in learning of biology in Niger State College of Education Minna.

KEYWORDS: Perceived usefulness, Perceive ease of use, Artificial intelligence

I. INTRODUCTION

Artificial Intelligence (AI) in education is the application of sophisticated technology, namely machine learning algorithms and computational models, to enhance the learning process, boost educational results, and customize instruction to meet the unique requirements of each student (Schueller *et al.*, 2017). Within the framework of scientific education in secondary schools in Nigeria, AI can comprise a diverse array of applications, such as intelligent tutoring systems, adaptive learning platforms, and virtual simulations. These technologies have the objective of examining students' learning habits, offering individualized feedback, and generating dynamic educational experiences. AI in education encompasses the use of diverse techniques including natural language processing, computer vision, and data analytics to provide a dynamic and adaptable learning environment. It surpasses conventional teaching techniques by utilizing computing power to adjust to the individual strengths and limitations of students, promoting a more customized and efficient educational experience. Artificial intellect (AI) is an innovative technical framework that encompasses the creation of computer systems with the ability to execute activities that usually need human intellect (Aina *et al.*, 2023). These activities involve problem-solving, acquiring knowledge, comprehending language, and seeing visual information. AI has become increasingly prominent in recent years, bringing about a revolutionary transformation in the methods by which jobs are completed in numerous businesses. Within the realm of education, artificial intelligence (AI) offers a multitude of

possibilities to augment the learning process. Intelligent systems provide the ability to adjust to the specific requirements of each learner, deliver tailored learning experiences, and provide immediate feedback (Aina et al., 2023). AI applications in education encompass adaptive learning platforms, intelligent tutoring systems, and virtual simulations. Through the use of artificial intelligence, educators have the ability to construct dynamic and interactive learning environments that accommodate the various learning styles and capabilities of students.

Integrating AI in science education in Nigeria can address challenges such as low engagement, lack of personalized learning, and outdated teaching methods. The use of AI tools and technology in colleges of education has the potential to fundamentally transform the methods of teaching and learning, hence enhancing accessibility, engagement, and effectiveness teaching and learning of biology. The significance of biology cannot be over emphasized as it is important in food production, hybridization, cross-breeding, in-vitro fertilization, blood transfusion, marriage counseling, pest control, development of early maturing of plants and animals (Inyang, 2021). All these aspects of life mentioned above and many more are very important for the effective living of the human race on this earth and they can never be studied without the knowledge of Biology. Studies have shown that active-learning instruction among students can be highly effective in facilitating the development of conceptual understanding and scientific thinking skills (Peters et al., 2020). Based on the report by the above researchers, it is believed that active learning processes such as artificial intelligence could be an effective method of teaching and learning of biology and could be a priority at all levels of our colleges of education system with pre-service perceived usefulness of medium of instruction. Perceived Usefulness (PU) is described as the extent to which a pre-service teacher trusts that the use of artificial intelligence would improve work performance (Buraimoh & Yusuf, 2019). It can also be explained as the extent to which users of technologies perceive that the usage of an information system will argument their teaching and learning process.

Perceived ease of use which is the next foundational drive in the Technology Acceptance Model, is explained as the level to which a pre-service teacher considers that using an information system would not be difficult to operate (Fumei et al., 2018)). The concept of the Perceived ease of use accounts for the level where a user accepts the fact that a particular technology like artificial intelligence would not be difficult to handle by college of education pre-service teachers. In order to carry both male and female pre-service teachers along in the present study, gender issue need to be put into consideration. Gender issue generally in education industry has become of immense importance and cannot be overlooked, but attention should be deliberately given to it, in order to make intellectual discourse free from sentiments and prejudice (Stamarski & Son-Hing., 2015). Male and female teachers need to make use of digital technologies in order to fit in the 21st century knowledge dissemination, so that student would be able to achieve better in their education pursuit. Adeyinka (2020) view gender factor to be capable of facilitating artificial intelligence. This paper seeks to examine pre-service biology teachers' perceive-usefulness and perceive ease of use towards use of artificial intelligence tutoring based in Niger State college of Education.

