



Digitizing Learning Delivery through YouTube Technology: A Transformative Approach in Education to Enhancing Students' Performance

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Abstract. In an era where digital literacy is becoming increasingly important, the Nigerian education system needs to shift from traditional, teacher-centered methods to more dynamic, student-centered approaches. This study examined how integrating YouTube technology has an impact on secondary school students' academic performance and attitudes in Civic Education in Akoko Metropolis, Ondo State, Nigeria. A quasi-experimental design was used, involving selected SSII students from public secondary schools in Akoko metropolis, Ondo State. Data were gathered through the Civic Education Performance Test (CEPT) and the Questionnaire on Students' Attitudes towards YouTube for Learning (QSAYL) ($r = 0.85$) and analyzed using descriptive statistics to identify significant differences between the experimental and control groups. The results showed that students who received YouTube-based instruction performed better and had more positive attitudes toward Civic Education (average mean score = 2.89). Additionally, students responded favorably to YouTube, noting increased interest, better understanding, and greater engagement with the subject. The study recommends improving teacher training in digital pedagogy, providing infrastructure for internet access in schools, and reforming curricula to include digital content delivery methods formally.

Keywords: Digital Literacy, YouTube Technology, Academic Performance, Attitude and Civic Education.

1. Introduction

Education plays a crucial role in national development by equipping individuals with the knowledge, skills, and values necessary for meaningful participation in society. Over the past few decades, the integration of technology in education has gained momentum,

transforming the ways in which teaching and learning take place. One of the most significant technological advancements in education is the use of digital platforms such as YouTube. YouTube, a widely accessible video-sharing platform, has increasingly been utilized in educational settings due to its ability to provide engaging, multimedia-rich content that enhances students' learning experiences. As a supplementary teaching tool, YouTube has been found to improve comprehension, engagement, and retention of knowledge among students (Kumar & Kalra, 2021).

The fundamental role of producing competent and effective citizens by the education industry is becoming more complex as society has been transformed by digital technologies of the 21st century. The integration of these technologies in socio-economic and political institutions is gradually making human interactions more digital (Garba, Byabazaire & Busthami, 2015). It is, therefore, required of the education industry to integrate digital technologies in teaching and learning to equip 21st-century learners with what it takes to fit into the larger society. It is worth noting that most of these digital technologies are not primarily designed for the education industry. The need to create a teaching and learning environment that mirrors the reality of the larger society calls for the innovative integration of digital technologies that have transformed the analogue society into a digital one (Harris, Mishra & Koehler, 2019). When technology is used in this manner, the teacher becomes a mentor and facilitator of the teaching and learning process while learners are actively involved in the process of constructing knowledge (Jagtap, 2016).

Prior to the 21st century, non-digital technologies were integrated into the teaching and learning process

for the purpose of enhancing learners' understanding and facilitating easy remembrance of the information conveyed by teachers (Obielodan, 2016). These non-digital technologies include but not limited to books, pens, paper, chalks, blackboards, whiteboards, printed pictures, maps, charts, and textbooks. The teachers who do integrate non-digital technologies are of believe that effective learning will take place when learners repeatedly learn particular information presented through these technologies. Chalkboard remained the most commonly integrated non-digital technology in the teaching and learning process at the secondary school level. The teacher conveys the learning content to the learner via writing on the board, along with verbal explanations, and sometimes draws on the board to illustrate the information to the learners. However, the issues of knowledge application/transfer in the context of the 21st-century workplace, as well as the development of positive attitudes through the integration of non-digital technologies, have remained a bone of contention among educational stakeholders (Hendry, 2015 & Nwodo, 2017).

As digital technologies become increasingly widespread, various methods of technology integration are being adopted in education. Digital Presentation Technologies (DPT) are reported to be the most commonly used digital tools in classrooms (Gambari, 2017). These include, but are not limited to, interactive whiteboards, LCD projectors, DLP projectors, Wireless Presentation Systems (WPS), and their associated computer applications (both offline and online), such as YouTube, PowerPoint, Zoom, Google Meet, WhatsApp, Prezi, Google Slides, Skype video calls, and both synchronous and asynchronous online presentations. A common feature of all these digital presentation tools is the use of multimedia. Teachers can innovatively utilize 'dual-coding' by combining text, audio, and motion graphics, animations, or real videos to enhance learning (Gambari, 2017).

