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EFFECTS OF ARTIFICIAL INTELLIGENCE ON SENIOR SECONDARY TWO CIVIC EDUCATION STUDENTS' MOTIVATION IN JOS-NORTH LOCAL GOVDERNMENT AREA, PLATEAU STATE, NIGERIA

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ABSTRACT

The study investigated the effects of artificial intelligence (AI) on senior secondary two (SS II) civic education students' motivation in Plateau State, Nigeria. Two objectives were identified, two research questions were answered, and two hypotheses were tested at 0.05 level of significance. The study employed a quasi-experimental research design, specifically the pre-test-post-test non-equivalent control group design. The population of the study was 1,779 SS II students out of which a sample of 75 students was drawn from two schools. The instrument used for data collection was a Civic Education Motivation Questionnaire (CEMQ), designed by the researchers. The instrument was rated on the five-point Likert scale. Mean and standard deviation were used to analyze data for answering the research questions. Analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The study found, among others, that the use of artificial intelligence in teaching civic education improved the motivation of SS II students in the experimental group in Jos-North Local Government Area, Plateau State, Nigeria, male students exhibited slightly higher motivation level than their female counterparts in civic education in the experimental group, and a significant difference existed in the mean motivation scores of SS II civic education students in the experimental and control groups. The study recommended among other things, that by engaging students with interactive AI tools, their understanding of civic concepts can be significantly enhanced, and adequate provision of AI tools by senior secondary schools will simulate real-world civic scenarios, provide personalized learning experiences, and adapt to individual learning styles.

Key words: Artificial intelligence, Gender, Motivation

INTRODUCTION

In an age of growing civic unrest such as in Nigeria, there is need to equip people deliberately and concertedly with necessary civic knowledge, values and skills that will empower them to have concerns for public life. More so, there is the need for citizens to fully take part and contribute positively to the political process. Weinschenk and Dawes (2021) affirm that to achieve political development, it is imperative that citizens take part in government's decision-making processes. This is apparently the concern of Civic Education.

Civic Education is a vital subject within the senior secondary curriculum in Nigeria. It aims to nurture students' understanding of citizenship, democracy, human rights, and the responsibilities of responsible citizens in society. This subject equips students with knowledge about the Nigerian political system, civic values, and their duties in their communities and the nation. However, there is poor achievement in Civic Education at the senior secondary school level. This can be attributed to a range of factors, including inadequate implementation, a shortage of qualified teachers, insufficient instructional materials, limited access to library facilities, inadequate government support, and ineffective teaching methods and low student engagement also contribute to this challenge. (WAEC, 2019)

Civic Education in Nigerian secondary schools, particularly in Senior Secondary Two (SS2) within Jos North Local Government Area of Plateau State, serves as a critical pillar for imparting civic knowledge, values, and skills to students. Despite its incorporation into the curriculum in 2007, the intended impact of Civic Education remains unattained. This shortfall can be attributed to inadequate implementation, primarily due to the prevalence of teacher-centred instructional methods. Traditional pedagogical approaches have proven ineffective in engaging students, leading to a decline in motivation and subpar academic performance in the subject, hence the need for another teaching strategy such as artificial intelligence.

Artificial intelligence (AI) refers to the emulation of human intelligence through software-coded heuristics, representing a rapidly advancing technology aimed at replicating human cognitive functions such as learning, reasoning, and perception. This multifaceted field encompasses various subfields, including machine learning (ML) and deep learning, where ML allows automated learning from new data without explicit programming and deep learning enables the automatic absorption of vast amounts of unstructured data. AI has found widespread applications across industries, including healthcare for diagnostics and patient classification, finance for detecting unusual activity and enhancing trading, and manufacturing for predictive maintenance and supply chain management.

AIM AND OBJECTIVES OF THE STUDY

The aim of the study is to determine the effects of artificial intelligence on senior secondary two (SS II) civic education students' motivation in Jos-North Local Government Area, Plateau State, Nigeria. The objectives of the study are to:

1. determine the pre-test and post-test motivation scores of SS II civic education students in the experimental and control groups.
2. find out the post-test motivation scores of SS II civic education students in the experimental groups based on gender.

RESEARCH QUESTIONS

The following research questions guide the study:

1. What are the the pre-test and post-test motivation scores of SS II civic education students in the experimental and control groups?
2. What are the post-test motivation scores of SS II civic education students in the experimental group based on gender?

