



Design and Development of An Integrated Web Multimedia Systems for Sustainable Assessment and Evaluation of Senior Secondary School Science Students' Academic Performance in Zaria Metropolitan Area, Kaduna State

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DOI: 10.5281/zenodo.15621717

Submission Date: 30 May 2025 | Published Date: 09 June 2025

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Abstract

The primary purpose of this study is to Design and Develop an Integrated Web-Based Multimedia System for Sustainable Assessment and Evaluation of Senior Secondary School Science Students' Academic performance in Zaria metropolis, Nigeria. The study compared the utilization of web-based multimedia system with traditional learning methods in the assessment and evaluation of students' academic performance. To achieve this, three Research Questions, three Hypotheses and a t-test analysis for pretest and posttest were drawn. The quasi-experimental design was selected for the study. The population for the study consists of 14,325 students with a sample size of 769 students selected using intact sampling. Two instruments were used for data collection: an Academic Performance Test and an Electronic Questionnaire. The Statistical package Minitab 19.2.0 was used to analyze the data. It was found out among others that difference exist among Senior Secondary School Science Students in instructional material utilization among students using web-based multimedia systems and those using traditional methods in academic assessment and evaluation in Zaria Metropolitan Area of Kaduna State and the difference is significant. X^2 computed $> X^2$ critical at df 40, p-value < 0.05 . It was also found out that differences exist in students' motivation between learners who use a web-based multimedia system and learners who use traditional methods in the academic assessment and evaluation of Senior Secondary School Science students' academic performance in Zaria Metropolitan Area of Kaduna State and the difference is significant. X^2 computed $> X^2$ critical at df 40, p-value < 0.05 . It was revealed that difference exist among the Senior Secondary School Science Students on Impact of web multimedia systems on assessment and evaluation among students in Zaria Metropolitan Area of Kaduna State and the difference is significant. X^2 computed $> X^2$ critical at df 40, p-value = $0.012 < 0.05$. Significant difference exists on the effect of web multimedia system on the academic performance of Senior Secondary School Science Students between students who used web multimedia systems and those who did not in Zaria Metropolitan Area of Kaduna State. P-value = $0.001 < 0.05$, t computed = $16.4333 > 1.96$ at df 714. Therefore, it was recommended that Government should make multimedia facilities available including reliable internet access and sufficient computer systems. Secondary Schools management should leverage on the potentials of multimedia in academic assessment and evaluation to cut down the budget of stationaries and quicken students' assessment processes. Secondary school libraries should be equipped with multimedia web facilities and applications (such as the one presented in this study) to assist students simulate external examinations.

Keywords: Integrated web multimedia system, Assessment, Evaluation.

Introduction

Before colonial influence, oral tradition was Nigeria's primary mode of knowledge transmission (Adedoyin 2021). This method involved sharing information through folklore, oral history, myths, legends, songs, and other verbal form. Oral tradition preserves cultural heritage, history, and societal values, passing them down through generations (Hassan, 2000, as cited in Mudassir & Musa, 2024). The emergence of writing systems marked a significant shift from the oral transmission of knowledge. While oral tradition continued to shape cultures, the emergence of writing systems and alphabet scripts enabled the preservation of information in a tangible format. This transition laid the groundwork for advancing written language and resources (Mudassir, et al., 2024). While familiar teaching approaches often relied solely on verbal instruction, integrating various instructional materials has significantly enhanced knowledge acquisition. Indigenous tools, such as sand, were efficiently used during early childhood education to arrange learning within local contexts and foster creativity (United Nations Educational Scientific Culture Organisation (UNESCO), 2021). Colonial education introduced a classroom-based model, where teachers instructed groups of students (Ngugi wa Thiong'o, 1981, as cited in Godwin, 2021). This marked a departure from the pre-colonial system, offering a structured approach to learning and progression based on academic achievement. Nigeria's educational system has experienced significant transformations since the mid-20th century. Implementation of the Universal Primary Education (UPE) program during the 1970s and 1980s aimed to increase access to education by increasing the availability of maps, textbooks, and charts. However, the economic downturns of the 1990s adversely impacted the value and accessibility of instructional materials. To address these issues, International Organizations (IOs) and Non-Governmental Organizations (NGOs) stepped forward to provide essential educational resources.