YouTube digital technology remains the most commonly integrated DPT in classrooms. It is reportedly very effective at engaging and holding students' attention, which positively influences their academic performance and motivation (Erdemir, 2019). YouTube appeals to sight and hearing, the most frequently used senses in teaching and learning activities (Gambari, Zubairu, Daramola, Abubakar, & Tukura, 2018). However, this form of technology integration creates a semi-compromised 21st-century learning environment. Students only receive information presented by the teacher through digital technologies, but they do not actively use digital tools to construct knowledge. Therefore, the suitability of

YouTube slides for digital natives (21st-century learners) has been questioned because the use of prior knowledge to build new understanding through interaction with learning content is limited (Chen, 2012).

YouTube application packages come equipped with interactive features that can be utilized to create engaging and dynamic learning environments (Garth, 2020). These features include hyperlinks, triggers, animations, custom shows, selection panes, animation panes, and various multimedia tools. Such components are instrumental in designing what is referred to as an Interactive YouTube system, where slides or content are hyperlinked, allowing for flexible navigation and user-centered interaction (Kosslyn, Kievit, Russell, & Shephard, 2020). Teachers can leverage this technology by developing virtual projects that incorporate video tutorials, educational games, virtual data collection activities, and drill-and-practice exercises. These can be combined in various ways depending on the instructional goals and desired behavioral changes in learners. One distinct advantage of YouTube-based learning is the concept of the "guided screen," which helps maintain learner focus through structured navigation.

Badmus (2021) examined the impact of digital technology in biology, where students engaged with instructional videos. The results showed a significant improvement in students' academic performance compared to those taught using traditional methods. These findings confirm the educational potential of YouTube and its interactive features, reinforcing its usefulness as a platform for promoting active learning, content mastery, and student engagement. The teacher in a YouTube-based learning environment plays a key role in prompting students to recognize the need for information to solve problems, collaborate with peers, and think critically to differentiate between relevant and irrelevant information. Following this approach to technology integration means shifting from the traditional teacher-centered classroom to a student-centered model where students actively construct knowledge instead of passively receiving it. This shift away from common practices can have academic effects—positive or negative—on students' learning outcomes when implementing curriculum content in any subject, such as civic education.

The civic education curriculum is held in high esteem by the Nigerian government in realizing the unmet goals of using formal education as a tool to develop expected knowledge, skills, and dispositions essential for learners' citizenship engagement. The esteem associated with the subject by the Nigerian

government warrants disarticulation of the subject from the social studies curriculum to become an independent core subject in lower basic (primary school), upper basic (Junior Secondary schools), and Post Basic (Senior Secondary Schools) education in Nigeria. Civic education as a core school subject in Nigerian senior secondary schools is made up of three different elements: civic knowledge, civic skills, and civic disposition. The digital tools that the 21st century ushered in are now being used extensively to demonstrate citizens' civic potentials via the use of digital tools, such as online petitions or automatic data aggregators, online electioneering (Meira, 2021). Using these technologies in implementing civic education curriculum will have educational implications on students' academic performance and attitudes toward civic education as a school subject.

In Nigeria, the education sector faces several challenges, including inadequate infrastructure, teacher shortages, and limited access to quality instructional materials (John & Igbudu, 2025). These challenges hinder effective teaching and learning, particularly in subjects such as Civic Education. Civic Education is a core subject in the Nigerian secondary school curriculum, designed to instill values of citizenship, governance, social responsibility, and national consciousness among students. However, the traditional methods of teaching Civic Education in many Nigerian schools rely heavily on rote memorization and teacher-centered approaches, which often fail to engage students meaningfully (Ogunleye & Ojo, 2022). As a result, many students struggle to develop a deep understanding of civic concepts and their real-world applications.

