

Research Article

Effects of animated and static graphic instructional packages on students' interest in Basic Science

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Abstract

This study investigated the effects of computer animation and static graphics instructional packages on the interest of Junior Secondary School students in Basic Science in Ankpa Education Zone, Kogi State. Two research questions and two hypotheses guided the study. A quasi-experimental non-equivalent control group design was used. The population comprised 2,105 JSS II students, while a sample of 108 students (67 urban students and 41 rural students) was selected through multistage sampling. Data were collected using the Basic Science Interest Scale (BSIS). This instrument for data collection and the learning packages were subjected to both content and face validations. Also, reliability tests were carried out on the instruments, and it yielded reliability coefficient of 0.80. Mean and standard deviation answered the research questions, while ANCOVA tested the hypotheses at the 0.05 significance level. Results showed that computer animation significantly increased students' interest compared to static graphics. Location had no significant influence. The study concluded that well-designed animations enhance interest of the learners, and recommended their use in teaching Basic Science concepts.

Keywords: Animation, Static Graphics, Instructional Packages, Students' Interest, Basic Science.

1. Introduction

The role of science in national building and development cannot be overemphasized. Science involves the systematic study of the environment through the collection, organization, and verification of knowledge about the natural world. It is a discipline that seeks to provide answers to many of the challenges and questions humans encounter in their environment. According to Bhagat (2018), science is the study of natural phenomena through observation and experimentation that lead to conclusions which can be verified. As a field of study, science is divided into different subjects such as Physics, Chemistry, and Biology at the senior secondary and tertiary levels of education. However, at the primary and junior secondary school levels, these subjects are integrated and taught as a single subject known as Basic Science.

Basic Science is a foundational subject designed to prepare primary and junior secondary school students for specialized science disciplines such as Physics, Chemistry, and Biology at the senior secondary and post-secondary

levels, thereby contributing to national development. It is an integrated course of study that eliminates rigid boundaries between different scientific disciplines. According to Collett et al. (2026), the objectives of Basic Science education include providing students at the upper basic level with a solid foundation for advanced learning in individual science subjects, enhancing the scientific literacy of the population, and enabling students to understand their environment holistically rather than in isolated segments.

The importance of Basic Science in everyday life cannot be overstated. It serves as a foundation that equips individuals with essential scientific knowledge and skills required to meet the growing demands of society. The knowledge acquired through Basic Science at the upper basic level promotes trans-formative developments in various fields such as medicine, engineering, electronics, and aeronautics (Azubike et al. 2021). The practical application of scientific knowledge has enabled countries like China and India to transform from relatively poor economies into

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industrial powers capable of competing with developed nations (Altenburg et al. 2008).

It is evident that individuals tend to put forth their best efforts toward achieving goals in which they have interest. Interest refers to the desire or willingness to learn about or participate in particular activities or situations. Judith, Jessi et al. (2016) described interest as both a psychological state characterized by focused attention and positive emotions toward a specific subject, and a lasting tendency to re-engage with that subject over time. Studies conducted by Judith et al. (2016) as well as Sambo, Ikukwi et al. (2014) revealed that students who show high levels of interest in the learning process tend to achieve better academic outcomes. Consequently, it becomes necessary to employ effective instructional methods in Basic Science teaching to stimulate students' interest, enhance their participation, and ultimately improve their academic achievement.

However, several studies have shown that students' interest in Basic Science remains relatively low. Sambo et al. (2014) identified low interest among students studying Basic Science and attributed this trend largely to ineffective teaching methods used by many teachers. Their findings revealed that when engaging and motivating teaching methods are employed, students' interest tends to increase. Similarly, Okechukwu and Opara (2021), in their study on team-teaching strategy and students' interest in Basic Science in Anambra State, Nigeria, found that students' interest in Basic Science has not reached an optimal level due to poor teaching methods and instructional approaches, which in turn contributes to persistent poor academic performance. Evidence from the reviewed literature therefore indicates a strong relationship between students' interest and instructional approaches in achieving the objectives of Basic Science education.