Building upon the foundation laid by UPE between the 1970s and 1980s, the Universal Basic Education program (UBE) was introduced in 1999 and gives more priority to the provision of quality instructional materials by assessing the efficiency of such platforms, their distribution, and overall quality (Federal Ministry of Education, 2022). The educational landscape experienced a technological shift in the 2010s, with the integration of computers, interactive whiteboards, and multimedia tools into classrooms. These digital tools complement traditional methods, enhancing educational outcomes (Ajayi, & Adeyemi, 2020).

The subsequent rise of digital textbooks, e-learning platforms, and instructive tools accelerated technology adoption, especially in urban settings. The pandemic of 2019 (COVID-19) further emphasized the need for online learning modalities. Initiatives like the government's Digital Literacy Framework and support from NGOs like the USPF (Universal Service Provision Fund) have expanded access to digital learning resources, including tablets with uploaded educational materials (UNESCO, 2023). Instructional materials, either traditional or digital, serve as essential tools to enhance knowledge acquisition. They offer diverse communication channels, which allow teachers to create engaging learning experiences (Akanbi & Usman 2019). Additionally, diverse materials facilitate interactive learning environments, nurturing Interactive exchanges, opportunities for dialogue and inquiry, and Collaborative learning experiences (Isola, 2021). Olagunju (2023) highlights the significance of finding solutions to different learner needs through varied instructional materials. This adaptability ensures an inclusive and equitable approach to high-quality education for all learners. Technology has narrowed the digital segregation in the 21st century, which is becoming increasingly integrated into daily life. Multimedia tools and associated equipment have appeared as key drivers of this technological shift. These developments have considerably stimulated knowledge acquisition, contributing to educational progress (Yijun, 2023).

Assessment is a vital component of the learning process. It involves gathering, analyzing, and interpreting students' learning database to inform instruction and monitor students' progress. Evaluation comprises of creating judgments about learners' learning foundation on the assessment records. Multimedia technologies offer innovative approaches to assessment. Online platforms can be used to deliver assessments, record student responses, and provide automated or personalized feedback. While traditional assessment methods, such as exams and quizzes, may not fully capture the potentials of students' abilities, including creativity and problem-solving skills. Therefore, there is requirement for further varied and complete assessment approaches. Multimedia systems enables learning by fostering improved interaction among teachers, learners, and learning tools. Which can lead to additional active and motivational learning skills that are additionally relevant to real-world applications (Olivier, Archambault, Clercq & Galand, 2019).

Educational landscape is rapidly evolving, with digital evaluation techniques gaining prominence. Digital portfolios, automated grading systems, and online quizzes are changing the evaluation process, providing streamlined feedback and enhancing students' learning outcomes. (Anžela Jurāne-Brēmane, 2023 & Laura, 2024). However, Laura (2024) further highlights bridging the gap between digital and traditional evaluation methods, ensuring their relevance and effectiveness in the digital age. **The primary distinction between conventional and modern assessment methods lies in their approaches to evaluation.** Traditional assessments often emphasize standardized testing and rote memorization, focusing primarily on cognitive skills in controlled environments. In contrast, modern assessment methods, such as authentic assessments, prioritize real-world applications and experiential learning, evaluating learners'

capability to apply knowledge in practical situations. This shift highlights the requirement for this research to bridge these methodologies and ensure more holistic evaluation capabilities.

Furthermore, many educators still find value in traditional, paper-based methods. These offer a familiar and tactile approach to evaluating students' understanding. However, paper-based assessments present significant drawbacks such as being time-consuming and expensive, extensive paperwork (traditional data entry can be costly and resource-intensive), prone to committing errors (manual data entry increases the likelihood of errors), limited feedback traditional methods often lack immediate feedback (hindering learning improvement, data management challenges (handling and consolidating paper-based evaluation is inefficient), and difficulty tracking progress (assessing student performance over time is difficult). An internet site "Marking.ai" (2024) emphasizes that ensuring grading reliability and fairness is crucial. Variations in teacher interpretations of evaluation conditions can lead to inconsistent student evaluations. Personal bias can compromise fair assessment. Marking.ai further explained the important workload associated with grading, particularly for teachers with large classes. These traditional methods that lead to personal bias can obstruct teachers' competence to provide timely feedback.

