EFFECT OF AI-BASED LEARNİNG ON COLLEGE OF EDUCATİON STUDENTS' ACADEMİC SKİLLS, DECİSİON-MAKİNG, AND TECHNOLOGY INTEREST USİNG KOLB'S MODEL

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Abstract
Artificial Intelligence has drastically changed the way we live, work, and learn. In recent years, there has been a growing emphasis on incorporating AI-based learning environments in educational settings. This study aims to explore the effect of an AI-based learning environment on the development of academic skills, decision-making, and interest towards the use of technology among students of the College of Education in research project writing, using Kolb's Experiential Learning Model as a theoretical framework. This study was conducted in Akwa Ibom State, Nigeria investigated to evaluate AI-based learning environments' effectiveness in developing academic skills, decision-making skills, and students' interest in using technology, guided by Kolb's ELT among COE students. The study employed a quasi-experimental design, comprising a pretest, post-test, control and an experimental groups. The population comprised all the students in College of Education, Akwa Ibom State in the 2022/2023 academic session.The taeget population comprised 2,683 NCE III school of science students. Purposively, 150 NCE III school of science students were sampled, because they engaged in project writing. The participants were divided into experimental and control groups, data was collected using Research achievement test (RAT), decision-making scale test (DEMST), and technology- orientation rating scale (TORS), all validated by experts in the field of computer, measurement and evaluation as being valid while reliability using KR20 showed coefficients of 0.82 for RATs, 0.80 for DEMSTs and 0.78 for TORSs respectively. Data were analyzed through descriptive statistics and (ANCOVA) revealed significant improvements in the experimental group's academic skills, i decision-making abilities and interest towards the use of technology, highlighting the Kolb model's substantial impact on learning outcomes across programs in academic skills, interest, and technology utilization in writing research project. The study underscores the importance of artificial intelligence-based learning environments in education and technology usage in writing research project.

Keywords: Artificial intelligence in education, Academic- skills, Decision-making skills, Interest towards the use of technology, Kolbs' Model**.**

Introduction

Recent advent of Artificial Intelligence (AI) have significantly transformed all sphere's of life and ecpecially education, enabling, that uses machines to perform tasks like learning, decision-making, and problem-solving (Kamalov et al., 2023). Integrating technology into education aims to offer personalized and adaptive learning experiences, thus enhancing students' academic skills and interest in technology (Zawacki-Richter et al., 2017). AI tools, including ChatGPT, QuillBot, AI Writer, Wordtune,Grammarly, and Google Translate, assist in text generation, revision, paraphrasing, and overall writing enhancement (Utami et al., 2023). AI technologies like ChatGPT, RapidMiner, Copilot, and Iris.ai enhance data analysis, literature reviews, and writing efficiency as enumerated by (Teng & Wang, (2023) and Zhao et al., (2023). These tools according to researchers like Leoste et al., (2021) and Dong, (2023), offer personalized feedback and encourage active participation, significantly impacting students' writing abilities as well as personalized, adaptable learning experiences across various fields (Mousa & Bilal, 2019). However, concerns exist regarding AI's influence on critical and creative thinking skills (Ali et al., 2023; Perkins, 2023). Aljuaid (2024) noted AI's benefits in grammar and style but raised creativity concerns. Balanced AI integration in writing is necessary as opined by (Bhatia, 2023). AI plays a role in developing educational strategies and improving practical skills (Al-Saud, 2017; Azmi et al., 2014). Researchers like Lutfi (2018) and Marghany (2023) highlight AI's potential to customize learning and reduce teacher workload through tools like Grammarly. AI's potential not withstanding, its application in Nigerian education, particularly in Akwa Ibom State College of education, is limited. Educational institutions like COE face challenges like expanding class sizes and budget limitations, which strain student-teacher interactions.AI solutions address these issues by customizing learning experiences, tracking progress, and identifying areas for improvement (Chen et al., 2020). This study explores students' decision-making in choosing optimal learning environments for research project writing.