HYPOTHESES

The following hypotheses are stated and shall be tested at 0.05 level of significance:

1. There is no significant difference in the pre-test and post-test motivation mean scores of SS II civic education students in the experimental and control groups.
2. There is no significant difference in the post-test motivation mean scores of SS II civic education students in the experimental group based on gender.

LITERATURE REVIEW

Citizenship Education

Civic education is the kind of education that prepares citizens for citizenship, equipping them with whatever is needed to be good and responsible citizens and contribute to good governance. A formative endeavour inculcates in citizens the skill, knowledge, and consciousness needed to exhibit positive and participatory behaviours in their country (Nwanna & Odoh, 2013). The knowledge of one's rights, roles, and responsibilities and consciousness of both the good and bad in one's environment as a citizen of a country guarantees good and honourable behaviour. Without such disposition, society is prone to slip back into the state of nature - a state without a government, a state of war of all against all, a state of anarchy and doom, a state of brutality and inhumanity. It is also the mission of education to enlighten and liberate citizens from such a state.

As civic education contributes to political stability, a lack of proper education is equal to deformation and contributes to disorder and anarchy. Hobbes in Dumas & Anderson (2014) canvassed and advocated for the transition to a civil state and for civil science, without which political stability becomes impossible. When people are not properly educated about civics, that is, their real rights, roles, and responsibilities to their nation, unfortunately, they will become unconsciously ignorant. Dumas and Anderson regarded this as a dangerous position where one sees the right way of doing something yet cannot do it, sees the wrong way as the right way, at times does not know what one should know, etc. The manifestation of such ignorance is abysmal and destructive. This is absolutely the root of the instability in different dimensions.

There are many different concepts of civic education, as there are many scholars in the field of civic education. Scholars have conceptualised civic education in different ways. Civic education has been most often considered a special school subject; in which case it includes several lessons taught by a teacher. However, it can also be a group of activities that students experience or a government policy (Kennedy & Archambault, 2012). Before we go further, we must understand that the entire educational process of any given nation in the world is centred on building citizens with the right knowledge, values, and skills for the state. This is to say that the process of education embodies certain aspects of civics, according to Cohen (2014), which include the impartation of knowledge and values, which often lead to the inculcation of certain attributes. Based on the type of behaviour that the products of an educational system imbibe, there are two types of citizens: individualistic and communal. However, having individualistic or communal citizens depends on the kind of knowledge and values inculcated in the citizens and the educational policies of the concerned state. The inculcation of knowledge and values that focus on the way citizens should behave in society, thus stressing the relevance of such individual conduct, will create individualistic citizens.

Concept of Artificial Intelligence

The realm of artificial intelligence (AI) in society is vibrant, presenting a blend of opportunities and challenges. The quest to define AI traces its roots to historical debates but gained substantial insights through pivotal contributions in the 1950s by Turing and McCarthy, who explored machine-human dialogue and proposed comprehensive definitions focusing on learning and intelligence (Russell & Norvig, 2016; Popenici, & Kerr, 2017). While traditional AI definitions concentrated on cognitive aspects, contemporary literature now characterizes AI as systems engaging in human-like processes, including learning, adaptation, and complex data processing. This shift in perspective has profoundly impacted various sectors, especially higher education.

The accelerated progress of AI is reshaping higher education profoundly. For instance, Deakin University's integration of IBM's Watson supercomputer exemplifies its transformative impact on service quality and operational efficiency (Moles & Wishart, 2016). Notably, 'machine learning' within AI showcases prowess in prediction and pattern identification (Schölkopf, 2015). In education, AI merges as a transformative force, reshaping methodologies and tools, from Siri in smart-phones to adaptive teaching strategies (Kelley & Knowles, 2016). Its integration in senior secondary education emphasizes placing students at the core of learning advancements, unlocking novel dimensions, and catering to diverse learning needs (Programas de las Naciones Unidas para el Desarrollo, 2015; Pandarinath, Nuyujukian, Blabe, Sorice, Saab, Willett, & Henderson, 2017) However, challenges persist in optimizing AI techniques for varied learning environments and discerning individual learning styles (Schleicher, 2012). Despite these challenges, the potential of artificial intelligence (AI) in enhancing classroom experiences and offering tailored instruction remains promising (Pandarinath et al., 2017). The Council of Europe underscores the imperative to embed human rights principles in AI applications for education (Council of Europe in Andrushchenko, Polishchuk, Bashta, Dutko, & Koval, 2021). Yet, defining AI itself remains challenging, with varied interpretations. While the Turing Institute emphasizes AI systems executing cognitive functions, UNESCO defines AI as machine-based systems influencing environments based on human-defined objectives (Adams & Wannamaker, 2022; UNESCO, 2021).