Purpose of The Study

The primary purpose of this study is to Design and Develop an Integrated Web-Based Multimedia System for Sustainable Assessment and Evaluation of Senior Secondary School Science Students' Academic achievement in the Zaria Metropolitan Area of Kaduna State. The following are the purpose of the study:

- 1) To compare the utilization of web-based multimedia systems with traditional methods in the assessment and evaluation of academic performance of Senior Secondary School Science Students in Zaria Metropolitan Area of Kaduna State.
- 2) To compare students' motivation level between the use of a web-based multimedia system and that of the traditional method on the assessment and evaluation of Senior Science Secondary School Students' academic performance in Zaria Metropolitan Area of Kaduna State.
- 3) To compare the impact of the use of web-based multimedia systems and that of the traditional methods on the assessment and evaluation of Senior Secondary School Science Students' academic performance in Zaria Metropolitan Area of Kaduna State.

Research Questions One : What is the difference in instructional materials utilization between Senior Secondary School Science students who used web-based multimedia system and those who used traditional methods in academic assessment and evaluation in Zaria Metropolitan Area of Kaduna State?

Table 1 : Instructional materials utilization between students who used a Web-based multimedia system and those who used traditional methods in academic assessment and evaluation in Zaria Metropolitan Area of Kaduna state.

S/No	Item statements	SA	A	D	SD	UA	MEAN	Rank
1	I am aware of the use of Web Multimedia systems for educational purposes.	130	556	17	5	7	4.115	9
2	I can access the necessary technology (computer, internet) to use Web Multimedia systems.	211	396	94	6	8	4.113	10
3	My school provides adequate resources for using Web Multimedia systems.	195	287	185	38	10	3.866	11
4	The feedback provided through Web Multimedia systems is timely and helpful.	288	391	25	2	9	4.324	5
5	Web Multimedia systems provide a more interactive learning method than traditional methods.	227	456	18	6	8	4.242	7
6	Web Multimedia systems effectively assess practical skills (e.g., science experiments, computer tasks).	231	450	19	3	12	4.238	8
7	A web multimedia system offers better ways to assess students' academic performance compared to paper-based methods.	320	369	17	9	0	4.399	3
8	Multimedia-based assessments provide a more comprehensive evaluation of students' skills than traditional methods.	314	382	14	5	0	4.406	2
9	A web-based multimedia assessment system reduces the likelihood of errors compared to traditional grading methods.	305	376	24	10	0	4.365	4

10	Assessing academic performance using a multimedia system saves time for students and teachers compared to traditional grading.	324	373	13	5	0	4.421	1
11.	I find it easy to submit assignments and receive grades with Multimedia systems	248	433	23	3	8	4.273	6
	Cumulative mean						4.251	

Decision mean=3.00

The influence of instructional material utilization between students who used a web-based multimedia system and those who used traditional methods and the difference in influence on students' academic outcomes is considerably high. This is because the cumulative mean of 4.251 exceeds the decision mean of 3.00. Assessing academic performance using a multimedia system saves time for both students and teachers compared to traditional grading which has the highest mean response of 4.421. Specifically, a total of 324 respondents' strongly agreed, also 373 agreed, 13 disagreed and the rest 5 strongly disagreed, while there are 62 unanswered questions. Also, Multimedia-based assessments provide a more comprehensive evaluation of students' skills than traditional methods, also has a great influence with the second-highest mean response of 4.406. A total of 314 respondents strongly agreed, and 382 agreed, as against 14 who disagreed while the rest 5 strongly disagreed. All questions in this aspect were answered. In summary, the influence of instructional material utilization between students' who used a web-based multimedia system and those who used traditional methods is considerably high, majorly because Multimedia-based assessments provide a more comprehensive evaluation of students' skills than traditional methods.

Research Question Two

What is the difference in students' motivation between those students assessed and evaluated using a Web Multimedia Systems and those assessed and evaluated using traditional methods among Senior Secondary School Science students in Zaria Metropolitan Area of Kaduna State?

Table 2: Motivation on the use of a web-based multimedia system on students' academic attainment of Senior Secondary School Science students in Zaria Metropolitan Area of Kaduna State.

