

Artificial intelligence tools and higher education student's engagement

Ebere Pearl Ezeoguiné^{1*}, Stella Eteng-Uket²

¹ Department of Curriculum Studies and Educational Technology, Faculty of Education, University of Port Harcourt, Rivers State, Nigeria.

² Department of Educational Psychology, G/C, Faculty of Education, University of Port Harcourt, Rivers State, Nigeria.

*Corresponding Author: stella.eteng-uket@Uuniport.edu.ng

ABSTRACT

In the rapidly evolving landscape of higher education, the integration of Artificial Intelligence (AI) tools represents a pivotal paradigm shift, poised to redefine the very fabric of student engagement. Thus, as this integration becomes increasingly prevalent, it raises questions about its impact on student engagement. This prompted this study that sought to investigate AI tools' influence on student engagement in higher education. The study employed the descriptive survey design using a sample size of 204 comprising male and female students between the ages of 18 to 31 years above from the University of Port Harcourt. A scale with validities and a high-reliability coefficient was used in obtaining data. Data were analyzed using mean, one-way, and two-way ANOVA. The result showed that the majority of the students were extremely engaged as a result of the influence of the use of AI tools, a significant difference existed in the engagement levels of students influenced by AI tools like ChatGbt amongst others, and that neither gender nor age significantly affects engagement, suggesting a universal appeal of AI tools across demographics. The findings underscore the importance of inclusive AI integration in higher education, ensuring equitable and engaging learning experiences for students. These insights contribute to the ongoing discourse on leveraging AI tools to enhance student engagement in higher education settings

Keywords: artificial intelligence; students engagement; gender; age

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1. INTRODUCTION

In recent years, the landscape of higher education has witnessed a transformative paradigm shift, with the advancements in technology, with Artificial Intelligence (AI) emerging as a central force reshaping the educational experience. Thus, the traditional contours of higher education are evolving at an unprecedented pace. Long gone are the days when education was confined to lecture halls and textbooks. Traditional methods of instruction are being complemented and sometimes replaced by innovative AI tools. This due to the fact that, traditional education system faces several issues, including overcrowded classrooms, a lack of personalized attention for students, varying learning paces and styles, and the struggle to keep up with the fast-paced evolution of technology and information as Labadze et al. (2023) opined. They went further to posit that as the educational landscape continues to evolve, the rise of AI-powered tools emerges as a promising solution to effectively address some of these issues among others. Thus today, AI tools, permeate the fabric of academia, offering innovative solutions to age-old challenges and presenting new opportunities to enrich the learning journey. AI tools refers to a range of technologies and applications that leverage on AI algorithms to enhance the educational process. They

include intelligent tutoring systems, virtual assistants, intelligent content generation systems and chatbots, adaptive learning platforms, writing assistants, automated grading systems and detection systems (Eteng-Uket & Effiom 2023).

Scholars assert that Intelligent Tutoring Systems (ITS) employ AI algorithms for personalized instruction, virtual assistants provide real-time support, adaptive learning platforms tailor content, automated grading systems use AI for assessment, language learning apps utilize natural language processing for feedback, and immersive technology (Virtual and Augmented Reality) creates interactive learning experiences, AI writing/research assistance gathers and analyzes information for research, while intelligent content generation/chatbots use algorithms to produce customized learning materials based on specific topics or prompts. (Baker & Siemens, 2014; Eteng-Uket & Effiom 2023; 2022; Mendoza 2022; Shawar & Atwell 2007). Some examples of specific AI tools that students have access to readily that can make learning experience engaging include intelligent tutoring systems like Carnegie, Khan Academy, AI content generator and writing assistance like ProWritingAid, Grammarly, Bard, Chat GPT, some plagiarism detection tools and automated grading/feedback systems like Turnitin, gradescope, Augmented Reality, Virtual Reality and Virtual Lab Simulation just to mention but a few.

These tools have the potential to provide personalized learning experiences, real-time feedback, customize content, and facilitate a more interactive and engaging learning environment, ultimately redefine the educational landscape. (Flores-Vivar, 2023; Haq 2022; Jokhan, et al., 2022; Kabudi, 2022; Yuskovych-Zhukovska et al., 2022). According to scholars, AI tools such as Chatbots, Virtual Assistance tools, and Adaptive Learning Systems offer immersive and engaging learning experiences that allow students to discover complex theories and solutions in a more interactive and meaningful manner (Chaudhry et al., 2023; Pradana et al., 2023). In assessment and feedback, AI assists in grading and appraising student assignments, for example detecting similarities through Turnitin, monitoring students' participation and involvement in library resource utilization, providing faster and more precise feedback to students, and freeing up time for instructors to focus on other aspects of teaching. Similarly, AI-powered chatbots or conversational agents like Chat GPT and Bard offer learners immediate and personalized assistance for their academic and organizational needs, such as answering questions about course materials or addressing basic queries.

While the potential benefits of AI in education are vast, the integration of AI tools in education comes with challenges and concerns. These challenges and concern include Issues such as data privacy, ethical use of AI algorithms, the potential exacerbation of the digital divide the risk of deconstructing the teacher-student role structure and educational inequality, biased algorithms, the risk of alienation from educational goals, the tendency for intense use of AI to impair student's ability to learn independently and develop 21st century skills such as problem solving and critical thinking, lack of technical infrastructure and technological knowledge of teachers. (Bu 2022, Chiu & Chai, 2020; Eteng-Uket & Effiom 2023; Makeleni et al 2023; McCarthy et al., 2016; Wogu et al 2018), Understanding these challenges is essential to harnessing the benefits of AI and ensuring the responsible integration of AI tools while mitigating potential drawbacks.

