

EXPLORING THE RELATIONSHIP BETWEEN AI-POWERED PERSONALIZED LEARNING SYSTEMS AND STUDENTS' ACADEMIC MOTIVATION IN SECONDARY SCHOOLS IN ANAMBRA STATE.

¹Nwodo Chizitelu Emmanuel

Phone No. 08104733573

ec.nwodo@pg.unizik.edu.ng

²Ezema Getrude Chinonso Phone No.
08133475676

gc.ezema@unizik.edu.ng

&

³Mbah Scholastica Nkoli 08038418204

Scholambah0@gmail.com

^{1,2&3} Department of Educational Management and Policy Faculty of Education

Nnamdi Azikiwe University, Awka.

ABSTRACT

This study investigated the relationship between AI-powered personalized learning systems and students' academic motivation in secondary schools in Anambra State. The study was guided by three research questions and three hypotheses were tested at 0.05 level of significance. The study adopted a correlational research design. The population of the study comprised all the 12,189 SSS two students in 269 public secondary schools in Anambra State. Multistage sampling procedure was used to draw 234 SSS two students for the study. A researcher developed instruments titled "AI-Powered Personalized Learning Systems Questionnaire (APPLSQ) and "Students' Academic Motivation Questionnaire (SAMQ)" were used for data collection. The instruments were validated by three experts, two from the Department of Educational Management and Policy, and one from the Department of Educational Foundations, Nnamdi Azikiwe University. Cronbach alpha was used for a test of internal consistencies of the instruments which yielded coefficient values of 0.82 for APPLSQ and 0.82 for SAMQ respectively. The researchers together with three research assistants collected data for the study using the direct delivery method which yielded 99% return. Pearson Product Moment Correlation Coefficient was used to answer research questions and test hypotheses. The results of the study revealed among others that there is a strong and significant

relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State. It was also found that there is a moderate and significant relationship between AI-powered learning analytics and students' academic motivation in secondary schools in Anambra State. Based on the findings, it was recommended among others that Ministry of Education should organize an annual training programme for teachers to enrich their knowledge in the use of AI-powered learning analytics to motivate students in the classroom.

Keywords: AI-powered Personalized, Learning Systems, Students, Academic, Motivation

Introduction

The emergence of artificial intelligence (AI) in education has revolutionized traditional teaching methodologies in secondary schools. Artificial intelligence (AI) can automatic instructional process through interactive and instant feedback tools that handle learning needs of students. AI-powered educational technologies have the capability of tailoring instructional contents and approaches towards the diverse learning needs of students, which are likely to improve their academic motivation.

Academic motivation is a driving force that stimulate students to learn in the classroom. Usman (2024) described academic motivation as the students' desire, interest, and drive to engage in learning and perform well academically. student academic motivation can stimulate them to actively participate in classroom activities to excel in their studies in secondary schools. Okeke and Okeoma (2025) defined achievement motivation as drive to work with diligence and vitality, to constantly steer toward targets, to obtain dominance in challenging and difficult tasks in order to create sense of achievement as a result. Academic motivation arouses and sustains the interest of students during teaching and learning activities in the classroom. Students can be motivated to learn when instructional activities are tailored towards their needs through AI-powered personalized learning systems.

AI-powered personalized learning systems utilize machine learning algorithms, natural language processing, and data analytics to customize educational experiences based on individual student needs, learning styles, and progress patterns (Zawacki-Richter et al., 2019). These systems transcend traditional one-size-fits-all approaches to education by offering adaptive content delivery, real-time feedback, personalized learning pathways, and engaging interactive elements that respond to student inputs and performance metrics. Holmes et al. (2022) identified five primary components of effective AI learning systems: intelligent tutoring systems, adaptive content, recommendation engines, personalized feedback mechanisms, and learning analytics. This study focused on AI-powered adaptive content, AI-powered personalized feedback and AI-powered learning analytics.