Decison making skill is one of the variables for consideration in this study and it is defined by Al-Mutairi (2017) as the student's ability to identify, organize, analyze, and evaluate problems based on specific criteria, then select the best alternatives to solve the problem.In the context of this study, decision-making involves analyzing situations, evaluating problems, identifying alternatives, choosing the most appropriate solutions, and justifying those choices. AI-based learning environments is another variable in this study that enhances decision-making skills by simulating real-world scenarios and offering data-driven insights (Davenport & Kirby, 2016). Another variable in this study is interest, and interest is an important concept in educational psychology, defined by Uko, (2021) as a psychological state involving focused attention and positive feelings toward a specific topic, as well as a lasting tendency to engage with that topic over time. This dual nature includes both situational interest, which is temporary, and individual

interest, which persists over time. Interest in technology encompasses a person's engagement with and inclination to use technological tools in various environments, especially in education. student interest in educational activities is vital for tailoring teaching methods; lecturers need to assess these interests to create engaging learning experiences.AI technology increases student interest in technology, preparing them for tech-driven careers (Ali et al., 2023). This interest helps individuals adopt new technologies in their learning and daily lives. Understanding and promoting interest, particularly in technology, can improve learning experiences and support effective use of educational technologies. In the realm of research writing, interest in using AI refers to a person's enthusiasm for engaging with AI tools during the writing process (Van Noorden, 2025). This includes using AI for tasks such as idea generation, error detection, grammar correction, plagiarism checks and proposal preparation. AI can make research writing more efficient by helping to improve clarity in writing, (American Psychological Association (2024), however, it is essential to integrate AI carefully. In the context of this study, interest in using AI for research project writing were assessed through various measurable variables.These variables are students' motivation, engagement, perception, and behavioral tendencies toward AI tools in academic writing.

Academic skills are crucial for achieving success in educational settings, especially in secondary schools, colleges, and universities. These skills, as described by Indeed Editorial Team, (2023), include abilities that help students improve their learning, critical thinking,and application of knowledge in subjects like reading, writing, and mathematics . These skills generally build on students' mastery of literacy and technical subjects like mathematics and science. In the context of this study, academic skills refer specifically to the competencies required for research project writing among college students. Academic skills, as defined in this study, include: 1. Research Planning – Developing research questions and structured study proposals. 2. Writing Proficiency Producing well-organized,coherent, and grammatically correct reports. 3. Critical Analysis – Evaluating sources, synthesizing data, and interpreting findings. 4. AI Tool Usage Leveraging AI for writing enhancement. 5. Citations & Referencing Mastering APA citation formats. 6. Editing & Revisions – Proofreading and refining research writing. Challenges in Academic Writing sees Students struggle with topic selection, content organization, writing quality, and research methodology (Livberber and Ayvaz, 2023). AI tools are positioned as aids to improve these competencies by offering structured feedback, enhancing originality, and refining sentence structure. This study also highlights concerns regarding the integration of AI in education, noting the absence of theoretical frameworks to explain AI's influence. Kolb's Experiential Learning Theory (ELT), which emphasizes learning through experience and feedback, is employed to understand how technology can enhance research writing skills. Research by Chen et al., (2020), shows that many students favor AI tools for their efficiency, although issues about academic integrity remain a concern. This study

explores how AI-based learning environments and tools likeChatGPT, Grammarly, Turnitin, QuillBot, and Mendeley can improve academic skills, decision-making, and interest in technology in research project writing skills among students at a College of Education in Akwa Ibom State, highlights the challenges students face in research writing and how AI can bridge cognitive skill gaps to better prepare them for academic and professional success, guided by David Kolb's Experiential Learning Theory (ELT).

Kolb's Experiential Learning Theory posits distinct learning preferences shaped by hands-on experience, observation, conceptualization, and experimentation. It is structured on two dimensions: action versus observation and concrete experience versus abstract conceptualization, forming four primary learning styles. Kolb introduces a four-stage model: Concrete Experience (CE): Active participation like lab sessions and fieldwork, Reflective Observation (RO): Reflecting on experiences, Abstract Conceptualization (AC): Developing theories or models, Active Experimentation (AE): Planning and testing theories. This cyclical process fosters continuous learning through feedback and repetition. Kolb criticizes overly theoretical programs and emphasizes balanced approaches, categorizing learning styles into four types: Divergers: Idea generators, Assimilators: Theoretical model experts using inductive reasoning, Convergers: Apply hypothetical-deductive reasoning and Accommodators: Adapt swiftly to execute plans and experiments. Kolb's theory aligns with scientific methods, suggesting courses engage students in all four stages for better learning and retention (Kolb, 1984). Educators should design materials for various learning styles, fostering self-direction and holistic development. Specifically, the purpose of this study is to:

1. assess the impact of AI-assisted research writing on academic achievement across different academic programs (Degree, NCE, and Sandwich).
2. investigate the effect of AI-based learning on students' decision-making skills in research project writing compared to traditional learning methods.
3. evaluate students' interest in using AI tools for research writing by measuring their motivation, perceived usefulness, engagement, confidence, ethical considerations, and future intent to use AI.
4. analyze the interaction effect of AI-based learning on academic skills, decision-making skills, and interest in AI across Degree, NCE, and Sandwich students.