The evolution of AI from symbolic to machine learning has been pivotal. However, AI grapples with challenges such as overselling, biases, and unrealized expectations, evident during the COVID-19 pandemic (García, Batanero, Cerero, & León, 2023). The anthropomorphism of AI terms contributes to misconceptions about its capabilities, demanding a more holistic understanding

(Rehak, 2021; Eynon & Young, 2020). Societal impacts encompass employment dynamics, with AI influencing labour market polarization and creating new job categories (Frey & Osborne, 2017). Yet, the full extent of AI impact on employment remains intricate.

Concept of Motivation

Motivation is the reason or reasons why a person behaves or acts in a certain way. Generally, a person's desire to do something fuelled by their motivation. This is a crucial element in attaining goals in one's life e. These goals can be personal, competitive, and based on society. A lack of motivation can lead to depression and other mental illnesses. Motivation is a multifaceted psychological concept referring to the internal or external factors that drive individuals to initiate, sustain, and direct their behaviour toward specific goals or outcomes. It involves the forces that energize human behaviour, influencing choices, effort, and persistence in goal achievement. Motivation can stem from personal needs, desires, values, external rewards, or societal expectations.

Motivation in education plays a pivotal role in shaping a learner's engagement and academic success. Motivation serves as a catalyst, driving students to focus on goals and fostering resilience, initiative, and curiosity (Yarborough & Fedesco, 2020). High motivation is associated with sustained attention and is vital for prolonged learning periods, showcasing the ability to navigate the learning journey autonomously. This force, inherent in human behaviour, is multifaceted, encompassing intrinsic and extrinsic motivations. Intrinsic motivations arise from personal satisfaction, while extrinsic motivations emanate from external stimuli like rewards or recognition (Lin, Chai, Jong, Dai, Guo, & Jian-jun, 2021). The authors held that in order to initiate, direct, and maintain goal-oriented behaviours across several dimensions, these motivations converge, requiring activation, persistence, and intensity to meet desired outcomes..

METHODOLOGY

The study employed the quasi-experimental design, specifically a non-randomized pretest-posttest non-equivalent control group design. DeRue, Nahrgang, Hollenbeck, & Workman (2012) explained that quasi-experiment estimates the causal impact of an intervention on a target population without random assignment. This design involves taking measurements both before and after treatment. The study's population included 1,779 SS II students (879 males and 900 females) enrolled in Civic Education for the 2022/2023 academic year across 24 government senior secondary schools in Jos North Local Government Area. The sample consisted of 75 students: 40 from Federal Government College (27 males and 13 females), which formed the experimental group, and 35 from Government College Jos (20 males and 15 females), which formed the control group. A multistage sampling technique was employed. Simple random sampling selected the educational area office in Jos North, Plateau State. Purposive sampling identified two government-owned, co-educational schools based on criteria such as being government-owned, offering day and boarding facilities, providing Civic Education with qualified teachers (minimum B.Sc. (Ed.) in Political Science or related discipline), and having a history of presenting candidates for Civic Education in WAEC and NECO examinations for at least three years. The instrument "Civic Education Motivation Questionnaire (CEMQ)" was used for data collection. Mean and standard deviation were used to analyze data for answering the research questions. Analysis of Covariance (ANCOVA) was used to analyze data for testing the hypotheses at 0.05 level of significance. The decision rule for the research questions was, a mean score of 2.50 and above was considered as "Agree," while a mean score of less than 2.50 was considered as "Disagree." For the hypotheses, decision rule for ANCOVA was as follows: if $p > 0.05$, the hypothesis was upheld, and if $p < 0.05$, the hypothesis was rejected.

PRESENTATION AND ANALYSIS OF RESULTS

Research Question One

What are the pre-test and post-test motivation scores of SS II civic education students in the experimental and control groups?