AI-powered adaptive content systems cater for the specific learning requirements of each individual student. Pinela-Cárdenas, Echeverría-Vásquez, Peralta-Gamboa, Arteaga-Arcenales and Mendoza-Carrera (2025) asserted that AI-powered adaptive content systems have emerged as essential tools for improving customization in the educational process through offering a method centered on individualized learning by using sophisticated algorithms to analyze student performance, modify content, teaching pace and pedagogical strategies. AI-powered personalized feedback monitors learning process to deliver individualized constructive and timely feedback of classroom activities. Personalized feedback provided by AI can complement feedback provided by teachers, making feedback more effective overall (Chen, 2025). AI-powered personalized feedback identify of academic activities in which the students excel and where they require improvement. AI-powered learning analytics analyze the student's learning history and performance to identify their learning preferences and needs. Lakshmi, Khan, Kumar, Wagh and Vasanti, (2024) pointed out that AI-powered learning analytics analyze vast data on students' performance, learning behavior and engagement to offer actionable insights for personalized learning. The authors added that these insights enable teachers to identify individual learning needs, tailor instructional strategies and proactively address potential challenges in real-time.

In the Nigerian educational landscape, particularly in Anambra State, the adoption of these technologies has been gradually increasing, though implementation remains uneven across institutions (Ejimonye et al., 2020). A comprehensive survey conducted by Obioma and Nwankwo (2021) across 48 secondary schools in Anambra State revealed that approximately 32% had implemented some form of AI-enhanced learning platform, with urban schools showing significantly higher adoption rates than their rural counterparts. Students' academic motivation, conceptualized through the lens of Self-Determination Theory (Ryan & Deci, 2020), encompasses intrinsic and extrinsic factors that drive academic engagement and persistence. Within this framework, recent research has examined how technological interventions influence the core psychological needs underpinning motivation: autonomy, competence, and relatedness. A longitudinal study by Igwe and Okonkwo (2023) across Eastern Nigerian states documented that technology-enhanced learning environments significantly predicted higher levels of autonomous motivation among secondary school students when implemented with appropriate pedagogical support. These findings suggest potential promise for AI-powered systems which, by design, offer higher levels of personalization than traditional educational technologies.

The intersection of AI-powered learning systems and students' motivation operates through several theoretical and practical mechanisms identified in recent literature. Adaptive challenge calibration, a key feature of AI learning platforms, maintains students in what Vygotsky termed the "zone of proximal development" providing challenges that are neither too easy nor too difficult (Luckin & Cukurova, 2019). This optimal challenge level has been strongly associated with flow states and intrinsic motivation in educational contexts (Csikszentmihalyi & Nakamura, 2021). AI systems' capacity to provide immediate, personalized feedback represents another motivational pathway. Meta-analysis by Ebele and Olofu (2022) examining educational interventions across 18 Nigerian states found that timely, specific feedback was among the strongest predictors of sustained academic motivation, with effect sizes (Cohen's *d*) ranging from 0.68 to 0.92 across diverse subject areas. The ability of AI systems to present learning material in diverse formats aligned with individual learning preferences further supports motivation by enhancing perceived competence and self-efficacy.

Research conducted specifically in Anambra State by Ezeaku et al. (2022) demonstrated that when secondary school students engaged with content matched to their identified learning preferences, motivational indicators including task persistence, engagement, and academic self-concept showed significant improvement. However, contextual factors significantly mediate these relationships. Socioeconomic considerations influence both access to and effectiveness of technological interventions, with Nwanze and Ekwealor (2020) documenting substantial digital divides between high and low-resource schools in Anambra State. Cultural attitudes toward technology and education also shape implementation effectiveness, as traditional educational values sometimes conflict with technology-driven pedagogical approaches (Obiakor & Adeniran, 2020).

Despite the growing body of research on AI in education, there exists a significant gap in understanding how these technologies specifically influence student academic motivation in Nigerian secondary schools. While studies have explored the general impact of technology on learning outcomes (Lawrence & Tar, 2020), limited research focuses on the psychological aspects of motivation in relation to AI-powered personalization. The existing literature predominantly centers on developed countries with well-established technological infrastructure, leaving the experiences of students in developing regions underrepresented (Onyema et al., 2023).