Over the years, the most common type of instructional delivery in Nigeria particularly for the teaching and learning of biology has been the conventional method (Eze and Bot, 2014). This form of teaching method has been characterized by numerous problems such as-non usage of scientific instructional facilities, low attention span of students, perceive learning and inability of the method to meet the needs of learners of different learning categories such as (high, medium an low learners), pace leaning and learning at any distance apart from been in the classroom, thereby denying biology pre-service teachers the need to acquire instructional delivery repeated before they can learn better. This disturbing trend in colleges of education shows a serious threat to education of slow learners that need to listen to instructional delivery repeatedly. However, researchers have revealed that artificial intelligence can be an alternative way of curbing this problem. If learning of biology are to be conducted through the use of artificial intelligence mode in Niger State Colleges of Education Minna. The drive for the present study, there seem to be limited research on the artificial intelligence usage among pre-service biology teachers in the population of this study. The questions to ask in this study were: are what is perceived usefulness of pre-service teachers towards use of

artificial intelligence in Niger State? and what is perceive ease of use of pre-service teachers towards artificial intelligence in Niger State? It is on this note that this study is geared towards exploring pre-service biology teachers' perceive-usefulness and perceived ease of use towards use of artificial intelligence tutoring based in Niger State College of Education.

II. METHODOLOGY

The population for this study comprised 531 pre-service biology education teachers in Niger state college of education Minna. The target population was made up of entire 100 to 300 levels of pre-service biology education students within the study area. The sample for this study was made up of 162 pre-service teachers (male = 89 female = 73) in Niger State. A random sampling technique was used to determine the sample size for the study. The instrument for the study was researcher-designed questionnaire named Perceived usefulness and Perceived ease of use of artificial intelligence questionnaire (PPAIQ) was used for data collection in this study. (PPAIQ) was divided into section A, B and C. Section A was used to collect demographic data such as name of the school and gender. Section B of (PPAIQ) consists of 10 on the Perceived usefulness and section C consists of 10 items that was used to collect data on perceived ease of use. A five-point Likert scale was used with a grand mean score of 3.0 to determine the decision mean of section B and C of the questionnaire.

The questionnaire (PPAIQ) was validated by science education experts from Federal University of Technology Minna. The experts examined research instruments appropriateness, suitability for target population in terms of clarity and language; that is whether its statements were simple and unambiguous. Vital inputs that was made by all the experts, their suggestions and corrections were diligently effected by the researcher and the research instruments was finally found fit for the research. The suggestions and recommendation were used to make corrections where necessary. The data collection was done through typed out questionnaires distributed to pre-service students in College of Education in Minna. The reliability of the research instruments was determined after conducting a pilot study on the sample of 10 pre-service teachers, who were among the population, but not part of the sample for the main study. The researcher carefully administered the instrument once on the respondents and the data obtained were analyzed using Cronbach Alpha. The following reliability coefficient indexes were obtained perceived usefulness 0.74 and perceived ease of use 0.83. Based on these reliability coefficient indexes obtained, the instrument was considered to have high and acceptable reliability. Alpha coefficients above 0.70 are considered acceptable. The questionnaire was administered on the sampled pre-service biology teachers during the main study and was analyzed using descriptive and inferential statistics. Mean and standard deviation were used to answer research questions and t-test was used to analyze research hypotheses. The justification for choosing them are research questions are usually analyze using mean and standard deviation, while null hypotheses are usually analyze using t-test and other statistical tools like ANOVA, ANCOVA etc.

Conclusion it was established that pre-service perceive usefulness could influence usage of artificial intelligence in the teaching and learning of biology. Artificial intelligence can serve as learning platform to learn biology. Recommendations; artificial intelligence should be used in learning of biology in Niger State College of Education Minna. College of education pre-service teachers should be encouraged to adopt usage of artificial intelligence as supplementary tool in order to improve on the difficult concepts to them.