Academic performance is one of the commonly used indices for determining students' success in learning specified curriculum content. It is a numerical rating obtained from continuous assessment and examination (Adediwura & Tayo, 2017). Students' academic performance at secondary school levels communicates to the government and other education stakeholders the effectiveness of schools, the well-being of youths in particular, and the nation in general (Lewin, Wasanga & Somerset, 2019). It is these numerical values that the educational industry commonly uses to judge the effectiveness of any educational intervention (Yusuf & Adigun, 2010). Using this measure alone as justification that learning has taken place has been criticized by educational stakeholders as inadequate. Useful knowledge is described as the knowledge that is transferable into skills and attitudes and applicable in real-life situations (Gano-Phillips, 2022).

Attitude represents our evaluations, preferences, or rejections based on the information received. It is a learned predisposition to respond in a consistently favourable or unfavourable manner concerning a given object. An important consequence of instruction is the students' attitudes toward the subject. A student with low achievement might have developed positive attitudes toward the subject matter, while students with high achievement might have developed negative attitudes toward the subject matter, vice versa. Teachers need to be aware of the attitudinal characteristics of their students (Gano-Phillips, 2022). The likelihood of a student putting his knowledge of civic education to use (applicability) largely depends on the student's attitude toward or against the subject because things disliked have a way of being forgotten easily.

1.1 Statement of the Problem

The rapid advancement of digital technologies has revolutionized education globally, compelling schools and higher institutions to re-examine traditional methods of teaching and learning. Among these technologies, YouTube has emerged as a widely accessible and powerful platform for delivering instructional content. Its visual, interactive, and user-friendly features offer opportunities to enhance comprehension, stimulate interest, and foster independent learning among students. Despite these potentials, concerns persist about its effective integration into formal learning environments, particularly in contexts where traditional, teacher-centered instruction still dominates.

The learners in the 21st century prefer technologically enriched learning environments because of the benefits derived from using digitalized learning, including increased motivation, deeper understanding, and improved performance through YouTube-based learning, others may encounter barriers that hinder its positive impact. As such, integrating digital tools into educational programs has become essential. The Nigerian government underscores the necessity of incorporating technology into teaching to ensure quality education. However, Civic Education in Nigerian secondary schools, especially in Akoko, Ondo State, still relies heavily on traditional, teacher-centered methods that prioritize rote memorization. This outdated approach has resulted in low student engagement, poor comprehension, and a general lack of interest in the subject. To address these issues, the integration of YouTube as a digital instructional tool will be a great avenue since YouTube offers a wide array of multimedia content-including animations, real-life examples, and expert-led tutorials can

transform Civic Education into a more engaging and practical subject.

Moreover, empirical evidence on the actual implications of YouTube technology on students' academic performance remains limited and inconclusive. While anecdotal reports highlight its benefits in promoting engagement and self-paced learning, few systematic studies have examined whether these outcomes translate into measurable improvements in students' academic achievement. This gap in research leaves educators, policymakers, and stakeholders uncertain about the real value of digitizing learning delivery through YouTube and its role in transforming education. Therefore, this study investigated the extent to which the integration of YouTube technology into teaching and learning influences students' academic performance, as well as students' attitudes in Akoko metropolis, Ondo State, Nigeria.

1.2 Purpose of the Study

The study determined the effect of YouTube technology integration on secondary school students' learning outcomes in civic education in Akoko, Ondo State, Nigeria. Specifically, the study aimed at:

- Determine the difference in the academic performance of SSII students taught civic education using YouTube instructional package (YTIP) and those taught using the traditional teaching method (TTM) in Akoko, Ondo State, Nigeria.
- Ascertain the difference between the performance of male and female students taught civic education using YouTube instructional package (YTIP) and those taught using the traditional teaching method (TTM).
- Examine the attitude of students toward utilizing YouTube for instructional purposes in Akoko, Ondo State, Nigeria.