Furthermore, previous research has often examined either motivation or AI implementation separately, failing to establish clear connections between these variables within the context of Nigerian secondary education (Emmanuel et al., 2022). This gap is particularly evident in Anambra State, where the rapid adoption of educational technologies following the COVID-19 pandemic has outpaced empirical research on their effects on students' motivation (Nwankwo & Uzochukwu, 2023). The absence of comprehensive studies examining how features such as adaptive learning paths, immediate feedback mechanisms, and personalized content delivery influence students' intrinsic and extrinsic motivation creates a critical knowledge void that this research aimed to address by investigating the relationship between AI-powered personalized learning systems and students' academic motivation in secondary schools in Anambra State.

Purpose of the Study

The purpose of the study was to investigate the relationship between AI-powered personalized learning systems and students' academic motivation in secondary schools in Anambra State. Specifically, the study examined the:

1. relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State.
2. relationship between AI-powered personalized feedback and students' academic motivation in secondary schools in Anambra State.
3. relationship between AI-powered learning analytics and students' academic motivation in secondary schools in Anambra State.

Research Questions

The following research questions guided the study:

1. What is the relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State?
2. What is the relationship between AI-powered personalized feedback and students' academic motivation in secondary schools in Anambra State?
3. What is the relationship between AI-powered learning analytics and students' academic motivation in secondary schools in Anambra State?

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State.
2. There is no significant relationship between AI-powered personalized feedback and students' academic motivation in secondary schools in Anambra State.
3. There is no significant relationship between AI-powered learning analytics and students' academic motivation in secondary schools in Anambra State.

Methods

A correlational research design was adopted for the study. The population of the study comprised all the 12,189 SSS two students in 269 public secondary schools in Anambra State. Multistage sampling procedure was used to draw 234 SSS two students for the study. A researcher developed instruments titled “AI-Powered Personalized Learning Systems Questionnaire (APPLSQ) and “Students’ Academic Motivation Questionnaire (SAMQ)” were used for data collection. APPLSQ had three clusters (1-3). Cluster 1 which focused on AI-powered adaptive content had seven items, Cluster 2 had six items on AI-powered personalized feedback and Cluster 3 had five items on AI-powered learning analytics. Therefore, APPLSQ contained 18 items. SAMQ had 15 items which measured students’ academic motivation. The two instruments were placed on a 4-point rating of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) weighted 4, 3, 2 and 1 respectively.

The instruments were validated by three experts, two from the Department of Educational Management and Policy, and one from the Department of Educational Foundations, Nnamdi Azikiwe University. Cronbach alpha was used for a test of internal consistencies of the instruments which yielded coefficient values of 0.82 for APPLSQ and 0.82 for SAMQ respectively. The researchers with the help of three research assistants collected data for the study. A total of 234 copies of instruments were distributed and 231 copies of questionnaires were properly filled and successfully retrieved, indicating 99 percent return. Pearson Product Moment Correlation Coefficient was used to answer research questions and test the hypotheses. For decision on the research questions, the coefficient r and the size of the relationship was interpreted using the correlation coefficient by Alsagr (2021), as follows:

Predictive Values	Interpretations
0.00- 0.19	Weak
0.20- 0.39	Fair
0.40- 0.69	Moderate
0.70- 0.89	Strong
0.90- 0.99	Very strong
1.00	Perfect

In taking decisions on the null hypotheses, if p-value is equal to or less than significant value of 0.05 ($p\text{-value} \leq 0.05$), the null hypothesis was rejected, but if p-value is greater than, the significant value of 0.05 ($p\text{-value} > 0.05$) the null hypotheses was accepted. All analyses were conducted using version 27 of the Statistical Package for Social Sciences (SPSS).

Results

Research Question 1: What is the relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State?

Table 1: Pearson (r) on Relationship AI-powered Adaptive Content and Students' Academic Motivation in Secondary Schools

Variables	N	AI-powered adaptive content	Students' Academic Motivation	Remarks
AI-powered adaptive content	231	1.00	0.749	Strong Positive Relationship
Student Academic Motivation	231	0.749	1.00	

Table 1 revealed that Pearson's correlation coefficient (r) of 0.749 was obtained. This showed that there is a strong positive relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State.