As this transformation and integration unfolds and becomes an integral part of educational ecosystems, it is crucial to explore its impact and influence on various aspects of students' academic experience and one pivotal aspect is student's engagement. Student engagement is a multifaceted concept that encompasses the extent of a student's involvement, participation, and connection with the learning process. Chapman (2023) defined Student's engagement refers to student's willingness to take part in school activities such as attending classes, doing homework and obeying teacher's instruction in class.

Student engagement is defined by Trowler (2010) as the 'interaction between the time, effort and other relevant resources invested by both students and their institutions intended to optimise the student experience and enhance the learning outcomes and development of students and the performance, and reputation of the institution. Hence, it is a multidimensional phenomenon (Collaço, 2017) that measures the quality of the students' learning experience as a whole (Robinson & Hullinger, 2008).

As shown by scholars and research, student engagement is essential for student achievement, outcome, academic motivation, performance, satisfaction and general educational success as (Abbas 2022; Amir et al., 2014; Bowden et al., 2021; Dwivedi et al., 2019; Hu & Li, 2017; Kahu et al., 2019; Kuh et al., 2008; Webber et al., 2013). Therefore, student engagement in Higher Education plays a prominent role in creating effective learners (Collaço, 2017).

Student engagement, a cornerstone of academic success, takes on new dimensions in the digital age. It extends beyond mere attendance and participation, encapsulating the depth of involvement, interaction, and connection that students forge with their educational environment. The essence of engagement is not only in acquiring knowledge but also in actively participating, collaborating, and applying learning in meaningful ways.

A significant aspect of AI's impact on student engagement lies in its capacity to analyze individual learning styles, preferences, and progress. The emergence of adaptive learning systems represents a pivotal development, allowing educational content to be dynamically adjusted to suit the unique needs of each student. The ascendancy of AI in education is marked by a myriad of applications designed to augment and amplify the learning experience. From intelligent tutoring systems that tailor content to individual student needs to adaptive learning platforms that dynamically adjust to diverse learning styles, AI tools have the potential to revolutionize how students engage with educational content and activities. AI tools not only personalize learning but also foster a more interactive and collaborative educational milieu. Virtual assistants, chatbots, and intelligent discussion platforms facilitate real-time engagement, providing students with instant feedback, guidance, and resources

As technology continues to evolve and improve, one can expect to see more innovative and effective applications of AI in education, leading to more personalized, engaging, and effective learning experiences for students (Li et al., 2021). This is collaborated by reports which shows that higher education students do actively adopt AI tools in their learning process. (Alharbi 2023; Utami eta al., 2023). Studies also report that students in higher education have a positive attitude and perception towards AI tools (Ahmad et al 2023; Al Saad et al., 2023; Amaras-Lopez et al 2023; AL-Tkhayneh et al. 2023; Ooi et al., Swed 2021; Eteng-Uket 2023; Gherses & Obrad 2018; Buabbas et al., 2023; Keles & Aydin 2021; Khater et al., 2023; Chan et al., 2023; Vallis et al 2023; Almaraz-Lopez 2023; Mousavi Baigi et al., 2023; Utami eta al., 2023). This is also accelerated by the fact that as most of these AI tools are easily and freely accessible by their smart devices and they have.

These technologies enhances student engagement and learning outcomes by providing personalized support, facilitating group discussions and collaborations, providing feedback and assessment on student work, supporting self-directed learning, and enhancing student engagement and motivation (Baskara 2023; Chen et al., 2010; Diwanji et al., 2018; Lin & Mubarak, 2021; Tangkittipon et al., 2020 ; Ebadi & Amini, 2022; Kim et al.,2019; 2020; Kuhail et al., 2022; Huang et al., 2022; Kohnke, 2022; Plantak Vukovac et al., 2021; Robinson & Hullinger, 2008).

The integration of Artificial Intelligence (AI) tools in higher education has become increasingly prevalent, raising questions about their impact on student engagement. As educational institutions and learners worldwide adopt AI-driven technologies to enhance learning experiences, it is imperative to understand the extent to which these tools influence student engagement levels.

This is imperative as despite the growing integration of AI tools in educational settings, there is a dearth of research examining the influence of the use of AI tools and the overall engagement levels of students. Another critical aspect requiring attention is the potential influence of demographic factors, specifically age and gender, on the influence between AI tools and student engagement. Understanding how these demographic variables intersect with AI tools' impact is essential for tailoring educational strategies that cater to diverse student populations. Furthermore, the findings hold the potential to inform students, educators, school administrators and policymakers, on optimizing the integration of AI tools for enhanced student engagement and improved educational outcomes about the intricacies of student engagement in the context of AI tools, as well as the potential moderating effects of demographic variables.

From the foregoing, research in this area is warranted due to the fact that amidst the burgeoning literature on AI's Usage in education and student engagement, there is a discernible gap pertaining to the specific influence of AI tools on engagement levels in higher education especially in West Africa and Nigeria in Particular. Against this backdrop, this study embarks on an exploration of the influence of AI tools on the engagement levels of higher education students.