1.3 Research Questions

Three research questions are raised for this study:

- Will there be any difference in the post-test performance of students taught civil education using the YouTube instructional package (YTIP) and those taught using the traditional teaching method (TTM)?
- Will there be any difference between the performance of male and female students taught civil education using YouTube instructional package (YTIP) and those taught using the traditional teaching method

(TTM)?

- What is the attitudinal disposition of students toward Civic Education when taught using the YouTube Instructional Package (YTIP)?

1.4 Research Hypotheses

There are two research hypotheses formulated for the study is:

H₀₁: There is no significant difference in the post-test performance of students taught civil education using the YouTube instructional package (YTIP) and those taught with the Traditional teaching method (TTM).

H₀₂: There is no significant difference between the academic performance of male and female students taught biology using the YouTube instructional package (YTIP)

2. Research Methodology

The study would adopt a pretest, post-test quasi-experimental design. Specifically, a pretest-posttest, non-equivalent, non-randomized, comparison groups design was used.

The population for this study comprised all the students of 63 Public Senior Secondary School in Akoko, Ondo State, Nigeria with a total population of 30,314 students. Akoko metropolis has 63 secondary schools that are categorized into three: the rearticulated Public Secondary schools (combination of Senior and Junior under the authority of one Principal), the Public Senior Secondary schools and the public junior secondary schools.

Two schools from Akoko metropolis were purposively selected for this study. The selected schools are operating on the same curriculum and already utilizing ICT gadgets to support their students' learning activities. Ipe High School served as the experimental group, while Isua High School served as the conventional teaching method group. Ipe High School is chosen for the experimental group because the school has the capacity required in terms of computers, internet facilities, and ICT personnel. SSII students were selected purposively for the study because the three topics chosen in the Civil Education for the study were offered in SSII, and these students have been exposed to different ICT gadgets and are familiar with them. The three topics include National integration, National development and Political Apathy.

The study used three research instruments, which include the Civic Education Performance Test (CEPT), Questionnaire on Students' Attitudes towards

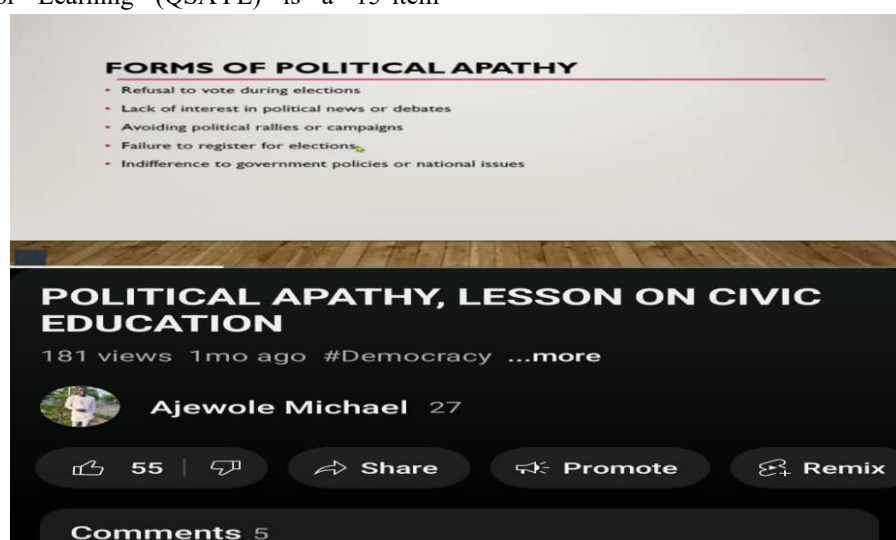
YouTube for Learning (QSAYL), and the YouTube Instructional Package (YTIP).

The CEPT consisted of 30 multiple-choice questions adapted from past exams of the West African Examination Council (WAEC) and the National Examination Council (NECO). The test was based on the SSII curriculum covering the concepts of (i) National Integration, (ii) National Development, and (iii) Political Apathy. The instrument contains multiple-choice item questions with four options (A-D). Students responded to the instrument in two sections. Section A was on personal data of the respondents, while Section B contained 30 objective questions on selected topics. The test was scored 30 marks for 30 questions.