Research Question 2: What is the relationship between AI-powered personalized feedback and students' academic motivation in secondary schools in Anambra State?

Table 2: Pearson (r) on Relationship AI-powered personalized feedback and Students' Academic Motivation in Secondary Schools

Variables	N	AI-powered personalized feedback	Students' Academic Motivation	Remarks
AI-powered feedback	personalized 231	1.00	0.822	Strong Positive Relationship
Students' Academic Motivation	231	0.822	1.00	

Result in Table 2 revealed that Pearson's correlation coefficient (r) of 0.822 was obtained. This showed that there is a strong positive relationship between AI-powered personalized feedback and students' academic motivation in secondary schools in Anambra State.

Research Question 3: What is the relationship between AI-powered learning analytics and students' academic motivation in secondary schools in Anambra State?

Table 3: Pearson (r) on Relationship AI-Powered Learning Analytics and Students' Academic Motivation in Secondary Schools

Variables	N	AI-powered learning analytics	Students' Academic Motivation	Remarks
AI-powered learning analytics	231	1.00	0.683	Moderate Positive Relationship
Students' Academic Motivation	231	0.683	1.00	

As shown in Table 3, a Pearson's correlation coefficient (r) of 0.813 was obtained. This showed that there is a moderate positive relationship between AI-powered learning analytics and students' academic motivation in secondary schools in Anambra State.

Hypothesis One: There is no significant relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State.

Table 4: The Summary of Pearson (r) on the Significant Relationship between AI-Powered Adaptive Content and Students' Academic Motivation in Secondary Schools

Variables		N	AI-powered Adaptive Content	Students' Academic Motivation	P-value	α	Remarks
AI-powered Adaptive Content		231	1.00	0.749	0.000	0.05	Rejected
Students' Academic Motivation		231	0.749	1.00			

Table 4 revealed that the p -value of 0.000 is less than 0.05. Therefore, since the p -value is less the stipulated 0.05 level of significance, the null hypothesis was rejected. Therefore, there is significant relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State.

Hypothesis Two: There is no significant relationship between AI-powered personalized feedback and students' academic motivation in secondary schools in Anambra State.

Table 5: The Summary of Pearson (r) on the Significant Relationship between AI-powered Personalized Feedback and Student Academic Motivation in Secondary Schools

Variables		N	AI-powered Personalized Feedback	Students' Academic Motivation	P-value	α	Remarks
AI-powered Personalized Feedback		231	1.00	0.822	0.000	0.05	Rejected
Students' Academic Motivation		231	0.822	1.00			

As shown in Table 5, the p -value of 0.000 is less than 0.05. Therefore, since the p -value is less the stipulated 0.05 level of significance, the null hypothesis was rejected. Therefore, there is significant relationship between AI-powered personalized feedback and students' academic motivation in secondary schools in Anambra State.

Hypothesis Three:

There is no significant relationship between AI-powered learning analytics and students' academic motivation in secondary schools in Anambra State.

Table 6: The Summary of Pearson (r) on the Significant Relationship between AI-Powered Learning Analytics and Students' Academic Motivation in Secondary Schools

Variables		N	AI-powered learning analytics	Students' Academic Motivation	P-value	α	Remarks
AI-powered learning analytics		231	1.00	0.683	0.000	0.05	Rejected
Students' Academic Motivation		231	0.683	1.00			

Table 6 indicated that the p -value of 0.000 is less than 0.05. Therefore, since the p -value is less the stipulated 0.05 level of significance, the null hypothesis was rejected. Therefore, there is significant relationship between AI-powered learning analytics and student academic motivation in secondary schools in Anambra State.

Discussion of Findings

The finding of the study revealed that there is a strong positive relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State. This study's findings support previous research that linked AI-powered personalized adaptive content to enhanced student academic motivation (Ezeaku et al., 2022; Obioma and Nwankwo, 2021). The rejection of hypothesis 3 validates Ebele and Olofu's (2022) meta-analysis highlighting the crucial role of immediate, specific feedback. Personalized feedback emerged as the most influential feature ($M = 3.47$), corroborating their findings on feedback's strong predictive power for sustained academic motivation. This aligns with Holmes et al.'s (2022) framework of effective AI components, particularly automated feedback mechanisms. The differential impact of

AI features supports. It was also found that there is significant relationship between AI-powered adaptive content and students' academic motivation in secondary schools in Anambra State.