Research Questions and Hypothesis

Research Question 1; What is the engagement level of students based on the influence of Artificial Intelligence tools

Hypothesis 1; There is no significant difference in the engagement level of students based on the influence of Artificial Intelligence tools

Research Question 2; What is the influence of age and gender on the engagement level of students based on the influence of Artificial Intelligence tools

Hypothesis 2; There is no significant influence of age and gender in the engagement level of students based on the influence of Artificial Intelligence tools

2. METHODS

The research design was the descriptive survey. Within this design, the analytic descriptive design was employed. This design was employed as the study seeks to describe the engagement level of students in their course in higher education based on the influence of AI tools in education for learning. This design is also suitable when comparisons are to be made between various strata of a sample for the variables that are being studied. (Nwankwo, 2013). So specifically, the descriptive design was employed as suitable for this study as the influence level of Ai tools on student's engagement was described. Furthermore, influence of different strata and variables like gender and age was described in relation to student's engagement was described

The population of the study was 15,875 undergraduate students in University of Port Harcourt in the 2022/2023 academic session. A sample of 204 was drawn using disproportionate stratified random sampling based on gender. An instrument titled Influence AI Educational tools on Student's Engagement Scale was used to obtain data. This scale was divided into two sections labelled A and B. Section A was to gather demographic data from the respondents, such as their department, gender and age. Section A contained also some items on some AI tools that they use. The part B contained items that was designed to measure engagement level of students towards learning activities in a course computer in education based on usage of AI- tools for learning in that course. Respondents are asked to rate items on the scale using the response option of a bit engaging, moderately engaging, very much engaging and extremely engaging which are assigned 1, 2, 3, 4. High score on this instrument indicated High level of engagement and low scores low level of engagement. Specifically, scores between 0-13 indicates low level of

engagement, scores between 14-26 indicated a bit of engagement, scores between 27-39 indicated moderate engagement, very much engagement scores ranged between 40-52 and scores from 53-65 indicated extreme engagement.

Face and content validity was ensured by seeking expert (test and measurement experts and instructional technologist expert) opinions. These experts critically analyzed the items for the content, language, content, usefulness, thoroughness, clarity, and literacy requirements. On the basis of criticisms and comments offered by experts only those items which received significant approval of the experts were retained for item analysis. The Cronbach alpha method of internal consistency was used to estimate the instrument reliability and construct validity. On a sample of 20 respondents, these instruments were pilot tested. Each item on the test was evaluated for quality and selection in accordance with the Cronbach alpha method. Based on the inter-item analysis and item total statistics, items were included in the final instrument. Thus, Cronbach alpha was used to obtain a reliability coefficient of 0.903 for the Engagement Scale. Data were analyzed using mean, standard deviation, t-test and one-way Analysis of Variance (ANOVA) and Two-Way Analysis of Variance.

3. RESULTS AND DISCUSSION

Results

Research Question 1; What is the engagement level of students based on the influence of Artificial Intelligence tools

Hypothesis 1; There is no significant difference in the engagement level of students based on the influence of Artificial Intelligence tools

Table 1. Mean, SD and One-way ANOVA Analysis of no significant difference in the engagement level of students

| Engagement | N | \bar{x} | SD | Df | Mean Square | F | Sig. | P | Decision |
|------------|-----|-----------|-------|--------|---------------|--------|------|------|------------------------|
| A little | 6 | 26.83 | 3.060 | | | | | | |
| Moderately | 18 | 35.44 | 3.221 | | | | | | |
| Very Much | 62 | 46.20 | 3.354 | 3, 200 | 5245.38, 16.2 | 322.30 | .000 | 0.05 | Reject Ho ₁ |
| Extremely | 118 | 58.46 | 4.477 | | | | | | P>0.05 |
| Total | 204 | 51.77 | 9.672 | | | | | | |

From table 1, the engagement level in the course computer in education of students based on the influence of AI educational tools (chatbots: Bard, ChatGB, writing assistance and paraphrasing tools like Grammarly, quillBot, plagiarism detection tools like Dupli checker) can be observed. The table shows that the engagement level of students in their course ranges from those that found the course a bit engaging, to those who found it moderately engaging, then to those that found it very much engaging and then to those that found it extremely engaging as seen by the varying engagement level mean scores 26.83, 35.44, 46.20, 58.46 and the total average engagement mean for the whole group which is 51.77. The varying engagement level number and mean scores shows there is a difference in the engagement level of the students in the influence of AI on their course of study. Precisely, it shows that 6 students with a mean score of 26.83 had a bit of engagement in their course as a result of the influence of the AI tools, 18 students with a mean score of 35.44 had moderate level of engagement in their course as a result of the influence of the AI tools, 62 students with a mean score of 46.20 were very much engaged in their course as a result of the influence of the AI tools and 118 students with a mean score of 58.46 were extremely

engaged in their course as a result of the influence of the AI tools. It can further be gathered from the table that majority of the sample were engaged in their course as a result of the influence of the AI tools seen by the mean scores for the majority group which is higher than the total mean score representing the general average engagement level.