Research Questions

Research Question One: What is the mean difference in academic skills scores in academic research project writing skills between Degree, NCE and Sandwich students taught using AI-based learning strategies in the light of Kolb Model?

Research Question Two: What effect do the use of AI-based learning in light of Kolb Model have on decision- making skills in academic research project

writing among Degree, NCE and Sandwich students?

Research Question Three: What is the mean difference in technology usage interest scores in academic research project writing among Degree, NCE and Sandwich students exposed to AI-based learning in light of Kolb Model?

Research Question Four: What is the combine effect of decision-making skills, academic skills, and interest towards technology usage in research project writing across Degree, NCE and sandwich students exposed to AI strategy in light of Kolb Model.

Hypotheses

The present study is based on the following hypotheses:

Hypothesis One: There is no statistically significant difference in academic skills between COE students in the experimental (Artificial Intelligence strategy, in light of Kolb Model) group and those in the control (traditional method) group.

Hypothesis Two: There is no statistically significant difference in decision-making skills between COE students in the experimental (Artificial Intelligence strategy, in light of Kolb Model) and those in the control (traditional method) groups.

Hypothesis Three: There is no statistically significant difference in COE students interest towards technology usage between those exposed to AI strategy in light of Kolb Model and those taught using traditional methods.

Hypothesis Four: There is no statistically significant interaction effect of the AI strategy in light of Kolb Model on academic skills, decision-making skills and interest towards technology usage among students in experimental and control groups from different academic programs in the College of Education.

Methodology

This quasi-experimental study utilized a pre-test, post-test, nonrandomized controlled group design with a 2x3 factorial model, allowing for the testing of various hypotheses simultaneously, following the design principles outlined by Popoola (2012). The research was conducted in Akwa Ibom State, located in Nigeria's South-South Zone, which consists of 31 local government areas and three senatorial districts, namely Akwa Ibom North East, Akwa Ibom North West, and Akwa Ibom South. The state has two government-owned Colleges of Education. The study population included all year three students in the 2022/2023 academic session at the two government-owned Colleges of Education. Specifically, the target population consisted of 2,683 year-three students enrolled in EDU321: Research Methods and Projects in the three programmes Degree, NCE and Sandwich at the College of Education Afaha Nsit, Nsit Ibom LGA. Six intact classes of year-three students were purposively selected from each of the three programs: NCE, Degree,

and Sandwich from the School of Science, with an emphasis on those with a background in computer science and access to the necessary technological resources. These students were also purposively chosen because the course is a year 3 course and is crucial for their research project work, a prerequisite for earning the National Certificate in Education (NCE) and Bachelors degree in education (B.Ed). A total sample of 150 students (58 from the Degree program, 50 from NCE, and 42 from the Sandwich program) was chosen through simple random sampling via balloting with replacement. Each of the six intact classes was divided into experimental and control groups. Six lectures, including the researchers with ICT knowledge who are the ones that teach the course in the 3 programs, were selected to assist in the study.

To evaluate the impact of the intervention, quantitative assessments were administered using Multiple Choice Questions (MCQs) covering Research Method and Project Achievement Test (REMPAT), Scale of Decision-Making Skills (SDMS), and Technology Interest Scale (Artificial Intelligence) (TISAI). Additionally, qualitative data on student perceptions and interest in technology was collected through interviews and surveys. The instruments were prepared as follows: - REMPAT: Consisted of a 25-question MCQ test, reviewed by experts, and measured cognitive and performance objectives. SDMS: Adapted from Tarawneh's (2006) scale, assessing eight decision-making skills. - TISAI: Adapted from Renzulli's (1997) Interest-A-Lyzer to suit the variable of the study, containing 20 items on AI interest. The instruments (REMPAT, SDMS, TISAI) underwent face and content validation by three experts in ICT,test and measurement. Reliability testing on 20 third-year students from a non-participating department yielded a Kuder-Richardson (KR20) reliability coefficient of 0.88, indicating high reliability. The technology interest scale demonstrated a correlation coefficient of 0.87 and Conformity Coefficient of 87%, confirmed valid with expert validation at 96%. Before the intervention, pre-tests were administered using REMPAT, SDMS, and TISAI to gauge the students' baseline knowledge, decision-making skills, and technology interest. After the experiment, post-tests were conducted to measure the acquisition and application of their knowledge in research writing. The collected data were then analyzed.