Research Question One is answered using the data presented in Table 1

Table 1

Pre-test and Post-test Motivation Mean Scores of SS II Civic Education Students in the Experimental and Control Groups

Group		Pre-test		Post-test			
	N	Mean	SD	Mean	SD	$\bar{x}$G	$\bar{x}$G- difference
Experimental	40	52.90	6.42	92.93	8.62	40.03	34.06
Control	35	51.69	5.43	57.66	5.02	5.97	

Key $\bar{x}$G = Mean Gain $\bar{x}$G- difference = Mean Gain difference

Table 1 presents the pre-test and post-test motivation mean scores of SS II students in civic education in the experimental and control groups. From the result, in the experimental group the post-test mean score ($\bar{x}$ =92.93, SD = 8.62) is higher than the pre-test mean score ($\bar{x}$=52.90, SD =6.42) with a mean gain of 40.03, indicating that there is an increase in the motivation of students after treatment. As for the control group, the mean score is 51.69 with a standard deviation of 5.43 at the pre-test. However, in the post-test the mean score of students rouse to 57.66 with standard deviation of 5.02. The mean gain of 5.97 has been recorded in the control group, with a mean gain of 40.03 for experimental group. The mean gain difference 34.06 has been found in favour of the experimental group. This shows that in the experimental group, the use of artificial intelligence in teaching civic education improves the motivation of senior secondary two students in Jos-North Local Government Area, Plateau State, Nigeria

Research Question Two

What are the post-test motivation scores of SS II civic education students in the experimental group based on gender?

Data for Research Question Two are presented in Table 2.

Table 2

Post-test Motivation Mean Scores of Civic Education Students in the Experimental Group Based on Gender

Group	Gender	N	$\bar{x}$	SD	$\bar{x}$- difference
Experimental	Male	13	93.62	9.38	1.03
	Female	27	92.59	8.39	

Table 2 presents the post-test motivation mean scores of male and female students in civic education within the experimental group. It shows that male students had a post-test motivation mean score of 93.62 with a standard deviation of 9.38, while female students had a slightly lower mean score of 92.59 with a standard deviation of 8.39. This results in a mean difference of 1.03 in favour of male students. This finding indicates that male students exhibited slightly higher motivation level than their female counterparts in civic education when taught using artificial intelligence.

Hypothesis One

There is no significant difference in the pre-test and post-test motivation mean scores of SS II civic education students in the experimental and control groups.

Hypothesis One is tested using the data presented in Table 3

Table 3

ANCOVA Results of Pre-test and Post-test Motivation Mean Scores of SS II Civic Education Students in the Experimental and Control Groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	23320.499[a]	2	11660.250	230.126	.000	.865
Intercept	3967.927	1	3967.927	78.311	.000	.521
Covariate	102.493	1	102.493	2.023	.159	.027
Group	22662.832	1	22662.832	447.272	.000	.861
Error	3648.167	72	50.669			
Total	465505.000	75				
Corrected Total	26968.667	74				

a. R Squared =.865(Adjusted R Squared =.861)

In Table 3 an Analysis of Covariance (ANCOVA) was conducted to test the impact of artificial intelligence on the motivation of SS II students. The analysis compared the motivation mean scores of students in the experimental and control groups. The results, as presented in Table 3, indicate a significant difference between the groups, with $F(1,72) = 447.27$ and $p < 0.05$. This shows that the null hypothesis was rejected, suggesting that artificial intelligence has a significant effect on students' motivation in civic education. Additionally, the adjusted R squared value of .861 indicates that 86.1% of the variation in students' motivation can be explained by the variation in treatment, while the remaining variation is attributed to other factors not considered in the study. This finding highlights the positive impact of artificial intelligence on increasing students' motivation in civic education in Plateau State.

Hypothesis Two

There is no significant difference in the post-test motivation mean scores of SS II civic education students in the experimental group based on gender.