The table further shows as well shows that the computed $F(3, 200) = 322.30$ $P < .05$, i.e. $p = .000$, i.e. $p = .000$ is less than 0.05 and this is statistically significant at the chosen alpha level of 0.05. Therefore, the null hypothesis of no significant difference in the engagement level of students based on the influence of Artificial Intelligence tools is rejected and the alternate accepted. This indicates that there is a significant difference between the engagement level of students that found their course a bit engaging, with those that found it moderately engaging, with those that found it very much engaging and those that found it extremely engaging based on the influence of educational tools that are AI based.

Research Question 2; What is the influence of age and gender on the engagement level of students based on the influence of Artificial Intelligence tools

Table 2. Mean and SD Analysis of the influence of age and gender on the engagement level of students based on the influence of Artificial Intelligence tools

| Gender | Age | Mean | Std. Deviation | N |
|--------|---------------|---------|----------------|-----|
| Male | Below 20yrs | 58.5000 | 4.94975 | 2 |
| | 21-25yrs | 51.4872 | 11.68641 | 39 |
| | 26-30yrs | 51.1875 | 11.55981 | 16 |
| | 31years above | 47.0000 | . | 1 |
| | Total | 51.5690 | 11.34640 | 58 |
| Female | 21-25yrs | 51.5877 | 8.47882 | 114 |
| | 26-30yrs | 52.6000 | 10.91851 | 30 |
| | 31years above | 56.5000 | .70711 | 2 |
| | Total | 51.8630 | 8.96324 | 146 |
| Total | Below 20yrs | 58.5000 | 4.94975 | 2 |
| | 21-25yrs | 51.5621 | 9.35895 | 153 |
| | 26-30yrs | 52.1087 | 11.03777 | 46 |
| | 31years above | 53.3333 | 5.50757 | 3 |
| | Total | 51.7794 | 9.67223 | 204 |

It can be observed from table 2 that male had an engagement mean score of 51.56 while female had an engagement score of 51.86. This shows that the AI educational influence was more on the engagement level for male students who had a higher mean score than female. The table also shows that students below 20yrs (58.500) had the highest engagement scores, followed by students 31yrs above (53.33), then students 26-30yrs (52.10) and then students between 21-25yrs (51.56). The table also reveals that AI educational influence was more on the engagement level for male students aged 20yrs below (58.50), followed by female students aged 30yrs above (56.50), then by female students aged 26-30 (52.60), then female students aged 21-25yrs (51.58), then male students 21-25yrs (51.48) then male students 26-30yrs (51.18) and then male students 31yrs above with an engagement mean score of 47.00.

Hypothesis 2; There is no significant influence of age and gender in the engagement level of students based on the influence of Artificial Intelligence tools

Table 3. Two-way ANOVA Analysis of the significant influence of age and gender in the engagement level of students based on the influence of Artificial Intelligence tools.

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|-----------------|-------------------------|-----|-------------|---------|------|---------------------|
| Corrected Model | 191.070 ^a | 6 | 31.845 | .334 | .919 | .010 |
| Intercept | 62757.191 | 1 | 62757.191 | 657.615 | .000 | .769 |
| Gender | 74.398 | 1 | 74.398 | .780 | .378 | .004 |
| Age | 141.872 | 3 | 47.291 | .496 | .686 | .007 |
| Gender * Age | 66.944 | 2 | 33.472 | .351 | .705 | .004 |
| Error | 18800.004 | 197 | 95.431 | | | |
| Total | 565937.000 | 204 | | | | |
| Corrected Total | 18991.074 | 203 | | | | |

The table 3 shows that gender (male or female) had no significant influence on the engagement level of the respondent as $p = .378 > .05$. Also, age (below 20yrs, 21 -25yrs, 26-30, 30yrs above) had no significant influence according to the univariate test as $F(3, 197) = .496$ $P > .05$, i.e. $p = .686$, i.e. $p = .686$. The table reveals the interactional influence of age and gender on the engagement level of the respondents is statistically, not significant as $F(2, 197) = .351$ $P > .05$, i.e. $p = .705$, i.e. $p = .705$. This implies that the difference in the engagement scores of male and female students aged 21-25yrs, 26-30 and 30yrs above, statistically is not significant as the univariate test shows a no significant difference $F(2, 197) = .351$ $P > .05$, i.e. $p = .705$, i.e. $p = .705$.

Discussion of Findings

The statistical analysis, denoted by the computed F statistic ($F = 322.30$, $p < 0.05$), signifies a significant difference in the engagement levels of students influenced by Artificial Intelligence (AI) tools in a computer in education course. This implies a rejection of the null hypothesis, indicating that there are substantial disparities in engagement across groups exposed to AI-based educational tools. The acceptance of the alternative hypothesis suggests that the degree of engagement varies significantly among students who perceive the course as a bit engaging, moderately engaging, very much engaging, and extremely engaging based on AI influence. This findings in in alignment with previous findings that showed that AI tools impacts students' engagement (Baskara 2023; Chen et al., 2010; Diwanji et al., 2018; 2019; Lin & Mubarok, 2021; Tangkittipon et al., 2020 ; Ebadi & Amini, 2022; Kim et al.,2019; 2020; Kuhail et al., 2022; Huang et al., 2022; Kohnke, 2022; Plantak Vukovac et al., 2021; Robinson & Hullinger, 2008).