Procedure

Research assistants received a two-weeks training on the lesson plan. The study employed the practical application of Kolb's theory on learning. Specifically: Implementation of AI Tools for Academic skills, Decision-Making Skills and Interest in Using Technology Using Kolb's Model. Kolb's Experiential Learning Model (1984) consists of four stages: 1. Concrete Experience (CE): Engaging in a real or simulated experience. 2. Reflective Observation (RO): Reviewing and analyzing the experience. 3. Abstract Conceptualization (AC): Developing new ideas based on reflection. 4. Active Experimentation (AE): Applying what has been

learned to solve real-world problems. In this study, AI tools were integrated at each stage to enhance academic skills, decision-making skills and interest in using technology among College of Education students.

Measuring Academic Skills in the Study

A multi-method approach was used to assess students' academic skills: 1. Research Project Writing Achievement Test (REMPAT) – Multiple-choice and short-answer tests on research methodology, writing structure, and referencing. 2. Research Writing Performance Rubric –Evaluating students' research projects on organization, grammar, analysis, referencing, AI usage, and revision quality. 3. Research Writing Self-Efficacy Scale (RSES) – Measuring students' confidence in research writing through Likert-scale responses. 4. AI Usage Competency Test – Assessing students' ability to use AI for research writing (e.g., generating abstracts, checking grammar). A grading rubric was applied: 22–24 points = Excellent Academic Skills.18–21 points = Good Academic Skills.12–17 points = Satisfactory Academic Skills. 6–11 points = Needs Improvement.0–5 points = No Demonstration of Academic Skills.

Implementation of AI Tools Using Kolb's Model

Stage 1: Concrete Experience (CE) – Exposure to AI in Research Writing Objective: Introduce students to AI tools for research writing. Implementation:Hands-on AI Training –Students explore ChatGPT,Grammarly, Turnitin, QuillBot, and Mendeley. Research Writing Tasks – Using AI tools for summarizing, paraphrasing, and checking plagiarism. Instructor-Led Workshop – Ethical use of AI in academic writing. Skills Developed: Research planning, writing proficiency, AI competency. Stage 2: Reflective Observation (RO) – Reviewing AI-Generated Work Objective: Evaluate AI-generated content and reflect on effectiveness. Implementation: Peer Review – Students assess clarity using, Grammarly's readability score. Self-Reflection on AI Usage – Rating AI tools for effectiveness. Instructor Feedback Session – Demonstrating necessary refinements of AI-generated content. Skills Developed: Critical analysis, AI-assisted revision, self-assessment. Stage 3: Abstract Conceptualization (AC) –Understanding AI's Role in Research Objective: Theorizing AI's role in academic writing. Implementation:Developing Research Frameworks – Using ChatGPT for structuring research questions and citations. Ethical AI Use Discussions – Evaluating AI's impact on academic integrity. Comparing AI vs.Traditional Writing – Analyzing an AI-generated paper versus a manually written one. Skills Developed: Research conceptualization, citation proficiency, ethical AI considerations. Stage 4: Active Experimentation (AE) – Applying AI Skills to Research Writing Objective: Use AI tools to enhance full research project writing. Implementation: AI-Supported Research Paper Writing – Students use AI tools at different stages of writing: Topic Selection – ChatGPT

Literature Review – QuillBot + Grammarly Editing & Proofreading – Wordtune + Grammarly Plagiarism Check – Turnitin Reference Management – Mendeley/Zotero Final Peer Review and Submission – AI-assisted editing and plagiarism checks. Skills Developed: Research writing proficiency, AI-integrated academic work, independent AI use.

AI in Decision-Making Skills Development

AI supports decision-making by providing data-driven insights, structured feedback, and scenario simulations. Stage 1: Concrete Experience – AI-Based Decision-Making Simulations AI-generated case studies and research problem simulations (e.g., methodology selection). AI Tools Used: ChatGPT (research planning), Elicit (literature insights), IBM Watson (decision analytics). Stage 2: Reflective Observation – Evaluating AI Decisions Comparing AI vs. Human Decision-Making through group discussions. AI Tools Used: Grammarly (decision justification writing), Turnitin (plagiarism check), QuillBot (explanation refinement). Stage 3: Abstract Conceptualization – Learning from AI Decisions, Developing AI-Based Decision Frameworks (e.g.,AI-driven research methodology selection). AI Tools Used: Mendeley/Zotero (source management), ChatGPT (framework structuring). Stage 4: Active Experimentation – Applying AI Decision-Making in Research Implementing AI-driven decisions in research papers. Final Peer Review and AI Comparison (Turnitin's AI feedback analysis). Skills Developed: Research decision-making, AI-based reasoning, structuring AI-driven academic work.