S/No	Items	SA	A	D	SD	UA	MEAN	Rank
1	Using Web Multimedia systems improves students' academic performance.	236	444	22	6	7	4.253	10
2	Web Multimedia systems have increased students' motivation to learn.	265	420	16	3	11	4.294	5
3	I feel more confident in knowledge and skills when using Web Multimedia systems.	247	430	15	9	14	4.241	12
4	Web Multimedia systems have helped students develop better time management	250	428	23	6	8	4.267	8
5	My overall experience with Web Multimedia systems has been positive.	247	435	16	4	13	4.257	9
6	I would recommend the use of Web Multimedia systems to other students.	265	417	13	6	14	4.277	6
7	Web multimedia systems provide more interactive way of learning than traditional methods	318	385	9	3	0	4.436	1
8	The web multimedia system motivates students to partake actively in assessments.	214	485	12	4	0	4.271	7
9	Using multimedia elements (videos, graphics) in assessments increases students' interest in learning.	290	400	12	2	11	4.337	4
10	The interactive features of the multimedia system make students feel more confident during assessments.	275	416	21	3	0	4.347	3
11	Web Multimedia systems are effective in assessing practical skills (e.g. science experiments, computer tasks).	298	394	18	5	0	4.378	2
12	I feel motivated when using web multimedia systems as a medium of academic engagement.	253	425	14	4	19	4.243	11
	Cumulative mean						4.300	

Decision mean=3.00

The motivation of students on the use of a web-based multimedia system on students' academic attainment of senior secondary school Science students is considerably high. This is because the cumulative mean of 4.300 exceeds the decision mean of 3.00. Specifically, they asserted that Web multimedia systems provide a more interactive way of

learning than traditional methods as this has the most influence with the highest mean response of 4.436. With details of the response show that whiles specifically, a total of 318 respondents strongly agreed, also 385 agreed, 9 disagreed as the rest 3 strongly disagreed, while there are 97 unanswered questions. Again they believe that Web Multimedia systems are effective in assessing practical skills (e.g. science experiments, computer tasks).as this attracted the second highest mean response of 4.378 as a total of 298 respondents strongly agreed, and 394 agreed, as against 18 who disagreed while the rest 5 strongly disagreed. Motivation on the use of a web-based multimedia system on students' academic attainment of Senior Secondary School Science students is considerably high, especially as they asserted that Web multimedia systems provide a more interactive way of learning than traditional methods.

Research Question Three

What is the difference in the impact of Web Multimedia Systems and traditional methods on the assessment and evaluation of academic performance among Senior Secondary School Science Students' in Zaria Metropolitan Area, Kaduna State?

Table 3 : Impact of Web Multimedia Systems and traditional methods on the Assessment and Evaluation of Senior Secondary School Science Students' academic performance.

S/No	Item	SA	A	D	SD	UA	MEAN	Rank
1	Web Multimedia systems make it easier for me to understand assessment requirements.	206	470	24	3	12	4.196	11
2	Using Web Multimedia systems helps me to better prepare for assessments.	264	421	19	4	7	4.302	6
3	The interface of the Web Multimedia system is user-friendly and easy to navigate for assessment.	225	457	16	7	10	4.231	9
4	I enjoy using Web Multimedia systems for my studies and assessment.	280	421	6	5	3	4.357	5
5	I face technical difficulties when using Web Multimedia systems for assessment.	224	444	30	9	8	4.213	10
6	There is adequate technical support available when I encounter problems with the Web Multimedia system during assessment.	257	422	25	4	7	4.276	8
7	Interactive elements (such as quizzes and simulations) enhance students' focus and attention during assessments.	301	389	22	3	0	4.382	3
8	Students find the multimedia assessment environment stimulating and engaging.	317	380	9	9	0	4.406	1
9	The ability to access assessments through multimedia encourages students to explore course material more deeply.	304	390	20	1	0	4.393	2
10	Students are more engaged in multimedia-based assessments as it provide immediate feedback.	308	376	19	12	0	4.371	4
11	Web Multimedia systems have encouraged my academic and assessment engagement.	267	417	13	4	14	4.285	7
	Cumulative mean						4.310	