Questionnaire on Students Attitudes towards YouTube for Learning (QSAYL) is a 15-item

questionnaire adapted from “A Biology Attitude Scale by Russell and Hollander (1975) which has reliability index of 0.8. The items were rated using a modified Likert scale ranging from Strongly Agreed (SA), Agreed (A), Disagreed (D) to Strongly Disagreed (SD). The items of the questionnaire were worded in positive form, which SA is attracted to 4 points, A is 3, D is 2, and SD is 1.

The YouTube Instructional Package (YTIP) was also developed by researchers using some other digital technologies such as PowerPoint video slide recorder, Action Button, Hyperlinks, Trigger, animation, transition, custom slide show, and graphics design supporting tools of YouTube. The package was made up of three topics: National integration, National development, and Political apathy.



The links to the three treated topics for this study are:

https://youtu.be/47zH3s5dd3I?si=n4Si-okur_jzTxV2 - National Integration and Unity

https://youtu.be/sbQel9wJxGg?si=fAtT-5_QOLgmzxp - Orderliness

<https://youtu.be/OGcyMZ43yjA?si=zR5sbes9o6e9WSu-> - Political Apathy

The three instruments were given to five experts in the field of educational technology (2), educational evaluation (2), and civic education (1). These experts validated for construct and content and face validity of the instrument for clarity of items, and appropriateness of the instructional package to the student’s level. These experts pointed out typographical errors and the need for re-arrangement of CEPT questions. It was advised that the items of QSAYL should be reduced to 15. All these observations were effected in the final copy of the instruments. To test the reliability of a treatment instrument, data from a pilot study were used. The data obtained was subjected to statistical tools using Cronbach's Alpha. An alpha of 0.85 was obtains.

After obtaining permission to use the selected schools, the researchers worked together with the subject teachers of the schools, who served as research assistants on the use of YTIP. At the beginning, a pre-test was administered to both experimental and control groups, while the treatment was administered on the experimental group using YouTube Instructional Package (YTIP). The YTIP was developed for both online and offline to give rooms for those that may not have internet service.

Data were analyzed using simple percentage, mean score, standard deviation, t-test and ANCOVA analysis through the aid of SPSS.

3. Results

Table 1: Demographic Information of Respondents

SCHOOL	GENDER	FREQUENCY	PERCENTAGE (%)
IPE HIGH SCHOOL	Male	21	26.25
	Female	17	21.25
ISUA GRAMMAR SCHOOL	Male	26	32.50
	Female	16	20.00
TOTAL		80	100

Table 1 displays the percentage of respondents from each participating school. At Ipe High School, which served as the experimental group, there are 21 male students (26.25%) and 17 female students (21.25%). Isua Grammar School, representing the control group, has 26 male students (32.50%) and 16 female students (20.00%).

Test of Hypotheses

Hypothesis 1: There is no significant difference in the post-test performance of students taught civil education using the YouTube instructional package (YTIP) and those taught with the Traditional teaching method (TTM).

The t-test analysis was used to determine the entry knowledge of the YTIP and TTM groups, to ensure equal opportunity for both groups. The result is shown in the Table 2.

Table 2: t-test on Pretest Scores of the Experimental and the Control Groups

Group	N	Mean	Std. Deviation	df	T	p	Remarks
Experiment (YTIP)	38	9.289	1.374	78	-0.63	0.255	Not Sig.
Control (TTM)	42	9.309	1.456				

The result in Table 2 showed that the students who learnt civil education had the same background of knowledge and equal ability before being exposed to the treatment, since $t(78) = 0.255 < P.05$. Any difference observed after the treatment can therefore be associated with the treatment. In order to test the experimental and control groups, the students' post-test scores were subjected to mean scores analysis and ANCOVA, which is discussed in Tables 3 and 4.