AI in Enhancing Interest in Technology

Stage 1: Concrete Experience – Hands-on AI Exploration AI Exploration Challenge – Comparing different AI tools. Mini Research Projects – Using AI for writing, analysis, and citation management. Stage 2: Reflective Observation – AI User Experience Analysis AI User Satisfaction Surveys (Google Forms). Technology Reflection Assignments – Evaluating AI's role in education. Stage 3: Abstract Conceptualization – Understanding AI's Role in Learning AI vs. Traditional Learning Debates – Examining the impact of AI in academics. Research on AI Trends – Using Elicit for AI-based research synthesis. Stage 4: Active Experimentation – Applying AI for Research Productivity AI-powered presentations (Canva AI). Final research reports on AI effectiveness in academics. AI-based learning environments, guided by Kolb's ELT, significantly improve academic skills, research decision-making, and technology engagement among students.AI tools facilitate structured learning, interactive feedback, and innovative problem-solving, making education more adaptive to modern workforce demands. The study highlights AI's potential in transforming research writing education while emphasizing ethical considerations and responsible AI use. Data obtained was analyzed using mean and standard deviation, to answer the research questions and Analysis of Covariance (ANCOVA) was used to test all the hypotheses at 0.05 level of significance.

Results

Research Question One: What is the mean difference in academic skills scores in academic research project writing skills between Degree, NCE and Sandwich students taught using AI-based learning strategies in the light of Kolb Model?

Table 1: Mean and Standard Deviation of Post-Test Scores for Academic skills Across Programs

Programs	N	Pre-Test Mean(SD)	Post-Test Mean(SD)	Mean Difference
Degree	58	17.34(10.23)	62.75(3.86)	45.41
NCE	50	20.28(9.62)	71.99(6.65)	51.71
Sandwich	42	19.50(9.95)	70.45(6.60)	50.95

Table 1. shows the results of Academic skills across programs.The results indicate that AI-based learning environments significantly improved research project writing skills in all programs.NCE students showed the highest improvement (mean difference = 51.71), followed closely by Sandwich students (50.95). Degree students had the lowest mean difference (45.41), suggesting that while AI was beneficial across all programs, it was most
effective for NCE and Sandwich students, possibly due to their structured teacher-training focus.

Research Question Two: What effect do the use of AI-based learning in light of Kolb Model have on decision- making skills in academic research project writing among Degree, NCE and Sandwich students?

Table 2: Mean and Standard Deviation of Post-TestScores for Decision-Making Skills Across Programs

Program	N	Pre-Test Mean(SD)	Post-Test Mean(SD)	Mean Difference
Degree	58	32.66(11.12)	66.71(7.62)	34.05
NCE	50	26.56(10.23)	77.77(11.12)	51.21
Sandwich	42	30.80(10.50)	64.67(10.23)	33.87

Table 2. shows the results of Decision-Making Skills Across Programs. AI-based learning had the most significant impact on NCE students' decision-making skills (mean difference = 51.21), followed by Degree (34.05) and Sandwich students (33.87). This suggests that NCE students benefited the most from AI-enhanced decision-making processes, likely due to the applied nature of their coursework.

Research Question Three: What is the mean difference in technology usage interest scores in academic research project writing among Degree, NCE and Sandwich students exposed to AI-based learning in light of Kolb Model?

Table 3: Mean and Standard Deviation of Post-Test Scores for Technology Interest usage Across Programs

Programs	N	Pre-Test Mean(SD)	Post-Test Mean(SD)	Mean Difference
Degree	58	30.77(10.12)	60.43(7.98)	29.66
NCE	50	32.64(9.43)	72.67(10.12)	40.03
Sandwich	42	31.20(9.80)	61.64(9.43)	30.44

Table 3. shows the results of Interest in Technology Across Programs. NCE students demonstrated the highest increase in interest towards AI tools (mean difference = 40. 03), followed by Sandwich (30.44) and Degree students (29.66). This suggests that structured teacher-training students were more receptive to AI integration compared to students in more general academic disciplines.

Research Question Four: What is the combine effect of decision-making skills, academic skills, and interest towards technology usage in research project writing across Degree, NCE and sandwich students exposed to AI strategy in light of Kolb Model.

Table 4: Estimated Marginal Means (Adjusted Means) for Interaction Effect of AI Strategy on Academic Skills, Decision-Making Skills, and Technology Interest

Programs	Academic Skills	Decision-Making Skills	Technology Interest
Degree	62.75	66.71	60.43
NCE	71.99	77.77	72.67
Sandwich	70.45	64.67	61.64

As can be seen from the results in Table 4for the Interaction Effect Across Programs, the interaction effect showed that AI-based learning had a significant impact across all programs, with the most improvement seen in NCE students.While all students benefited, Degree students showed the lowest improvement, suggesting a need for more structured AI integration in their learning processes.