Decision mean=3.00

The Impact of Web Multimedia Systems on the assessment and evaluation of Senior Secondary School Science Students' Academic Performance is considerably high. This is because the cumulative mean of 4.310 is greater than the decision mean of 3.00. Specifically, they asserted that Students find the multimedia assessment environment stimulating and engaging. With the highest mean response of 4.406. The details of the response showed that a total of 317 respondents strongly agree, 380 agree, 9 disagree, and 9 strongly disagree. Again they believe that the ability to access assessments through multimedia encourages students to explore course material more deeply. This attracted the second highest mean response of 4.393 as a total of 304 respondents strongly agreed, and 390 agreed, as against 20 who disagreed, 1 strongly disagreed, while there are 61 unanswered questions. The difference between the use of Web Multimedia Systems and the traditional method on the assessment and evaluation of Senior Secondary School Science Students' academic performance is considerably high in favour of web multimedia systems especially as they asserted that Students' overall success depends on finding the multimedia assessment environment stimulating and engaging.

Hypothesis One

There is no significant difference in instructional materials utilization between students using web-based multimedia systems and those using traditional methods for Senior Secondary School Science Students' academic assessment and evaluation in the Zaria Metropolitan Area of Kaduna State.

Table 4: Instructional material utilization of students using web-based multimedia systems and those using traditional methods for Senior Secondary School Science students' academic assessment and evaluation in Zaria Metropolitan Area of Kaduna State.

Variable	SA	A	D	SD	UA	DF	X2 computed	X2 critical	p-value
Instructional material utilization among students using web-based multimedia system with those using traditional methods.	231	450	19	3	12	40	1114.639	55.758	0.001
	253.9	406.2	40.8	8.3	5.6				

X2 computed > X2 critical at df 40, p-value < 0.05

The above showed that significant differences exist among students using web-based multimedia systems with those using traditional methods in terms of academic assessment and evaluation in the Zaria Metropolitan Area of Kaduna State. The calculated p-value of 0.001 is lower than the 0.05 alpha level of significance and its' computed chi-square value of 1114.639 is greater than the chi-square critical value of 55.758 at df 40. Their observed frequency counts responses are 231, 450, 19, 3, 12, and 40 for strongly agreed, Agreed, Disagreed, strongly disagreed, and undecided respectively. This shows that the differences in their perception in this regard are significant. Therefore, the null hypothesis which states that there is no significant difference in instructional material utilization among students using web-based multimedia systems with those using traditional methods in terms of academic assessment and evaluation in Zaria Metropolitan Area of Kaduna State, is hereby rejected.

Hypothesis Two

There is no significant difference in students' motivation between those assessed and evaluated using a web-based multimedia system and those assessed and evaluated using traditional methods among Senior Secondary School Science students in the Zaria Metropolitan Area of Kaduna State.

Table 5: Motivation of Senior Secondary School Science students assessed and evaluated using a web-based multimedia system and those assessed and evaluated using traditional methods in the Zaria Metropolitan Area of Kaduna State.

Variable	SA	A	D	SD	UA	DF	X2 computed	X2 critical	p-value
Motivation derived among students assessed and evaluated using web-based multimedia system with those assessed and evaluated using traditional methods.	318	385	9	3	0	40	134.907	55.758	0.011
	263.1	423.2	15.9	4.5	8.1				

X2 computed > X2 critical at df 40, p-value < 0.05

Above showed that significant differences exist in motivation among students assessed and evaluated using a web-based multimedia system with those assessed and evaluated using traditional methods among Senior Secondary School (Science) students in the Zaria Metropolitan Area of Kaduna State. Reason being that the calculated p-value of 0.011 is lower than the 0.05 alpha level of significance and its' computed chi square value of 134.907 is greater than the chi square critical value of 55.758 at df 40. Their observed frequency counts responses are 318, 385, 9, 3 and 0 for strongly agree, Agree, Disagree, strongly disagree and undecided respectively. This shows that the differences in their perception in this regard, is significant. Therefore, the null hypothesis which state that there is no significant difference in student motivation among those assessed and evaluated using a web-based multimedia system with those assessed and evaluated using traditional methods among Senior Secondary School (Science) students in the Zaria Metropolitan Area of Kaduna State is hereby rejected.