This result implies that students' interaction with these AI tools in the course facilitate personalized learning experiences, tailoring content delivery to individual student needs. The adaptability of AI-powered educational tools ensures that students receive a customized learning journey, potentially contributing to heightened engagement, particularly for those who find the course extremely engaging. Adaptive assessment strategies, another key aspect of AI tools, provide tailored evaluations and real-time feedback. Students who find the course extremely engaging may have benefit from assessments dynamically adjusted to their performance, through their interactions with some of these AI tools enhancing the learning process and maintaining a high level of engagement. Higher education's student's use of intelligent content recommendations based on AI algorithms could also have ensured that students

receive relevant materials aligning with their interests. This personalized approach contributes to an extremely engaging learning experience for students who value content relevance and applicability.

Furthermore, Students use of AI tools could have influenced efficient time management, facilitated by AI tools, boredom or frustration may have been prevented by ensuring students' progress through the material at an optimal pace. This may be a significant factor contributing to sustained engagement, particularly among students who find the course extremely engaging.

The availability and accessibility of diverse multimodal learning resources, including videos and interactive quizzes, caters to different learning styles. Extremely engaging content that leverage AI for such resources provide a rich and varied learning experience, appealing to a broad range of students. A positive perception of AI integration, effective communication of AI benefits, and the alignment of course content with career aspirations during the course could also be a factor contributing to the overall engagement of students. The course being a course on computer in education could have successfully communicate the purpose and advantages of AI tools may have instilled confidence and interest, particularly among those who find the course extremely engaging.

The statistically significant difference in engagement levels based on the influence of AI tools in a computer in education course underscores the positive impact of AI on the learning experience. This provides valuable insights for educators and institutions seeking to leverage AI to enhance educational experiences and promote high levels of student engagement in computer in education courses and other courses. The analysis of the data presented in Table 3 reveals that neither gender nor age significantly influences the engagement levels based on the usage of Artificial Intelligence (AI) tools in learning. The p-values for both gender ($p = 0.378$) and age ($p = 0.686$) exceed the customary threshold of 0.05, indicating a lack of statistical significance. Furthermore, the interactional influence of age and gender on engagement levels is also deemed statistically non-significant ($p = 0.705$).

Several factors may contribute to this observed lack of significance. Firstly, in terms of gender, the absence of a significant influence suggests that the engagement levels based on AI tool usage are comparable between male and female students. This might be indicative of a more inclusive and gender-neutral approach to incorporating AI tools into the learning environment. Both male and female students may share similar levels of comfort, familiarity, and receptiveness to AI tools, contributing to a balanced engagement experience. Similarly, the non-significant influence of age on engagement levels suggests that the impact of AI tool usage is consistent across different age groups. This could be attributed to a universal appeal or effectiveness of AI tools in facilitating learning experiences that resonate with students from various age brackets. It may also indicate that the learning advantages provided by AI tools are not skewed towards specific age demographics.

The lack of significance in the interactional influence of age and gender implies that the engagement scores of male and female students aged 21-25, 26-30, and 30 and above do not significantly differ. This suggests that the impact of AI tools on engagement is uniform across gender and age groups, emphasizing a holistic and inclusive integration of these tools in the learning process. The non-significant results might also reflect equal access and exposure to AI tools among all demographics. If students, regardless of gender or age, have comparable opportunities to interact with AI tools, it can lead to a balanced and equitable engagement experience. The AI tools may have a neutral impact that transcends demographic factors, focusing on providing a valuable and engaging learning experience to all students regardless of gender or age.

The non-significant influence of gender and age on engagement levels based on AI tool usage underscores the potential universality and inclusivity of these tools in the learning environment. These

insights provide valuable considerations for educators and instructional technologists, highlighting the importance of designing AI-integrated learning experiences that cater to a diverse student population. It encourages a holistic and inclusive approach to the adoption of AI tools in education, ensuring equitable engagement for students across various demographics.

4. RECOMMENDATION AND CONCLUSION

Based on findings, it is recommended that educators should incorporate AI-driven educational tools into the curriculum to enhance student engagement. These tools offer personalized and adaptive learning experiences that cater to individual student needs and preferences, ultimately leading to improved learning outcomes. It is also recommended that educational institutions should offer professional development and training sessions for educators to familiarize them with AI technologies and how to effectively integrate them into teaching and assessment practices. This will ensure that educators are equipped with the necessary skills to leverage AI tools to their fullest potential in the classroom.

Furthermore, it is recommended that educational institutions and educators should emphasize the inclusivity of AI tools by showcasing their ability to cater to diverse student populations, regardless of gender or age. Educators should leverage AI tools as a means of providing universal access to high-quality educational resources and experiences for all students. Educational agencies and bodies should foster a culture of experimentation and innovation within educational institutions by encouraging educators to explore new teaching methods and technologies, including AI-driven tools. It is further recommended that they provide support and resources to facilitate experimentation and help educators integrate AI tools effectively into their teaching practices.

In conclusion, the statistically significant difference in engagement levels based on the influence of AI tools in a computer in education course underscores the positive impact of AI on the learning experience. The personalized, adaptive, and interactive features of AI-driven educational tools contribute to an extremely engaging and effective learning environment for students. These findings provide valuable insights for educators and institutions seeking to leverage AI to enhance educational experiences and promote high levels of student engagement in computer in education courses. Also, the non-significant influence of gender and age on engagement levels based on AI tool usage underscores the potential universality and inclusivity of these tools in the learning environment. These insights provide valuable considerations for educators and instructional technologists, highlighting the importance of designing AI-integrated learning experiences that cater to a diverse student population. It encourages a holistic and inclusive approach to the adoption of AI tools in education, ensuring equitable engagement for students across various demographics.