Hypothesis One: There is no statistically significant difference in academic skills between students in the experimental (Artificial Intelligence strategy, in light of Kolb Model) group and those in the control (traditional method) group.

Table 5: Summary ANCOVA of Students' Post- for Academic skills (Experimental vs. Control Group)

Source	Sum of Squares	Df	Mean Square	F- Value	P- Value
Corrected Model	10311.80[a]	4	1718.63	20.60	.00
Intercept	41716.02	1	41716.02	500.02	.00
Covariate (Pretest)	827.88	1	827.88	9.92	.06
Main Effect (AI)	3498.42	2	1749.20	20.97	.00
Main Effect (Trad)	235.97	1	235.97	2.83	.16
AI * Traditional	407.91	2	203.95	2.45	.09
Total	528119.00	150			

^{NS} = Not significant at .05 level of significance; S* = Significant at .05 level of significance

Results in Table 5 show the difference between the mean scores of students in the experimental (Artificial Intelligence strategy, in light of Kolb Model) group and the scores of students in the control (traditional method) group in the academic skills test. The result showed no significant difference between experimental and control groups in pre-test scores (F-value 9.92, p-value 0.06 > 0.05). However, the main effects analysis indicated a significant difference in academic skills between AI-based and traditional methods (F-value 20.97, p-value 0.00 < 0.05), rejecting the null hypothesis. The study concludes that AI-based learning environments significantly enhance academic skills in College of Education students, evidenced by higher post-test scores and mean difference scores compared to traditional methods.

Hypothesis Two. There is no statistically significant difference in decision-making skills between COE students in the experimental (Artificial Intelligence strategy, in light of Kolb Model) and those in the control (traditional method) groups.

Table 6: ANCOVA Summary for Decision-MakingSkills (Experimental vs. Control

Source	Sum of Squares	Df	Mean Square	F- value	P- value
Corrected Model	12763.05[a]	4	1860.52	27.97	.00^{S}
Intercept	13567.18	1	11567.18	159.10	.00^{S}
Covariate (Pretest)	346.80	1	346.80	4.78	.07^{NS}
Main Effect (AI)	11374.05	2	5686.53	78.21	.00^{S}
Main Effect (Trad)	257.61	1	257.61	3.54	.06^{NS}
AI * Traditional	10.57	2	5.28	.07	.93^{NS}
Total	672527.00	150			

^{NS} = Not significant at .05 level of significance; S * = Significant at .05 level of significance

Results in Table 6 shows the difference between the mean scores of students in the experimental (AI strategy, in light of Kolb Model) group and the scores of students in the control (traditional method) group in the decision-making skill test. The result shows that the analysis of covariate (pre-test scores) of the students exposed to AI strategy, in light of Kolb Model and those exposed to traditional method is not

significant since the calculated F-value (4.77) having a calculated P-value (.07) is greater than the significant level (.05), indicating that the means of the two groups were statistically equivalent.The table also shows that the calculated F-value (78.21) having a calculated p-value (.00) of the main effects of strtegy is less than the significant level (.05), therefore, the null hypothesis two is rejected. It is evident that the average percentage in the post-application for the experimental group are higher than the control group, confirming that AI-based learning environments significantly improve students' decision-making skills compared to traditional methods.

Hypothesis Three: is no statistically significant difference in COE students interest towards technology usage between those exposed to AI strategy in light of Kolb Model and those taught using traditional methods.

Table 6: ANCOVA Summary for effect of AI- based and Traditional -based instructional model on students' interest in Technology usage in Research writing

Source	TypeIII Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	5.12[a]	4	1.28	7.29	.00
Intercept	94.73	1	94.73	539.29	.00
Pre-interest	2.52	1	2.52	14.35	.00
AI-Methods	.04	1	.04	8.03	.02
Traditional	.44	1	.44	2.48	.12
AI* Traditional	2.17	1	2.17	12.34	.01
Error	38.29	145	.18		
Total	2474.20	150			
Corrected Total	43.42	149			

a. R Squared = .118 (Adjusted R Squared = .102)

Table 6. shows the difference between the mean scores of students in the experimental (AI strategy, in light of Kolb Model) group and the scores of students in the control (traditional method) group in the interest towards technology usage test. The result revealed that the calculated value of F (8.03) for the effect of treatment on students' interest in technology usage was 0.02. Thus, there is a significant difference between the mean interest scores of students in experimental group and those in the conventional method in favour of the experimental group. This is for the fact that the probability value of 0.02 is less than the 0.05 level of significance ($p < .05$). It is clear that the mean interest scores in the post-application are higher for the experimental

group than for the control group, which indicates a significant improvement in technology interest usage in project writing among students using AI-based learning, leading to rejection of Ho_3.