Hypothesis Three

There is no significant difference in the impact of using web-based multimedia systems and impact of traditional methods on the assessment and evaluation of Senior Secondary School Science Students' academic performance in the Zaria Metropolitan Area of Kaduna State.

Table 6: Impact of web-based multimedia systems and traditional methods on the academic assessment and evaluation of Senior Secondary School Science Students' academic performance in the Zaria Metropolitan Area of Kaduna State.

Variable	SA	A	D	SD	UA	DF	X2 computed	X2 critical	p- value
Impact of web multimedia systems with traditional methods on academic assessment and evaluation among Senior Secondary School Science Students' academic performance	317	380	9	9	0	40	172.677	55.758	0.012
	268.4	417.0	18.4	5.5	5.5				

X2 computed > X2 critical at df 40, p-value = 0.012 < 0.05

Above showed that significant differences exist among the Senior Secondary School (Science) Students' on Impact of web multimedia systems with traditional system on assessment and evaluation among Senior Secondary School (Science) Students' academic performance in the Zaria Metropolitan Area of Kaduna State. Reason being that the calculated p-value of 0.012 is lower than the 0.05 alpha level of significance and its computed chi square value of 172.677 is greater than the chi square critical value of 55.758 at df 40. Their observed frequency counts responses are 317, 380, 9, 9 and 0 for strongly agreed, Agreed, Disagreed, strongly disagreed and undecided respectively. This shows that the differences in their perception in this regard, is significant. Therefore, the null hypothesis which state that there is no significant (difference) in the impact of web-based multimedia systems with traditional methods on the academic assessment and evaluation among Senior Secondary School (Science) Students' academic performance in the Zaria Metropolitan Area of Kaduna State is hereby rejected.

Discussion of Findings

The discussion of findings was done in line with the results of this study ;

Instructional material utilization and the use of web-based multimedia system and traditional methods.

The current study investigates the differences in web multimedia instructional tools utilization among Secondary School Science students' and traditional methods in academic assessment and evaluation. The web multimedia instructional material utilization outcome is considerably high in compairing to that of traditional methods. Assessing academic performance using a multimedia system saves time for both students and teachers compared to traditional method. Therefore, influence of instrucional material utilization among students' who used a web-based multimedia system and those who used traditional methods and the difference in influence on students' academic outcomes is considerably high, majorly because Multimedia-based assessments provide a more comprehensive evaluation of students' skills than traditional methods.

Kiat et al. (2020) study on the effectiveness of instructional multimedia tools utilization on the academic achievement of science subjects in 'Junior' High school learners in Malaysia corroborated this study. The findings of this research showed that instructional multimedia tools utilization approach was appropriate for learning science subjects for Junior high school students. Students were found to be more active in engaging themselves in their learning and contributed to higher academic achievement in the post-test result. Through learning with the integration of Multimedia-Instructional Material Assisted Content, students' achievement in science subjects is enhanced, and it has helped students develop a better understanding of science concepts and ideas.

The findings of Almasi et al. (2017) work on utilizing instructional multimedia elements in learning is in tandem with the result of this current study Almasi et al (2017) indicated that majority of students who utilized multimedia instructional contents online, use it for online studies, and assessment simulation which lead to students' higher academic achievement.

Furthermore, corroborating the current study, Sosnowski (2024) study found that one significant advantage of instructional content utilization on the web is the ability to seamlessly integrate a diverse sensory experience images, sounds, and videos directly into the learning environment. This eliminates the requirement for physical excursions or the procedure of potentially hazardous materials. For instance, learners can almost "scale mountains" during a geography lesson or observe the dissection of a rare animal without leaving the classroom. Furthermore, the use of projectors or individual computers as instructional tools allows for a close-up examination of information and materials, enhancing visual learning and engagement. According to Thompson (2023), students who learn from instructional materials that integrate both text and graphics demonstrate significantly improved problem-solving abilities, with solution accuracy increasing by 55 to 121 percent far higher than students who use conventional methods whose problem-solving abilities, with solution accuracy decreasing by 86 percent. The inclusion of images alongside text can enhance learning in several ways: Reduced cognitive load with visual elements which can help learners process information more effectively by breaking down complex text and making it more visually appealing, improved retention with graphics that can enhance

retention by highlighting key information through strategic placement, layout, and color, activated prior knowledge with visual analogies that can quickly activate prior knowledge. It makes it easier for learners to connect new information to existing concepts, enhanced understanding with diagrams and visualizations which can facilitate higher academic achievement and the creation of mental models, aiding in the comprehension of abstract concepts and processes.