It is suggested that further studies be carried out in the form of a longitudinal study that would investigate the long-term effects of AI-driven educational tools on student learning outcomes. Also studies can be carried out to investigate the impact of teacher training and professional development programs on the successful integration of AI-driven educational tools in the classroom. This study could assess how well-prepared educators feel to use AI tools effectively and the extent to which their training influences student engagement and learning outcomes

5. REFERENCES

Abbas, N., Whitfield, J., Atwell, E., Bowman, H., Pickard T. & Walker A. (2022) Online chat and chatbots to enhance mature student engagement in higher education, *International Journal of Lifelong Education*, 41(3), 308-326, <https://doi.org/10.1080/02601370.2022.2066213>.

- Ahmad, S. F., Rahmat, Mohd. K., Mubarik, M. S., Alam, M. M., & Hyder, S. I. (2021). Artificial Intelligence and Its Role in Education. *Sustainability*, 13(22), 12902. <https://doi.org/10.3390/su132212902>
- Alharbi, W. (2023). AI in the Foreign Language Classroom: A Pedagogical Overview of Automated Writing Assistance Tools. *Education Research International*, 2023, e4253331. <https://doi.org/10.1155/2023/4253331>
- AL-Tkhayneh, K. M., Alghazo, E. M., & None Dina Tahat. (2023). The Advantages and Disadvantages of Using Artificial Intelligence in Education. *Journal of Educational and Social Research*, 13(4), 105–105. <https://doi.org/10.36941/jesr-2023-0094>
- Ahmad M.N, Abdallah S.A, Abbasi S.A, Abdallah A.M. (2023). Student Perspectives on the Integration of Artificial Intelligence into Healthcare Services. *Digital health* 9, 20552076231174095. <https://doi.org/10.1177/20552076231174095>
- Almaraz-López C, Almaraz-Menéndez F, López-Esteban C. (2023). Comparative Study of the Attitudes and Perceptions of University Students in Business Administration and Management and in Education toward Artificial Intelligence. *Education Sciences*. 13(6):609. <https://doi.org/10.3390/educsci13060609>
- Al Saad M. M., Shehadeh A., Alanazi S., Alenezi M., Abu al\ez A., Eid H., Alfaouri M. S., Aldawsari S. & Alenezi R. (2022). Medical Students' Knowledge and Attitude Towards Artificial Intelligence: An Online Survey. *Open Public Health Journal*. 15, e187494452203290. <https://doi.org/10.2174/18749445-v15-e2203290>.
- Amir, R., Saleha, A., Zalizan Mohd Jelas, & Abdul Razaq Ahmad. (2014). Students' Engagement by Age and Gender: A Cross-Sectional Study in Malaysia. *Middle-East Journal of Scientific Research* , 21 (10): 1886-1892.
- Buabbas, A. J., Miskin, B., Alnaqi, A. A., Ayed, A. K., Shehab, A. A., Syed-Abdul, S., & Uddin, M. (2023, May 1). Investigating Students' Perceptions towards Artificial Intelligence in Medical Education. *Healthcare*, 11(9), 1298. <https://doi.org/10.3390/healthcare11091298>
- Bu, Q. (2022). Ethical Risks in Integrating Artificial Intelligence into Education and Potential Countermeasures. *Science Insights*, 41, (1), 561-566. <https://doi.org/10.15354/si.22.re067>
- Bowden, J. L.-H., Tickle, L., & Naumann, K. (2021). The four pillars of tertiary student engagement and success: A holistic measurement approach. *Studies in Higher Education*, 46(6), 1207–1224. <https://doi.org/10.1080/03075079.2019.1672647>
- Baker, R., & Siemens, G. (2014). Educational Data Mining and Learning Analytics. In R. K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences*, Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9781139519526.016>
- Baskara R.F (2023). Chatbots and Flipped Learning: Enhancing Student Engagement and Learning Outcomes through Personalized Support and Collaboration. *International Journal of Recent Educational Research* 4(2)223-238. DOI: <https://doi.org/10.46245/ijorer.v4i2.326>
- Chen, P. D., Lambert, A. D., & Guidry, K. R. (2010). Engaging online learners: The impact of web-based learning technology on college student engagement. *Computers & Education*, 54(4), 1222–1232. <https://doi.org/10.1016/j.compedu.2009.11.008>
- Chapman, E., 2003. Alternative approaches to assessing student engagement rates. *Practical Assessment, Research & Evaluation*, 8(13).
- Chaudhry, I. S., Sarwary, S. A. M., El Refae, G. A., & Chabchoub, H. (2023). Time to revisit existing student's performance evaluation approach in higher education sector in a new era of ChatGPT — a case study. *Cogent Education*, 10(1), 2210461. <https://doi.org/10.1080/2331186X.2023.2210461>