Hypothesis Four: There is no statistically significant interaction effect of the AI strategy in light of Kolb Model on academic skills, decision-making skills and interest towards technology usage among students in experimental and control groups from different academic programs in the college of Education.
Further analysis from Tables 5, 6, and 7 shows that AI strategy has a significant impact on cognitive achievement, decision-making, and interest in technology usage in students' research project writing. However, the exact magnitude of this effect was not known, Hence, hypothesis four seeks to measured it using Post hoc tests, partial Eta Squared values and estimated marginal means, with results detailed in Tables 8. These analyses controlled for pretest scores to assess the true effect of the AI intervention, with partial Eta Squared values indicating the effect size following Cohen's guidelines (0.2 for small, 0.5 for moderate, and 0.8 for large effects). Post hoc tests revealed the direction of significant differences among the dependent variables, underscoring the effectiveness of AI strategies in enhancing educational outcomes.

Table 8: Estimated Marginal Means (Adjusted Means) of Students' Post-Test Scores in Academic skills, Decision-Making Skills, and Technology Interest (Experimental vs.Control Groups Across Programs)

Program	Instructional Approach	Academic Skills	Decision-Making Skills	Technology Interest
Degree	AI-Based learning	62.75	66.71	60.43
	Traditional learning	48.26	50.78	49.91
NCE	AI-Based learning	71.99	77.77	72.67
	Traditional learning	55.80	57.21	60.10
Sandwich	AI-Based learning	70.45	64.67	61.64
	Traditional learning	50.12	51.32	53.77

AI-based learning significantly improved academic skills, decision-making skills, and technology interest across all programs when compared to traditional methods. The largest improvement was observed among NCE students, followed by Sandwich and Degree students. Technology interest scores were the lowest in traditional learning methods, suggesting that AI tools engage students more effectively. The interaction effect suggests that AI-based learning works best for structured training programs (like NCE) where applied learning is emphasized.

Table 9: LSD Post Hoc Analysis of Students' Scores on AI-Based Learning Effects on Academic skills, Decision-Making Skills, and Technology Interest

(I)Dependent Veriables	(J) Dependent Veriables	Mean Difference (I-J)	Std. Error	Sig.[b]
Academic Skills	AI-Based learning	-2.68	1.85	.44[NS]
	Traditional learning	11.13[*]	2.23	.00[S]
Decision-Making Skills	AI-Based learning	2.68	1.85	.44[NS]
	Traditional learning	13.82[*]	2.17	.00[S]
Technology Interest	AI-Based learning	-11.13[*]	2.23	.00[S]
	Traditional learning	-13.82[*]	2.17	.00[S]

Key:S = Significant ($p < 0.05$),NS = Not Significant ($p > 0.05$)

Results in table 9 showed Post Hoc Analysis –of Students' Scores on Effects of AI-Based Learning strategy in light of Kolb Model on Academic skills, Decision-Making Skills, and Technology Interest in research project writing between Experimental and Control Groups across programs in college of Education. ANCOVA results revealed significant differences in mean scores, with [$F(2,145)=20.97$, $p=0.006$] for Academic skills, [$F(2,145)=78.21$, $p=0.00$] for decision-making, and [$F(2,145)=8.03$, $p=0.02$] for technology usage interest. Significant differences ($p < 0.05$) were found between technology interest and both decision-making skills and academic skills, meaning AI-based learning had the strongest effect on students' interest in technology. No significant difference was found ($p > 0.05$) between academic skills and decision-making skills, suggesting these two are more closely related in terms of learning outcomes. AI had the most impact on decision-making skills and interest in technology, followed by academic skills. This confirms that AI-based learning environments enhance students' decision-making and engagement with technology in research project writing. The partial Eta Squared values, indicating effect sizes, were compared against Cohen's guidelines and were found to be 7.50 for students' interest in technology usage (moderate effect), 9.76 for students' cognitive achievement (large effect), and 10.81 for students' decision-making skills (large effect). This shows that decision-making skills contributed the more to the overall achievement, followed by academic skills while interest in technology contributed the least. This is so because the AI environment is very new to the students, with time this will be corrected.The null hypothesis (HO_4) was rejected, meaning there is a significant interaction effect of AI-based learning on academic skills, decision-making skills, and technology interest. NCE students benefited the most from AI-based learning, followed by Sandwich and Degree students. AI significantly boosted students' engagement with technology, suggesting its effectiveness in modernizing research project writing approaches.