Table 3. Mean Analysis of Posttest of YTIP and TTM on Students' Academic Performance

Group Posttests	N	Mean	STD	Std. Error Mean
YTIP	38	22.18	1.608	0.261
TTM	42	16.28	1.559	0.241

Table 3 revealed the mean scores of the posttests of YTIP and TTM. It showed that the students who were exposed to YTIP performed better, with a mean score of 22.18, while their counterparts TTM group had a mean score of 16.28. This implied that students in YTIP received better treatment when exposed to YouTube instruction for learning. Table 4 shows the significance level, as the pretest served as a covariate

Table 4: Analysis of Pretest-Posttests of YTIP and TTM on Students' Academic Performance

Tests of Between-Subjects Effects					
Dependent Variable: PRETESTGROP					
Source	Type III Squares	Df	Mean Square	F	Sig.
Corrected Model	18.347 ^a	12	1.529	63.913	.000
Intercept	3.488	1	3.488	145.800	.000
PRETEST GROUP	.004	1	.004	.182	.671
POSTTEST GROUP	18.346	11	1.668	69.719	.000
Error	1.603	67	.024		
Total	206.000	80			
Corrected Total	19.950	79			

a. R Squared = .920 (Adjusted R Squared = .905)

The result in Tale 4 showed a statistically significant difference in the post-test scores between the experimental and control groups ($F = 69.72, p < 0.05$). This indicates that there is a significant difference in post-test Civic Education performance scores between students taught with YouTube and those taught with traditional teaching methods. Students taught with a YouTube instructional package performed better than those taught using the traditional teaching method. This strongly suggests that the multimedia and interactive features of YouTube enhanced students' comprehension and retention of Civic Education content.

Hypothesis 2: There is no significant difference between the academic performance of male and female students taught civic education using the YouTube instructional package (YTIP)

Table 5: t-test of the Posttest Performance of the Male and Female of the YTIP group

YTIP Gender	N	Mean	Std. D.	df	T	P	Remarks
Male	21	22.19	2.001	36	0.260	0.101	Sig.
Female	17	22.18	2.451				

Table 5 indicates that $t(36) = 0.260 > P.05$ of the male and female scores of YTIP experimental group was not significant. This means that there was no significant difference in the post-test mean score between male and female students. The male students' mean score (21.19) did not differ significantly from that of female students with a mean score of 22.18 when both were taught using the YouTube instructional package. Therefore, the hypothesis is hereby accepted.

Research Question 3: What is the attitudinal disposition of students toward Civic Education when taught using the YouTube Instructional Package (YTIP)?

Table 6: Attitudinal Disposition of Students towards Utilisation of YTIP

S/N	Statement	SA	A	D	SD	N	Mean	Std. Dev.
1	The YouTube package makes me like the topics in8 civic education	25	2	3	38	3.00	0.771	
2	YouTube packages make me enjoy the activities we15 do in Civic Education Class	14	7	2	38	3.11	0.894	
3	YouTube packages make me like Civic Education	18	12	5	38	3.18	0.954	
4	YouTube packages make what I learn in civic14 Education interesting	11	8	5	38	2.89	1.060	
5	YouTube packages make me happier in a civic10 education class than in any other class	13	5	10	38	2.61	1.152	
6	With YouTube packages, when I hear civic education,13 I have a feeling of likeness	16	2	7	38	2.91	1.075	
7	YouTube packages make me like Civic Education11 class because it is active and interesting	14	6	7	38	2.76	1.076	
8	YouTube packages make me like Civic Education9 because it is fascinating and fun.	19	5	5	38	2.84	0.945	
9	With YouTube packages, Civic Education makes me12 feel comfortable, restful, and patient	11	9	6	38	2.76	1.076	
10	YouTube packages make me like Civic education16 because it teaches what happens around us.	14	5	3	38	3.13	0.935	
11	In civic education, I try to do as well as I can because12 of the impact of YouTube packages	14	5	7	38	2.81	1.087	
12	Because of the YouTube package, I will register civic17 education as one of my JAMB subjects	12	3	6	38	3.05	1.089	
13	YouTube packages make it easy for me to11 comprehend what is being taught in Civic Education Class, I have hope of passing	13	9	5	38	2.80	1.018	
14	Civic education will be my first choice at a higher9 institution because I can easily understand what we are being taught in civic education class with the help of YouTube packages.	14	8	7	38	2.66	1.047	
15	YouTube packages make what I'm being taught in11 Civic education important in everyday life	15	5	7	38	2.79	1.069	
		Average mean score = 2.89						