Research Questions

The following research questions were raised to guide the study;

- (a). What are pre-service teachers' perceptions of the usefulness of artificial intelligence tutoring for learning in college of education Minna?
- (b). What are gender of pre-service teachers' perceived usefulness on the use of artificial intelligence tutoring for learning in college of education Minna?
- (c). What are pre-service teachers' perceived ease of use on the use of artificial intelligence tutoring for learning in college of education Minna?

- (d). What are gender of pre-service teachers' perceived ease of use on artificial intelligence tutoring for learning in college of education Minna?

Research Hypotheses

The following null hypotheses were formulated and were tested in the study at 0.05 alpha level

- HO₁: There is no significant difference between the mean scores of male of and female pre-service teachers on perceived usefulness on the use of artificial intelligence tutoring based for learning in college of education Minna.
- HO₂: There is no significant difference between mean scores of male and female pre-service teachers on perceived ease on the use of artificial intelligence tutoring based for learning in college of education Minna.

III. RESULTS AND DISCUSSION

Research Question One: What are pre-service teachers' perceptions of the usefulness of artificial intelligence tutoring for learning in college of education Minna?

Table 1: Mean and standard deviation of pre-service teachers' perceptions of the usefulness of artificial intelligence tutoring for learning in college of education Minna.

| SN | Item | N | Mean | SD | Decision |
|------------|---|-------------------|-------|-------|----------|
| 1 | I find it easy to apply the artificial intelligence in learning biology. | 162 | 3.80 | 1.217 | Agree |
| 2 | Artificial intelligence enables me to accomplish tasks given to me more quickly in biology | 162 | 3.55 | 1.266 | Agree |
| 3 | Using artificial intelligence is easy and understandable. | 162 | 3.60 | 1.348 | Agree |
| 4 | Artificial intelligence is more flexible to learn than traditional method of teaching and learning. | 162 | 3.65 | 1.311 | Agree |
| 5 | Artificial intelligence can open educational opportunities for pre-service teachers to meet up the miss classes. | 162 | 3.57 | 1.270 | Agree |
| 6 | Artificial intelligence reduces the time I spend on unproductive instructional planning. | 162 | 3.57 | 1.199 | Agree |
| 7 | Teaching and learning process would be difficult for pre-service teachers without artificial intelligence | 162 | 3.58 | 1.240 | Agree |
| 8 | Artificial intelligence provide teachers to assess other countries academic curriculum to extract best out of it. | 162 | 3.36 | 1.387 | Agree |
| 9 | Artificial intelligence will give pre-service teachers opportunity to research on new development in biology. | 162 | 3.57 | 1.332 | Agree |
| 10 | Artificial intelligence will make generation of examination question easy for me during my teaching practice. | 162 | 3.88 | 1.079 | Agree |
| Grand Mean | | | | | |
| | | Grand mean | 36.15 | 7.382 | |

Decision mean = 3.0

Table 1 shows the mean and standard deviation of perceived usefulness on the use of artificial intelligence among pre-service teachers in Niger State Colleges of Education Minna. All of 162 biology pre-service teachers responded to the instrument. The table shows that item 1- 10 indicated a mean greater than 3.0 (agree) A grand mean of 3.61 was obtained indicating that the respondents agreed that artificial intelligence are useful for learning of biology. The average standard deviation of 0.73 indicating that standard deviation spread in the data set are close to the group mean of the data set.

Research Question Two: Find out gender of perceived usefulness on the use of artificial intelligence tutoring based among pre-service teachers in college of education Minna.

Table 2: Mean and Standard Deviation of gender of perceived usefulness on the use of artificial intelligence tutoring based among pre-service teachers in college of education

| School Type | N | \bar{X} | SD | Mean Difference |
|-------------|----|-----------|------|-----------------|
| Male | 89 | 36.28 | 7.00 | 0.29 |
| Female | 73 | 35.99 | 7.86 | |

Table 2 shows the mean and standard deviation of gender of perceived usefulness on the use of artificial intelligence tutoring based among pre-service teachers in college of education Minna. From the result, the mean and standard deviation values of the male and female pre-service teachers in college of education are $\bar{X} = 36.28$, $SD = 7.00$ and $\bar{X} = 35.99$, $SD = 7.86$. From the table the male students had a higher mean than their female counterpart. The mean difference of 0.29 was between male and female of perceived usefulness on the use of artificial intelligence tutoring based among pre-service teachers in college of education Minna. This implies that male pre-service teachers have higher mean than their female counterpart.