Discussion of Findings

AI-based learning significantly improved academic skills, decision-making skills, and interest in technology across all programs. NCE students benefited most from the AI-based learning environments, showing the greatest improvements in all three areas. The effect size for all measures was large, indicating that AI integration has a substantial impact on student learning. Post-hoc tests confirmed significant differences between programs, with NCE students outperforming others in terms of achievement,decision-making, and technology interest. The null hypothesis one was rejected in favor of the hypothesis that there is a significant difference between the experimental group who used the AI-based learning environment and the control group who used traditional methods. This supports findings from various studies on AI tools that highlight enhanced efficiency, instant feedback, and accessibility of writing support (Algerafi et al., 2023; Ali et al., 2020; Sajjad et al., 2023; Mousa, 2014). The design considered individual differences among COE students by offering activities aligned with their learning preferences as described in Kolb's model. These included direct activities with specific answers (proximity) and divergent activities with multiple possible answers. It also incorporated abstract concepts for reflective observation and concrete experiences for active experimentation, aiding the development of learning achievement. The high achievement of the experimental group students in hypothesis two was attributed to their method of study, which translated ideas, words, and symbols into mental images, helping them retain information longer. In contrast, the control group studied traditionally, with less connection to prior knowledge, leading to quicker forgetting. Post-application averages were higher for the experimental group, indicating the effectiveness of the AI learning environment. The null hypothesis was rejected for decision-making skills in favor of the hypothesis that there is a significant difference ($p<0.05$) between the experimental group studying in the AI learning environment and the control group using traditional methods. These results are consistent with studies by Davenport and Kirby, (2016), Al-Mutairi, (2017), and

Al-Beqari (2016), which also highlighted the positive impact of AI applications within the framework of Kolb's experiential learning theory. The study investigated the effect of an AI-based learning environment, guided by Kolb's Experiential Learning Theory, on students' interest in technology usage in project writing. Results showed that the experimental group, which learned in an AI-based environment, significantly had higher post-application interest scores compared to the control group, which used traditional methods. The researcher linked this improved interest to the interactive nature of the AI applications within the Kolb model, which enhanced students' engagement and enjoyment, thereby increasing their interest in technology and AI in project writing. This finding aligns with previous studies by Huang et al. (2019) and Chen et al. (2020). Additionally, the study measured the AI-based environment's effect size on cognitive achievement, decision-making skills, and interest in technology: 1. Cognitive Achievement: There was a significant effect of the AI-based learning environment on cognitive

achievement, with an effect size value of 20.97, indicating a substantial impact. 2. Decision-making Skills: The environment also significantly impacted decision-making skills, with an effect size value of 78.21, affirming a considerable influence. 3. Interest in Technology: The effect on students' interest in technology was also substantial, with an effect size value of 8.03, further validating the positive influence of the AI-based learning environment. Overall, the study underscores the significant role of AI applications within the Kolb model in fostering cognitive achievement, decision-making skills, and interest in technology, particularly for project writing. The results of studies on the application of the Kolb's experiential learning theory in education such as Al-Haidari, (2015), study Al-Otaibi, (2016), and Dance and Oboas, (2016) gives credence to the findings of this study.

Conclusion

Effectiveness of AI-based learning environments in enhancing academic skills, decision-making skills, and interest in technology was confirmed based on the data collected and result of the analysis. The study further highlights that NCE students benefited the most, followed by Sandwich and Degree students. The results of this study suggest that an AI-based learning environment can have a positive effect on the development of academic skills, decision-making abilities, and interest in technology among students of COE in research project writing. By integrating AI technologies into educational practice, educators can create more personalized and engaging learning experiences that empower students to become active learners and critical thinkers. Future research should explore the mechanisms through which AI influences learning outcomes and investigate the long-term effects of AI-based interventions on student learning and development.

Recommendations

Based on the findings of this research and linking to previous studies, the researchers recommended the following:

1. Preparing the College of Education environment in a way that enhances development of decision-making skills and the interest towards technology using artificial intelligence techniques is apt.
2. Providing opportunities for students, in all the programmes run by the College to participate and interact through discussions, analysis and rethinking about what they hear or read, which helps them develop higher-order thinking skills, predict the future, and propose new actions based on the new gained experiences .
3. Holding seminars and courses to train college members of staff and students on how to use and apply existing learning environments based on artificial intelligence, and on their educational significance for the success of the educational process.
4. Emphasizing that the success of learning using learning environments based on artificial intelligence does not happen quickly, but requires the effort and persistence of those involved in the educational process.

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