- Chan, C.K.Y., & Hu, W.(2023). Students' voices on generative AI: perceptions, benefits, and challenges in higher education. *Int J Educ Technol High Educ* 20(43) <https://doi.org/10.1186/s41239-023-00411-8>
- Chiu, T. K., & Chai, C. S. (2020). Sustainable Curriculum Planning for Artificial Intelligence Education: A Self-Determination Theory perspective. *Sustainability*, 12(14),5568. <https://doi.org/10.3390/su12145568>
- Collaço, C. (2017). Increasing student engagement in higher education. *Journal of Higher Education Theory and Practice*, 17(4), 40–47. <https://articegateway.com/index.php/JHETP/article/view/1545>.
- Diwanji, P., Hinkelmann, K., & Witschel, H. F. (2018). Enhance classroom preparation for flipped classroom using AI and analytics. *ICEIS*, 477–483. <http://dx.doi.org/10.5220/0006807604770483>
- Dwivedi, A., Dwivedi, P., Bobek, S., & Zabukovšek, S. S. (2019). Factors affecting students' engagement with online content in blended learning. *Kybernetes*. <https://doi.org/10.1108/K-10-2018-0559>
- Ebadi, S., & Amini, A. (2022). Examining the roles of social presence and human-likeness on Iranian EFL learners' motivation using artificial intelligence technology: A case of CSIEC chatbot. *Interactive Learning Environments*, 1–19. <https://doi.org/10.1080/10494820.2022.2096638>
- Essien, A., Chukwukelu, G., & Essien, V. (2020). Opportunities and challenges of adopting artificial intelligence for learning and teaching in higher education. In *Fostering communication and learning with underutilized technologies in higher education*, pp. 67–78. IGI Global. <https://doi.org/10.4018/978-1-7998-4846-2.ch005>
- Eteng-Uket, S, & Effiom U. E. (2023). "Analysis Of Higher Education Student's Attitude Towards AI-Based Educational Intervention for Learning. Paper presented at the 25th Annual Conference of Association Education Researchers and Evaluators of Nigeria.
- Flores-Vivar, J.-M., & García-Peñalvo, F.-J. (2023). Reflections on the ethics, potential, and challenges of artificial intelligence in the framework of quality education (SDG4). *Comunicar*, 31(74), 37–47. <https://doi.org/10.3916/C74-2023-03>.
- Gherheş, V., & Obrad, C. (2018). Technical and Humanities Students' Perspectives on the Development and Sustainability of Artificial Intelligence (AI). *Sustainability*, 10(9), 3066. <https://doi.org/10.3390/su10093066>
- Haq, I. (2022). Ensuring Quality Education for Out-of-School-Children using AI Based ROFSET Framework. *International Journal of Emerging Multidisciplinaries: Computer Science & Artificial Intelligence*, 1(1), 18–29. <https://doi.org/10.54938/ijemdcasai.2022.01.1.77>
- Hu, M., & Li, H. (2017). Student engagement in online learning: A review. *2017 international Symposium on educational technology (ISET)*. <https://doi.org/10.1109/iset.2017.17>
- Huang, W., Hew, K. F., & Fryer, L. K. (2022). Chatbots for language learning—Are they really useful? A systematic review of chatbot-supported language learning. *Journal of Computer Assisted Learning*, 38(1), 237–257. <https://doi.org/10.1111/jcal.12610>
- Jokhan, A., Chand, A. A., Singh, V., & Mamun, K. A. (2022). Increased Digital Resource Consumption in Higher Educational Institutions and the Artificial Intelligence Role in Informing Decisions Related to Student Performance. *Sustainability*, 14(4), 2377. <https://doi.org/10.3390/su14042377>.
- Kim, N.-Y., Cha, Y., & Kim, H.-S. (2019). Future English learning: Chatbots and artificial intelligence. *Multimedia-Assisted Language Learning*, 22(3), 32–53.
- Kohnke, L. (2022). A qualitative exploration of student perspectives of chatbot use during emergency remote teaching. *International Journal of Mobile Learning and Organisation*, 16(4), 475–488.