Research Question Three: What is the mean of perceived ease of use on the use of artificial intelligence tutoring based among pre-service teachers for learning in college of education Minna?

Table 3: Mean and standard deviation of perceived ease of use on the artificial intelligence tutoring based among pre-service teachers for learning in college of education

| SN | Item | N | Mean | SD | Decision |
|-------------------|---|-----|------|-------|----------|
| 1 | Artificial intelligence supports critical aspects of my learning process. | 162 | 3.04 | 1.387 | Agree |
| 2 | It is easy to become skillful at using artificial intelligence | 162 | 3.46 | 1.319 | |
| 3 | Interacting with the artificial intelligence during learning of biology improve my knowledge. | 162 | 3.30 | 1.361 | Agree |
| 4 | I find it easy to recover from errors encountered while using artificial intelligence during learning process | 162 | 3.47 | 1.237 | Agree |
| 5 | I find it easy to apply the artificial intelligence in doing biology assignment | 162 | 3.32 | 1.341 | |
| 6 | Using artificial intelligence is easy and understandable. | 162 | 3.51 | 1.424 | Agree |
| 7 | Using artificial intelligence gives me greater control in learning process. | 162 | 3.42 | 1.245 | Agree |
| 8 | My interaction with the artificial intelligence is easy for me to understand | 162 | 3.22 | 1.405 | Agree |
| 9 | I find artificial intelligence easy to use when sourcing for diagram in biology. | 162 | 3.52 | 1.306 | |
| 10 | My interaction with the artificial intelligence is easy for me to understand | 162 | 3.23 | 1.273 | Agree |
| Grand mean | | | 3.34 | 0.88 | |

Decision mean = 3.0

Table 3 shows the mean and standard deviation of perceived ease of use on the use of artificial intelligence use in learning among pre-service teachers in Niger State Colleges of Education Minna. All of 162 biology pre-service teachers responded to the instrument. The table shows that item 1-10 indicated a mean greater than 3.0 (agree) A grand mean of 3.34 was obtained indicating that the respondents agreed that perceived ease of use

of artificial intelligence for learning of biology is positive. The average standard deviation of 0.88 indicating that standard deviation spread in the data set are close to the group mean of the data set.

Research Question Four: Find out gender of perceived ease of use on the use of artificial intelligence tutoring based among pre-service teachers for learning in college of education Minna.

Table 4: Mean and Standard Deviation of gender of perceived ease on the use of artificial intelligence tutoring based among pre-service teachers for learning in college of education

| School Type | N | \bar{X} | SD | Mean Difference |
|-------------|----|-----------|------|-----------------|
| Male | 89 | 35.74 | 7.38 | 4.99 |
| Female | 73 | 30.75 | 9.74 | |

Table 4 shows the mean and standard deviation of perceived ease of use on the use of artificial intelligence tutoring based among pre-service teachers for learning in college of education Minna. From the result, the mean and standard deviation values of the male and female pre-service biology teachers are \bar{X} =35.74, SD = 7.38 and \bar{X} = 30.75, SD =9.74. The mean difference of 4.99 was between male and female pre-service teachers perceived ease of use of artificial intelligence tutoring based for learning in college of education.

Hypothesis One: There is no significant difference between the mean scores of male of and female pre-service teachers on perceived usefulness on the artificial intelligence tutoring based for learning in college of education.