Table 4 presents the results for Hypothesis Two

Table 4

ANCOVA Results on Post-test Motivation Mean Scores of SS II Civic Education Students in the Experimental Group based on Gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	9.493[a]	2	4.746	.061	.941	.003
Intercept	4425.774	1	4425.774	56.755	.000	.605
Pre-motivation	.313	1	.313	.004	.950	.000
Gender	9.358	1	9.358	.120	.731	.003
Error	2885.282	37	77.981			
Total	348297.000	40				
Corrected Total	2894.775	39				

a. R Squared =. 003(Adjusted R Squared =-.051)

In Table 4, one-way analysis of covariance (ANCOVA) was conducted on the motivation scores of students in civic education, considering gender as the independent variable. The results, as shown in the table, indicate that the effect of gender is not statistically significant at the 0.05 level. Specifically, the main effect of gender yielded $F(1,37) = 0.120$, with a p-value greater than 0.05 ($p = 0.731$). This suggests that the motivation mean score of male students did not significantly differ from that of female students in civic education. Therefore, there is no significant difference in the motivation levels between male and female students in civic education.

FINDINGS

The analysis of the results has yielded the following findings:

1. In the experimental group, the use of artificial intelligence in teaching civic education improves the motivation of SS II students in Jos-North Local Government Area, Plateau State, Nigeria.
2. Male students exhibit slightly higher motivation level than their female counterparts in civic education in the experimental group when taught using artificial intelligence.
3. There is a significant difference in the mean motivation scores of SS II civic education students in the experimental and control groups. The null hypothesis is therefore, rejected, suggesting that artificial intelligence has a significant effect on students' motivation in civic education.
4. The effect of gender is not statistically significant at the 0.05 level, suggesting that there is no significant difference in the motivation levels of male and female students in civic education.

DISCUSSION OF FINDINGS

The results in Table 1 indicate a significant increase in student motivation in the experimental group following the AI treatment, as evidenced by the higher post-test mean score compared to the pre-test mean score. In contrast, the control group also experienced an increase in motivation, although to a lesser extent. This suggests that while traditional teaching methods can also enhance motivation, the use of AI in teaching civic education has a more pronounced effect on students' motivation. Furthermore, the findings show a significant mean gain difference between the experimental and control groups, favouring the experimental group. This highlights the effectiveness of AI integration in improving students' motivation in civic education. These results are consistent with previous studies by Al-Mansoori (2019), Mohamad and Khasawneh (2023), and Azamatova, Bekeyeva, Zhaxylikova, Sarbassova, and Ilyassova (2023), which have demonstrated the positive impact of AI on students' motivation in learning.

As for hypothesis one whose results are on Table 3, a comparison of motivation mean scores between the experimental and control groups showed a significant difference, with $F(1,72) = 447.27$ and $p < 0.05$, rejecting the null hypothesis and suggesting that artificial intelligence significantly influences students' motivation. This finding highlights the significant impact of artificial intelligence in enhancing students' motivation in civic education. These results are consistent with the findings of Candra and Heri-Retnawati (2020).

Table 2 shows the post-test motivation mean scores of civic education students in the experimental group based on gender. It shows that male students had a slightly higher post-test motivation mean score than female students. This result shows that male students had a slightly higher motivation level than their female counterparts in civic education when taught with artificial intelligence. These finding supports the broader research indicating that artificial intelligence is effective in improving and changing students' motivation across gender groups. This is consistent with the works of Ucoglu (2020), Gocen and Aydemir (2020), and Ali and Yassin (2021). Table 4 revealed that the motivation mean score of male students did not significantly differ from that of female students in civic education. Therefore, there is no significant difference in the motivation levels of male and female students in civic education.

CONCLUSION AND RECOMMENDATIONS

Based on the findings, the study draws the following conclusion: The use of artificial intelligence in teaching civic education improves the motivation of SS II students in the experimental group in Jos-North Local Government Area, Plateau State, Nigeria. Male students exhibit slightly higher motivation level than their female counterparts in civic education in the experimental group when taught using artificial intelligence. There is a significant difference in the mean motivation scores of SS II civic education students in the experimental and control groups. The null hypothesis is therefore, rejected, suggesting that artificial intelligence has a significant effect on students' motivation in civic education; and the effect of gender is not statistically significant at the 0.05 level, suggesting that there is no significant difference in the motivation levels of male and female students in civic education.

Based on the findings, the following recommendations are made:

1. Educational institutions and policymakers need to collaborate to develop AI-driven content and platforms. This collaboration will ensure that AI applications are effectively embedded in teaching methodologies.
2. By engaging students with interactive AI tools, their understanding of civic concepts can be significantly enhanced.
3. Need for the adequate provision of AI tools by senior secondary schools. This step can simulate real-world civic scenarios, provide personalized learning experiences, and adapt to individual learning styles.

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