The result in Table 3 revealed that the average mean score of the students' attitude towards the YouTube

instructional package was 2.89 out of 4. The percentage result is 72.25% with this result, it can be

said that students taught civic education utilizing YTIP have a great positive attitude towards YouTube for the instructional process.

4. Discussion of Findings

This result confirms that students who were taught using YouTube performed significantly better than those taught with traditional methods, even after controlling for prior knowledge. This finding supports earlier research, which suggests that digital media like YouTube provide a more engaging and context-rich learning environment. YouTube's visual and auditory features may enhance students' understanding of Civic Education concepts by making abstract ideas more concrete and relatable. This result is consistent with studies by Mayer and Moreno (2003) on multimedia learning who found that YouTube significantly improves student performance in the social sciences, and students who are exposed to YouTube-based learning strategies in the social sciences demonstrated significant academic gains.

Hypothesis Two tested for a significant difference between the academic performance of male and female students taught civic education using the YouTube instructional package. The finding revealed that male students' mean score did not differ significantly from that of female students, with a mean score of 22.18 when both were taught using the YouTube instructional package. This result is in line with the findings of Achuonye (2019), who discovered in her study that gender had no significant effect on the use of computers, but the use of computers in teaching improved the academic performance of the students. Also, Badmus (2021) revealed that gender has no significant influence on their academic performance when taught with Flipped Classroom Instruction for biology study.

The experimental group showed higher levels of enjoyment, interest, and perceived relevance of Civic Education. These findings suggest that YouTube not only serves as a cognitive tool but also as an affective enhancer, shaping how students emotionally connect to what they learn. This aligns with research by Fidan and Debbag (2018), who found that students exposed to video-based instruction displayed greater enthusiasm and positive attitudinal change toward learning. The social and interactive nature of YouTube may also foster a sense of autonomy, relevance, and curiosity in learners, all of which are vital for attitude formation.

5. Conclusion

YouTube technology integration significantly enhances both the academic and attitudinal outcomes of SSII students in Civic Education. Its multimedia capacity helps to clarify complex civic issues, increases learner engagement, and supports a shift toward student-centered instruction. This indicates that digital tools like YouTube can bridge the gap between theory and real-life application, making Civic Education more relevant and impactful.

6. Recommendations

Based on the findings, the following recommendations are made:

- The Ministry of Education should include YouTube-assisted instruction in Civic Education policy frameworks and teacher training programs.
- Educators should receive ongoing digital pedagogy training to maximize the instructional use of YouTube among students, both male and female.
- Stakeholders in the educational sector should include digital resources like YouTube as part of teaching strategies to facilitate learning in the class.

References

- Achuonye, K. A. (2019). Using computer in science class: The interactive effect of gender. *Global Journal of Sociology and Anthropology* Vol. 8 (4), pp. 001-004. <https://www.internationalscholarsjournals.com/article/s/using-computer-in-science-class-the-interactive-effect-of-gender.pdf>
- Adediwura, A. A. & Tayo, T. (2017). Perceptions of teacher knowledge, attitude and teaching skills as predictor of academic performance in Nigerian secondary schools. *Educational Research and Review*, 2(7): 165-171.
- Badmus, A. M. (2021). Educational application of flipped classroom instruction: Impact on students' academic achievement in Lagos State, Nigeria. *African Journal of Science, Technology and Mathematics Education (AJSTME)*, 6 (1), 21-28.
- Chen, Y. (2012). Integrating anchored instructional strategy and modularity concept into Interactive multimedia PowerPoint presentation. *International Journal of the Physical Sciences*. Vol. 7(1).