Opposing the current study on instructional material utilization among learners who used a web-based multimedia system with learners who used traditional methods in the academic assessment and evaluation of students. Taylor (2024) countered the current study that successful implementation of multimedia lessons often necessitates significant investments in technology, including computers, projectors, and other electronic devices. This can pose financial challenges for educational institutions, particularly in terms of acquiring and maintaining high-quality equipment for all students. Furthermore, Taylor (2024) stated that integration and utilization of instructional multimedia elements, such as videos and images, can potentially slow down the pace of instruction due to factors like loading times and technical difficulties. Unequal access to computers and reliable internet connection among learners can likewise create disparities in learning outcomes. Variations in the quality of devices can impact students' ability to effectively engage with multimedia resources and complete assignments. The part of the tutor shifts significantly when designing multimedia-based learning experiences. Instead of being the primary source of information, the teacher transitions to a facilitator, guiding student learning and providing support. However, Taylor (2024) further suggested that the shift in roles can present challenges in classroom management. Self-paced learning environments, where students' progress through learning materials at their stride, can make it difficult to maintain classroom order and check that learners were engaged. These tasks are more intensified when group work or shared computer access is involved. Furthermore, students with limited technological proficiency may require additional time to develop the necessary computer skills, potentially hindering their ability to effectively access and utilize the learning materials, thereby seriously hindering their academic achievement.

Hudia (2024) also disagrees with the findings of this study, Hudia (2024) related to utilization and assimilating multimedia tools into the training and learning method in Bangladesh. Key challenges identified included: Inadequate infrastructure- Lack of sufficient multimedia equipment (projectors, computers), inconsistent internet connectivity, and insufficiently furnished technology classrooms, Teacher training and preparedness: Limited teacher training and absence of self-assurance in applying web multimedia tools effectively, Resource constraints: Insufficient funding for the procurement, maintenance, and upgrade of digital equipment and resources, Time constraints: Technical difficulties with equipment and the time required to integrate multimedia effectively can disrupt the flow of multimedia instructional tools utilization thereby affecting learners academic achievement.

Assessment and evaluation of students' academic assessment and motivation using web multimedia system and traditional method

The current study investigates the differences in students' motivation among those who use a web-based multimedia system and students who use traditional methods in academic assessment and evaluation.

The current study on motivation and the use of a web-based multimedia system on students' academic attainment of Senior Secondary School Science students is considerably high. This is because the cumulative mean of 4.300 exceeds the decision mean of 3.00. Specifically, they asserted that Web multimedia systems provide a more interactive way of learning than traditional methods as this has the most influence with the highest mean response of 4.436. With details of the response show that whiles specifically, a total of 318 respondents strongly agreed, also 385 agreed, 9 disagreed as the rest 3 strongly disagreed, while there are 97 unanswered questions. Therefore, the outcome on the influence of motivation on the use of a web-based multimedia system on students' academic attainment is considerably high, especially as they asserted that Web multimedia systems provide a more interactive way of learning than traditional methods.

Supporting the current study on motivation among students who use a web-based multimedia system and those who use traditional method is Tingting (2008) who investigated how simulations and real-world examples can increase students' motivation by demonstrating the relevance and practical applications of learned skills. Tingting (2008) also investigated the influence of instructional media on learning, specifically focusing on the efficiency of animated instructions with narration. The findings support the expectation that exploratory learning tasks provide learners with higher motivation on the learning procedure and attain higher academic achievement. This finding supports the dynamic media hypothesis, which posits that learners who use multimedia as a tool in learning get more motivated and attain academic excellence than learners who use text-based instruction.