Instructional approaches refer to the strategies, activities, and materials used in the teaching process to enhance students' engagement and interest in learning. Martin and Akpan (2023) defined instructional approaches as a combination of activities, materials, and devices utilized by teachers to simplify concepts and promote quick understanding among students. Examples of such approaches include the use of virtual reality, augmented reality, interactive digital boards, smart boards, tablets, computer animations, and static graphics in teaching and learning. Based on findings from an empirical study, Papama et al. (2022) concluded that the use of appropriate instructional approaches in teaching significantly enhances students' interest and improves academic performance. Considering the effectiveness of suitable instructional approaches in promoting students' interest in science, the researchers deemed it necessary to investigate the influence of computer animation and static graphics on students' interest in Basic

Science.

Computer animation is a subset of computer graphics in which images or objects displayed on a screen appear to move. Samuel (2018) defined animation as the creation of motion through the rapid display of a sequence of still images. He further explained that when static images are shown quickly in succession, the human brain perceives them as continuous movement. Alabi, Omeiza, and Falode (2015) identified three key components of animation: images, indications of movement, and simulation. The flexibility of animation enhances learning by incorporating multiple sensory stimuli such as visual and auditory elements, thereby increasing students' interest in the subject (Josiah, 2017). Research has also shown that animations are particularly effective in teaching science because they help students understand abstract and complex concepts more easily (Olamigoke, 2021). By engaging multiple senses simultaneously, animations capture learners' attention and sustain their interest. Consequently, animation has created new possibilities in education by offering innovative methods of content delivery and promoting learner-centered learning environments that enhance students' interest. Based on these advantages, this study seeks to examine the influence of computer animation on students' interest in Basic Science.

Another instructional approach investigated in this study is computer static graphics. Computer static graphics refer to non-moving visual representations displayed on computer screens. Gambari et al. (2014) described computer static graphics as visual representations of texts, ideas, or concepts presented through computers, which enable learners to identify key information, organize ideas, and understand relationships among different concepts in a learning task. Static graphics may include graphs, diagrams, photographs, drawings, line illustrations, numbers, and symbols presented through computer systems. Studies on learning processes have shown that the human sense of sight is more developed than other senses used for learning. The visual system plays a crucial role in obtaining and processing information from the surrounding environment (Yuan, 2021). The potential of computer animation and static graphics to stimulate and sustain students' interest, as highlighted in previous studies, motivated the researchers to investigate the influence of these instructional approaches on students' interest in Basic Science. In addition, the study also examined the interaction effect of gender and teaching technique on students' interest in Basic Science.

The purpose of this research is to investigate the effects of computer animation and statics graphic on junior secondary school students' interest in Basic Science in Nigeria schools. The specific purposes of the study are to determine the:

- (i) effects of computer animations and static graphics instructional packages on students' interest in Basic Science;
- (ii) influence of location on students' interest in Basic Science;

The following two research questions were used to guide the study:

1. what are the mean interest ratings of students taught Basic Science using computer animations and those taught using computer static graphics instructional packages?
2. what is the influence of location on students' achievement in Basic Science?

The study was guided by the following set of hypotheses and was tested at 0.05 level of significance;

H₀₁. there is no significant mean interest ratings of students taught Basic Science using computer animations and those taught using computer static graphics instructional packages

H₀₂. there is no significant influence of location on students' achievement in Basic Science.

2. Methodology

This study employed a quasi-experimental research design, specifically the pretest-posttest non-equivalent control group design. The population of the study consisted of 2,105 Junior Secondary School Two (JSS2) students offering Basic Science in public schools within Ankpa Education Zone. This population comprises 624 JSS II Basic Science students in urban public schools and 1481 JSS II Basic Science students in rural public schools

A sample of 108 students was selected from four public secondary schools in the study area. The instrument used for data collection was the Basic Science Interest Scale (BSIS). For the experimental treatment, computer animation and static graphics instructional packages, developed by the researchers, were utilized.

The BSIS instrument, computer animation, and static graphics packages were validated by three experts, one from the Department of science education, one from the Department of measurement and evaluation. The reliability of the BSIS was determined using the Cronbach's Alpha reliability method, which produced a reliability coefficient of 0.80, indicating good internal consistency.