Table 5: t-test Analysis of male of and female pre-service teachers on perceived usefulness on the artificial intelligence tutoring based for learning in college of education

| Participants | N | \bar{X} | SD | t-cal | Df | p-value |
|--------------|----|-----------|------|-------|-----|---------|
| Male | 89 | 36.28 | 7.00 | 0.25 | 160 | 0.80 |
| Female | 73 | 35.99 | 7.86 | | | |

0.05 level of significance

Table 5 showed pre-service biology teachers mean score for male $X=36.28$ and the mean for Female $X=35.99$. The table show that t-cal 0.25, df = 160, with p = 0.80. Since $p>0.05$, hypothesis one is hereby accepted. Since the p-value is greater than 0.05. Therefore, there was no significant difference between the mean scores of male of and female pre-service teachers on perceived usefulness on the artificial intelligence tutoring based for learning in college of education.

Hypothesis Two: There is no significant difference between mean scores of male and female pre-service teachers on perceived ease on the use of artificial intelligence tutoring based for learning in college of education Minna

Table 6: t-test Analysis of male and female pre-service teachers on perceived ease on the use of artificial intelligence tutoring based for learning in college of education

| Participants | N | \bar{X} | SD | t-cal | Df | p-value |
|--------------|----|-----------|------|-------|-----|---------|
| Male | 89 | 35.74 | 7.38 | 3.70 | 160 | 0.00 |
| Female | 73 | 30.75 | 9.74 | | | |

Table 6 showed that there is no significant difference between mean scores of male and female pre-service teachers on perceived ease of artificial intelligence tutoring for learning in college of education Minna. Pre-service biology teachers mean score for male $X=35.74$ and the mean for female $X=30.75$. The table show that $t\text{-cal } 3.70$, $df = 160$, with $p = 0.00$. Since $p < 0.05$, hypothesis two is hereby rejected. Therefore, there was significant difference between mean scores of male and female pre-service teachers on perceived ease on the use of artificial intelligence tutoring based for learning in college of education Minna. There was no significant difference between the mean scores of male of and female pre-service teachers on perceived usefulness on the use of artificial intelligence tutoring based for learning in college of education Minna. This is in agreement with the study of Adebawale (2017) who the study revealed that there is no significant difference in male and female teacher towards use of digital technologies material in teaching. The implication of this means that when Artificial Intelligence (AI) is integrated into our classroom it will improve the learning outcome on the students. Also disagree with study of Falode *et al* (2016) who found that there was significant difference between the attitude scores of the two groups in favour of students exposed to computer simulation instructional package.

There was significant difference between mean scores of male and female pre-service teachers on perceived ease on the use of artificial intelligence tutoring based for learning in college of education. This is in disagreement with the findings of Hilao and Wichadee (2017) who carried out study on gender differences in mobile phone usage for language learning, attitude, and performance. The findings revealed that male and female students did not differ in their usage, attitudes toward mobile phone uses for language learning as well as their learning performance at a significance level. The implication of the findings of Hilao and Wichadee (2017) mean that the was no difference between the male and the female students' usage of mobile phone for language learning, attitude and performance.

IV. CONCLUSION

From the findings of this study, it is concluded that pre-service teachers in colleges of education have positive perceived usefulness and perceived ease of use of artificial intelligence in Niger State College of Education. Majority of respondents favoured the use of artificial intelligence for learning of biology. More importantly, they believe the use of artificial intelligence for learning of biology will break the barrier of distance learning by pre-service teachers, Also, most of the respondents agreed that artificial intelligence will go a long way to carry pre-service teachers that miss any lectures along for better understanding of biology concepts. From the findings of this study, it is concluded that no difference in the response of perceive usefulness of use of artificial intelligence based on gender while there was differences in the perceived ease of use-to-use artificial intelligence based on gender among pre-service biology teachers.

Ethical considerations should be explored, given the increasing integration of AI in educational environments, it is crucial to ethical standard in using AI into consideration. This will includes comprehensive examination of issues related to the protection of data privacy, guarantee of fair allocation of educational resources. Conducting research is crucial for building ethical principles and to protect the rights and well-being of pre-service teachers and instructors. Training programmes on AI are becoming a significant focus for future research endeavours. It is crucial to investigate efficient methods for teacher education programmes, both for those who are preparing to become teachers and for those who are already working as teachers. These programmes should prepare pre-service teachers' proficiency in using AI into current teaching methods would enable educators to fully leverage the capabilities of these technologies.

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