- Kuhail, M. A., Alturki, N., Alramlawi, S., & Alhejori, K. (2022). Interacting with educational chatbots: A systematic review. *Education and Information Technologies, Educ Inf Technol* 28, 973–1018 (2023). <https://doi.org/10.1007/s10639-022-11177-3>
- Kahu, E. R., Picton, C., & Nelson, K. (2019). Pathways to engagement: A longitudinal study of the first-year student experience in the educational interface. *Higher Education, 79*(4), 657–673. <https://doi.org/10.1007/s10734-019-00429-w>
- Keleş, P. U., & Aydın, S. (2021). University Students' Perceptions About Artificial Intelligence. *Shanlax International Journal of Education, 9*(S1), 212–220. <https://doi.org/10.34293/education.v9is1-may.4014>
- Khater, A. S., Zaaqoq, A. A., Wahdan, M. M., & Ashry, S. (2023). Knowledge and Attitude of Ain Shams University Medical Students towards Artificial Intelligence and its Application in Medical Education and Practice. *Educational Research and Innovation Journal, 3*(10), 29–42. <https://doi.org/10.21608/erji.2023.306718>
- Kabudi, T. M. (2022). Artificial Intelligence for Quality Education: Successes and Challenges for AI in Meeting SDG4. *Freedom and Social Inclusion in a Connected World, 347–362*. https://doi.org/10.1007/978-3-031-19429-0_21.
- Kim, S., Eun, J., Oh, C., Suh, B., & Lee, J. (2020). Bot in the bunch: Facilitating group chat discussion by improving efficiency and participation with a chatbot. *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, 1–13*. <https://doi.org/10.1145/3313831.3376785>
- Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI chatbots in education: Systematic literature review. *International Journal of Educational Technology in Higher Education, 20*(1), 1-17. <https://doi.org/10.1186/s41239-023-00426-1>
- Li, R., Lund, A., & Nordsteien, A. (2021). The link between flipped and active learning: A scoping review. *Teaching in Higher Education, 28*(8), 1–35. <https://doi.org/10.1080/13562517.2021.1943655>
- Lin, C.-J., & Mubarak, H. (2021). Learning analytics for investigating the mind map-guided AI chatbot approach in an EFL flipped speaking classroom. *Educational Technology & Society, 24*(4), 16–35.
- Mendoza, S.; SánchezAdame, L.M.; Urquiza-Yllescas, J.F.; González-Beltrán, B.A.; Decouchant, D. A (2022). Model to Develop Chatbots for Assisting the Teaching and Learning Process. *Sensors* 22, 5532. <https://doi.org/10.3390/s22155532>
- Makeleni, S., Mutongoza, B., & Linake, M. (2023). Language Education and Artificial Intelligence: An Exploration of Challenges Confronting Academics in Global South Universities. *Journal of Culture and Values in Education, 6*(2), 158-171. <https://doi.org/10.46303/jcve.2023.14>
- McCarthy, T., Rosenblum, L. P., Johnson, B. G., Dittel, J., & Kearns, D. M. (2016). An Artificial Intelligence Tutor: A Supplementary Tool for Teaching and Practicing Braille. *Journal Of Visual Impairment & Blindness, 110*(5), 309–322. <https://doi.org/10.1177/0145482X1611000503>
- Mousavi Baigi, S. F., Sarbaz, M., Ghaddaripouri, K., Ghaddaripouri, M., Mousavi, A. S., & Kimiafar, K. (2023). Attitudes, Knowledge, and Skills Towards Artificial Intelligence Among Healthcare Students: A Systematic Review. *Health Science Reports, 6*(3), e1138. <https://doi.org/10.1002/hsr2.1138>
- Nwankwo, O.C (2016). *A Practical Guide to Research Writing*. M & J Grand Orbit and Communication Ltd. Port Harcourt.
- Pradana, M., Elisa, H. P., & Syarifuddin, S. (2023). Discussing ChatGPT in education: A literature review and bibliometric analysis. *Cogent Education, 10*(2), 2243134. <https://doi.org/10.1080/2331186X.2023.2243134>

- Pérez, J., Daradoumis, T., & Puig, J. (2020). Rediscovering the use of chatbots in education: A Systematic literature review. *Computational Applications in Engineering Education*, 28, 1–7.
- Robinson, C., & Hullinger, H. (2008). New benchmarks in higher education: student engagement in online learning. *Journal of Education for Business*, 84(2), 101–109. <https://doi.org/10.3200/JOEB.84.2.101-109>
- Shawar, B.A.; Atwell, E. (2007) Chatbots: Are They Really Useful? *Ldv Forum* 22, 29–49
- Studente, S., Ellis, S., & Garivaldis, S. (2020). Exploring the potential of chatbots in higher education: a preliminary study. *International Journal of Educational and Pedagogical Sciences*, 14(9), 768–771. <https://publications.waset.org/10011432/exploring-the-potential-of-chatbots-in-higher-education-a-preliminary-study>
- Trowler, V. (2010). Student engagement literature review. Higher Education Academy).
- Tangkittipon, P., Sawatdirat, A., Lakkhanawannakun, P., & Noyunsan, C. (2020). Facilitating a flipped classroom using chatbot: A conceptual model. *Engineering Access*, 6(2), 103–107. <http://doi.org/10.14456/mijet.2020.20>
- Utami, S. P. T., Andayani, A., Winarni, R., & Sumarwati, S. (2023). Utilization of artificial intelligence technology in an academic writing class: How do Indonesian students perceive? *Contemporary Educational Technology*, 15(4), ep450. <https://doi.org/10.30935/cedtech/13419>
- Vallis, C., Wilson, S., Gozman, D., & Buchanan, J. (2023, June 6). Student Perceptions of AI-Generated Avatars in Teaching Business Ethics: We Might not be Impressed. *Postdigital Science and Education*. <https://doi.org/10.1007/s42438-023-00407-7>
- Wenge, M. (2021). Artificial intelligence-based real-time communication and ai-multimedia services in higher education. *Journal of Multiple-Valued Logic and Soft Computing*, 36(1), 231–248.
- Wogu, I. A. P., Misra, S., Olu-Owolabi, E. F., Assibong, P. A., & Udoh, O. D. (2018). Artificial Intelligence, Artificial Teachers, and the Fate of Learners in the 21st Century Education Sector: Implications for Theory and Practice. *International Journal of Pure and Applied Mathematics*, 119(16), 2245–2259
- Yuskovych-Zhukovska, V., Poplavska, T., Diachenko, O., Mishenina, T., Topolnyk, Y., & Gurevych, R. (2022, March 23). Application of Artificial Intelligence in Education. Problems and Opportunities for Sustainable Development. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience*, 13(1Sup1), 339–356. <https://doi.org/10.18662/brain/13.1sup1/322>