The researchers visited the four schools for the experiment two weeks before the commencement. The aim was to seek approval from the authority of the schools to carry out the study. Also, to get acceptance and cooperation of the Basic Science teachers who served as research assistants. The research assistants were given hard and soft copies of the two instructional packages for Basic Science teaching prior to the actual coaching on the usage of these packages. The researchers scheduled periods of training workshop for the research assistants for familiarization with the research instruments and approaches. Each research

assistant in the four selected schools was exposed to four hours training at the school sampled in Ankpa town for two weeks. The guidelines on efficient and effective application of computer animation and static graphics in teaching basic science was well emphasized for the involved teachers. Resultantly, the training aided in achieving a common instructional standard among the research assistants.

Before the treatment, there was first administration of the BSIS. The first administration of the BSIS was rated by the researchers so as to ascertain the students' initial interest in Basic science and to determine the comparability of the two groups (computer animation and static graphic instructional approach) with respect to their interest in the first administration scores. Thereafter, the experiment commenced. The computer animation groups were taught using computer animation video clips displayed on computer for the students to see the various bones of the body and their movement patterns and also to see respiratory processes. Based on the researcher's directives, the research assistants simultaneously explain all the sections of the animation (in line with the lesson plans) for the students and also guided them not to be distracted or taken away from the objectives of the lesson as a result of amusement that would result from the animation. The research assistants also paused the animation intermittently when necessary for deeper explanations of concepts and processes.

The computer static graphics groups on the other hand, were taught with static graphics instructional packages with alternative lesson plans. These lesson packages consisted of properly arranged structures and illustrations of skeletal and respiratory system in computer static graphics. The research assistants verbalized the entire information and at the same time continued to press computer buttons to show images/structures that represent concepts and processes of the planned lessons. The traditional lecture method was used here; this took the shape of the normal classroom activities where students interact with the contents of the learning packages during instructional processes. The entire teaching period lasted for four weeks,

At the end of the lesson, the tools BSIS for measurement were administered to the students as second administration both computer animation and static graphic groups by the research assistants. The scores of both the first administration and second administration were used for research analysis and inferences.

Data collected were analyzed using mean and standard deviation to answer the research questions, while the hypotheses were tested using Analysis of Covariance (ANCOVA) at the 0.05 level of significance.

3. Results

3.1. Answers to research questions

3.1.1. Research Question 1

What are the mean interest ratings of students taught Basic Science using computer animations and those taught using computer static graphics instructional packages?

Table 1: Mean analysis of the interest scores of students taught Basic Science using Animation and those taught using Static graphics

Treatment	N	Pretest		Posttest		Mean gain
		Mean	Std. Deviation	Mean	Std. Deviation	
Animation	43	29.51	4.89	62.81	6.92	33.30
Static Graphics	65	29.77	4.79	52.88	9.23	23.11

Table1 indicates that the students who were taught Basic Science using animation instructional method had mean interest scores of ($M = 29.51$, $SD = 4.89$) and ($M = 62.81$, $SD = 6.92$) at the pretest and posttest respectively, while the students who were taught Basic Science using static graphics instructional method had mean interest scores of ($M = 29.77$, $SD = 4.79$) and ($M = 52.88$, $SD = 9.23$) at the pretest and posttest respectively. The mean gain scores of 33.30 and 23.11 for the students taught using animation and those taught using static graphics indicate that the

students taught using animation had higher interest at the posttest than their counterparts taught using static graphics. Besides, the posttest standard deviations of 6.92 and 9.23 for the two groups respectively show that the individual interest scores of the students taught using static graphics varied more from their group mean than those of the animation group.

3.1.2. Research Hypothesis 1

There is no significant mean interest ratings of students taught Basic Science using computer animations and those taught using computer static graphics instructional package

Table 2: Analysis of covariance of the effect of computer animation and static graphics on students' interest in Basic Science

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2672.216 ^a	4	668.054	9.363	.000	.267
Intercept	11257.470	1	11257.470	157.784	.000	.605
Pre-interest	110.474	1	110.474	1.548	.216	.015
Treatment	2377.435	1	2377.435	33.322	.000	.244
Location	3.026	1	3.026	.042	.837	.000
Treatment *	.153	1	.153	.002	.963	.000
Location Error	7348.784	103	71.347			
Total	358864.000	108				
Corrected Total	10021.000	107				

Table 2 reveals that there is a significant effect of computer animation and static graphics on students' interest in Basic Science in favour of the students taught using animation, $F(1, 103) = 33.322$, $p < .001$. Thus, the null hypothesis is rejected since the p-value of .000 is less than the .05 level of significance. Besides, the effect size of .244 implies that 24.4% improvement in students' interest in

Basic Science is attributed to the effect of animation instructional method.