UNICEF (2017) report opposes the current study on motivation among students who use a web-based multimedia system UNICEF (2017) acknowledges the significant risks posed by digital technology to children's safety, privacy, and well-being, highlighting that these technologies can exacerbate existing vulnerabilities. Worries exist concerning the possible negative impacts of web multimedia on student learning, social interactions, and overall well-being. The article by UNICEF explores how the integration of web-based multimedia technologies, such as iPads, laptops, internet

connections, and social media, within the classroom can inadvertently negatively impact the educational process. The report further suggests that excessive web multimedia system technology use can: detrimentally affect literacy skills by impairing reading and writing abilities, dehumanize learning environments by reducing opportunities for meaningful face-to-face interaction, distort social interactions by altering teacher-students' relationships. In addition, the web based multimedia system hinder the development of essential social skills, and by Increasing social isolation, lead to increased social isolation and decreased engagement with the physical world. While many students perceive technology as an effective learning tool, it is crucial to recognize the potential for misuse and its potential to hinder rather than enhance the educational process. The report, therefore, concluded that it is essential to implement strategies that mitigate the potential demotivation impacts of technology on students' learning.

Assessment and evaluation of students using web multimedia system and traditional method and academic performances

Osabutey et al. (2022) study corroborates the current study on the impact of web-based multimedia systems on the academic assessment and evaluation of students. Osabutey et al. study investigates online assessment's impact on student academic performance in higher education. The research establishes significant differences in learners' performance between online and paper-based assessments. The results intensely showed that web multimedia (online platforms) assessments can confidently influence student academic achievement.

Akpe n et al. (2024) is in tandem with this study, when it was observed that there are differences after assessment and evaluation in academic performance of students with access to the online multimedia content in their school labs or on their mobile phones. However, for those students with access to household online multimedia content and public places, and those without access, there are no differences in their academic performance. The result revealed that online multimedia content access influence academic achievement among students, as those with online multimedia access have shown a higher improvement in academic performance than those without access.

Opposing the current study Ellis (2022) found evidence linking excessive screen time to adverse health effects, including physical health issues which increased the risk of eye strain, sleep disturbances, musculoskeletal problems, Cognitive and academic impacts with potential for decreased attention span, impaired cognitive function, and negative impacts on academic performance. The study highlighted the increasing pressure on educators to incorporate technology (multimedia) into their teaching, leading to a significant increase in student screen time. This "gateway habit" of excessive technology use can contribute to unhealthy lifestyle choices in adolescents. Based on these findings, Ellis (2022) opposes use of multimedia instructional tools to enhance academic performance but rather Ellis encourages the conventional instructional material utilization, enhance their utilization in order to safeguard the overall wellbeing of students.

Conclusion

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

- a) Instructional material utilization among students using web-based multimedia systems is considerably higher than those using traditional methods in terms of academic assessment and evaluation in the Zaria Metropolitan Area of Kaduna State.
- b) Motivation among learners who used a web-based multimedia system is considerably higher than those using traditional methods in the academic assessment and evaluation of Senior Secondary School Science students' academic in Zaria Metropolitan Area of Kaduna State.
- c) The impact of using web multimedia systems for assessment and evaluation on academic performance is considerably higher than those using traditional methods of assessment and evaluation among students in Zaria Metropolitan Area of Kaduna State.

Recommendations

The following recommendations are suggested:

- 1) Kaduna State Government should make appropriate multimedia instructional packages available (reliable internet access, sufficient computer systems, multimedia instructional software, projectors, power backups) in Secondary Schools and provide periodic professional development to empower stakeholders to fully leverage the system's potential
- 2) The State government should invest in the construction of standard multimedia laboratory in Secondary Schools and employ Educational Technology instructors to manage the laboratories.
- 3) Secondary Schools should leverage the potential of multimedia in academic assessment and evaluation, like (the one presented in this research). This will assist to scale down the budget of stationaries and quicken students' assessment processes.
- 4) Secondary school libraries should be equipped with web multimedia facilities and software applications to assist students simulate external examinations.

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CITATION

Benjamin A. F., Suleiman M., Abubakar S.M., Elisha M.E., Akporuovo H.O., & Akporuovo E. (2025). Design and Development of An Integrated Web Multimedia Systems for Sustainable Assessment and Evaluation of Senior Secondary School Science Students' Academic Performance in Zaria Metropolitan Area, Kaduna State. In *Global Journal of Research in Agriculture & Life Sciences* (Vol. 5, Number 3, pp. 96–105). <https://doi.org/10.5281/zenodo.15621717>