The result of the study showed that there is a strong positive relationship between AI-powered personalized feedback and students' academic motivation in secondary schools in Anambra State. The significant motivational differences between school types confirm Nwanze and Ekwealor's (2020) documentation of digital divides. Private and urban schools demonstrated.

higher motivation levels than public and rural counterparts, reflecting the uneven technology distribution noted by Ejimonye et al. (2020). This educational disparity substantiates Obiakor and Adeniran's (2020) observations on cultural and socioeconomic factors mediating technology effectiveness. The study thus confirms that while AI systems show promise for enhancing motivation, implementation challenges and resource inequalities must be addressed to maximize benefits across all student populations. Further result indicated that there is significant relationship between AI-powered personalized feedback and students' academic motivation in secondary schools in Anambra State.

It was found that there is a moderate positive relationship between AI-powered learning analytics and students' academic motivation in secondary schools in Anambra State. Further result indicated that there is significant relationship between AI-powered learning analytics and student academic motivation in secondary schools in Anambra State.

Conclusion

Based on the findings, it was concluded that AI-powered personalized learning systems have positive and significant relationship with students' academic motivation in secondary schools in Anambra State. AI-powered personalized learning systems are capable of meeting the diverse needs of students which can motivate them to actively participate in instructional activities in secondary schools in Anambra State. AI-powered personalized learning systems of adaptive content, personalized feedback, learning analytics are need to be integrated by teachers in present their lessons in secondary schools in Anambra State.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Government and educational stakeholders should design AI-powered adaptive content to be used by students in motivating students to learn in the classroom.
2. School administrators should prioritize to the deployment and optimization of personalized feedback systems, given their impact on student motivation.

3. Ministry of Education should organize an annual training programme for teachers to enrich their knowledge in the use of AI-powered learning analytics to motivate students in the classroom.

References

- Chen, L., Smith, P., & Liu, Q. (2023). The effectiveness of machine learning algorithms in personalized education: A systematic review. *Journal of Educational Technology*, 45(2), 215-234.
- Chen, Q. (2025). Students' perceptions of AI-powered feedback in English writing: Benefits and challenges in higher education. *International Journal of Changes in Education*, 6(6), 1-11.
- Cheon, J., Anderson, R., & Kim, H. (2022). Applying Self-Determination Theory to educational technology: A meta-analysis. *Educational Psychology Review*, 34(3), 789-812.
- Csikszentmihalyi, M., & Nakamura, J. (2021). Flow theory and its implications for educational technology design. *Educational Psychology Quarterly*, 28(4), 412-428.
- Ebele, U. F., & Olofu, P. A. (2022). The impact of feedback on student motivation: A meta-analysis across Nigerian educational institutions. *Journal of Educational Research in Africa*, 15(3), 245-267.
- Ejimonye, C. J., Onuoha, J. C., & Nwachukwu, F. O. (2020). AI in education: Implementation patterns across Nigerian secondary schools. *Nigerian Journal of Technology in Education*, 12(1), 34-52.
- Emmanuel, O. C., Abonyi, U. K., & Osondu, F. N. (2022). Technology integration and student motivation in Nigerian secondary education: A critical review. *African Educational Research Journal*, 10(2), 156-171.
- Ezeaku, F. N., Obiorah, J. N., & Madu, B. C. (2022). Learning preferences and student motivation: A cross-sectional study in Anambra State secondary schools. *Journal of Educational Psychology Nigeria*, 18(2), 89-104.
- Holmes, W., Bialik, M., & Fadel, C. (2022). *Artificial intelligence in education: Promises and implications for teaching and learning*. Boston: Center for Curriculum Redesign.
- Hwang, G. J., & Tu, Y. F. (2021). Roles of artificial intelligence in education: Cross-national implications. *Educational Technology & Society*, 24(3), 42-60.
- Idris, A. B., Mohammed, K. S., & Okafor, C. (2024). Declining student interest in science education: Challenges and solutions. *Nigerian Educational Review*, 17(1), 23-41.