- Erdemir, N. (2019). Determining students' attitude towards physics through problem-solving strategy. *Asia-Pacific Forum on Science Learning and Teaching*, 10(2), Article-1.
- Fidan, M. and Debbag, M. (2018). The Usage of Video Blog (vlog) in the "School Experience" Course: The Opinions of the Pre-service Teachers. Retrieved from https://www.researchgate.net/publication/322963076_The_Usage_of_Video_Blog_vlog_in_the_School_Experience_Course_The_Opinions_of_the_Pre-service_Teachers_Okul_Deneyimi_Dersinde_Video_Gunlugu_vlog_Kullanimi_Ogretmen_Adaylarinin_Gorusleri
- Gambari A. I. (2017). *Digital Instructional Media in the 21st Century*. Nigeria: Impresmedia Printing and Publishing Co.
- Gambari, A. I., Zubairu, S. A., Daramola, F. O. Abubkar, H. A., & Tukura, C. S. (2018). Impact of Infographics on the academic performance of junior Secondary School Social Studies Students in Giwa Educational Division, Kaduna State, Nigeria. *Journal of Information, Education, Science and Technology*. Vol.5(1). 157-167.
- Gano-Phillips, S. (2022). *Affective Learning in General Education*. University of Michigan – Flint.
- Garba, S. A. Byabazaire Y. & Busthami A. H. (2015). Toward the Use of 21st Century Teaching Learning Approaches: The Trend of Development in Malaysian Schools within the Context of Asia Pacific. *International Journal of Education Technology (iJET)*, Volume 10(4).
- Garth, A. (2020). *Interactive PowerPoint: An Interactive Guide*. Sheffield Hallam University
- Harris, J. B., Mishra, P., & Koehler, M. (2019). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed, *Journal of Research on Technology in Education*, 41(3), 393-416.
- Hendry, C. (2015). Chalkboard teaching in the age of technology. Reflection: *A Teacher the Best of Teaching and Learning Services*. Available at <https://carleton.ca/edc/wp-content/uploads/2015-16-Reflections-Newsletter.pdf>.
- Jagtap, P. (2016). Teachers Role as Facilitator in Learning. *Scholarly Research Journal for humanity Science and English Language* Vol. 3(17).
- John, I. & Igbudu, N. J. (2025). Effective Resource Utilization in Revitalising Educational Productivity in Nigeria: Challenges and Strategies. *International Journal of Educational Management*, Rivers State University, 1(2), 339-351.
- Kosslyn, S. M., Kievit, R. A., Russell, A. G., & Shephard, J. M. (2020). *Building the best learning environment*. Learning Sciences Press.
- Kumar, R., & Kalra, P. (2021). Enhancing learning outcomes with YouTube. *International Journal of Digital Education*, 9(4), 88-102.
- Lewin, K. M., Wasanga, P., Wanderi, E. & Somerset, A. (2019). Participation and Performance in Education in Sub-Saharan Africa with Special Reference to Kenya: Improving Policy and Practice. Create pathways to Access. Research Monograph No. 74: University of Sussex.
- Mayer, R. E., Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist*, 38(1), 43-52.
- Nwodo, M. O. (2017). Innovative Learning Strategies for Modern Pedagogy in Science and Technology for Quality Assurance in Education. *International Journal of Education (IJOE)*. Volume 2(1).
- Obielodan, O. O. (2016). Instructional Media: Typology and Relevance in Instruction. Yusuf, M. O. & Onasanya, S. A. (ed), *Critical Issues in Educational Technology*. Ilorin: Department of Educational Technology, University of Ilorin.
- Yusuf, M. A. & Adigun, J. T. (2010). The Influence of School Sex, Location and Type on Students' Academic Performance. *Int J Edu Sci*, 2(2): 81-85.