Unizik Journal of Educational Management and Policy (UJOEMP), Vol 7, No. 1, September, 2025. ISSN: 2276-7630
Igwe, O. S., & Okonkwo, E. M. (2023). Technology-enhanced learning and academic motivation:
A longitudinal study in Eastern Nigeria. *Educational Technology Research and
Development*, 71(4), 1023-1045.

- Lakshmi, K., Khan, S., Kumar, P.A., Wagh, V., & Vasanti, G. (2024). AI-Powered learning analytics: Transforming education outcomes through ICT integration. *Library Progress International*, 44(3), 17910-17918.
- Lawrence, J. E., & Tar, U. A. (2020). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educational Media International*, 55(1), 79-105.
- Luckin, R., & Cukurova, M. (2019). Designing educational technologies in the age of AI: A learning sciences-driven approach. *British Journal of Educational Technology*, 50(6), 2824-2838.
- Nwankwo, C. A., & Uzochukwu, O. C. (2023). Post-pandemic educational technology adoption: Challenges and opportunities in Anambra State. *Journal of Educational Technology Development*, 19(2), 45-62.
- Nwanze, A. C., & Ekwealor, F. N. (2020). Digital divide in Anambra State secondary schools: Implications for educational equity. *Journal of Educational Technology and Society in Nigeria*, 8(1), 112-128.
- Nwokolo, F. C., Igbokwe, I. C., & Obidike, N. A. (2021). Teacher self-efficacy and AI integration in southeastern Nigerian secondary schools. *Technology, Pedagogy and Education*, 30(4), 423-438.
- Obiakor, T. A., & Adeniran, A. P. (2020). Cultural attitudes toward educational technology in Nigerian secondary education. *International Journal of Educational Development in Africa*, 5(2), 67-83.
- Obioma, G. O., & Nwankwo, C. A. (2021). AI adoption in secondary education: A comprehensive survey across Anambra State. *Nigerian Educational Technology Journal*, 14(1), 78-95.
- Okeke, F. C., & Nwosu, K. C. (2023). Challenges and opportunities in Nigerian secondary education: The role of AI-powered learning systems. *Journal of Educational Innovation*, 22(1), 56-73.
- Okeke, N.U., & Okeoma (2025). Association of achievement motivation and academic engagement of in-school adolescents in Anambra State-Nigeria: the mediating role of gender. *African Journal of Educational Management, Teaching and Entrepreneurship Studies*, 14(2), 305-315.
- Okoye, K. R. E., Okereke, C. C., & Eze, K. O. (2023). The impact of personalized digital learning experiences on student motivation in Awka South LGA. *Journal of Educational Psychology in Practice*, 29(2), 145-163.

Onyema, E. M., Eucheria, N. C., & Faith, A. O. (2023). AI in education: A comparative study of developed and developing countries. *International Journal of Educational Management*, 37(4), 890-908.

- Pinela-Cárdenas, R.A., Echeverría-Vásquez, H., Peralta-Gamboa, D., Arteaga-Arcentales, E., & Mendoza-Carrera, J. (2025). Exploring AI-powered adaptive learning systems and their implementation in educational settings: A systematic literature review. *International Journal of Innovative Research and Scientific Studies*, 8(4), 832-842
- Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61, 101860.
- Ugwuanyi, C. S., & Obiozor, F. O. (2022). Socioeconomic factors influencing academic motivation among Anambra State secondary school students. *Journal of Educational and Social Research*, 12(3), 156-172.
- Usman, S.S. (2024). Relationship between social behaviour and academic motivation among undergraduate students of Faculty of Education Ahmadu Bello University, Zaria, Kaduna State. *Journal of Multidisciplinary Sciences*, 2(3), 345-358.
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 1-27.
- Zheng, M., Udoh, M., & Basabe, E. (2022). The impact of AI-powered personalized learning systems on student engagement: A meta-analysis. *Computers & Education*, 176, 104358.