3.1.3. Research Question 2

What is the influence of location on students' interest in Basic Science?

Table 3: Mean analysis of the interest scores of urban and rural school students in Basic Science

Location	N	Pretest		Posttest		Mean gain
		Mean	Std. Deviation	Mean	Std. Deviation	
Urban	67	29.87	4.75	57.55	9.69	27.68
Rural	41	29.34	4.94	56.29	9.75	26.95

Table 6 indicates that the urban school students had mean interest scores of ($M = 29.87$, $SD = 4.75$) and ($M = 57.55$, $SD = 9.69$) at the pretest and post-test respectively, while the rural school students had mean interest scores of ($M = 29.34$, $SD = 4.94$) and ($M = 56.29$, $SD = 9.75$) at the pretest and post-test respectively. The mean gain scores of 27.68 and 26.95 for the urban and rural school students respectively indicate that the urban school students had higher post-test mean interest score than their rural school counterparts. Besides, the post-test standard deviations of 9.69 and 9.75 for the urban and rural school students respectively show that the individual interest scores of the rural school students varied more from their group mean than those of the urban school students.

3.1.4. Research Hypothesis2

There is no significant influence of location on students' interest in Basic Science.

Table 2 reveals that there is no significant influence of location on students' interest in Basic Science, $F(1, 103) = .042$, $p = .837$. Thus, the null hypothesis is not rejected since the p-value of .837 is greater than the .05 level of significance. Therefore, the inference drawn is that location of school did not influence students' interest in Basic Science.

4. Discussion

Effect of Computer Animation and Static Graphics on Students' Interest in Basic Science

The findings of this study revealed that students taught Basic Science using the computer animation instructional package developed higher interest than those taught using computer static graphics. This was evident in the higher mean gain score of students exposed to animation (33.30) compared to those taught using static graphics (23.11). The Analysis of Covariance (ANCOVA) result further showed that the difference was statistically significant. This indicates that the use of computer animation significantly enhanced students' interest in Basic Science.

The higher interest recorded among students exposed to animation may be attributed to the dynamic and engaging nature of animated instructional materials. Animation presents concepts in a moving and interactive form, which attracts learners' attention and stimulates curiosity. Through the integration of visual motion and sometimes audio effects, animation helps learners visualize scientific processes that are difficult to observe directly. This enhances understanding and sustains learners' interest during instruction.

This finding is consistent with the assertion of Samuel (2018) who explained that animation creates the perception of motion through the rapid display of images, thereby making learning more engaging and easier to understand.

The result also supports the view of Josiah (2017) that the flexibility of animation enhances learning by stimulating multiple senses, especially visual and auditory channels, which increases students' interest in the learning process.

Furthermore, the finding agrees with Olamigoke (2021) who reported that animation is particularly effective in science teaching because it helps learners understand abstract and complex concepts more easily. When students are able to visualize scientific processes clearly, their motivation and interest in the subject tend to increase. Similarly, the result aligns with the findings of Papama et al. (2022) who concluded that the use of appropriate instructional approaches significantly improves students' engagement and interest in learning.

The result also supports the earlier findings of Alabi et al. (2015) who emphasized that animation integrates images, movement, and simulation, thereby creating a more interactive learning environment that promotes students' participation and interest in science subjects.

However, although students taught with static graphics also showed improvement in interest from pretest to posttest, the improvement was lower compared to the animation group. This may be because static graphics, such as diagrams, charts, and pictures, provide visual support but lack the dynamic features that can vividly demonstrate scientific processes. This observation is consistent with Gambari et al. (2014) who stated that static graphics help learners organize and interpret information visually but may not provide the same level of engagement as animated representations.

Influence of Location on Students' Interest in Basic Science

The findings of the study also revealed that school location (urban or rural) had no significant influence on students' interest in Basic Science. Although the mean gain scores indicated slight differences between urban and rural students, the ANCOVA result showed that the difference was not statistically significant. This implies that students' interest in Basic Science was not determined by whether they attended urban or rural schools.

The similarity in interest levels between urban and rural students may be attributed to the fact that both groups were exposed to the same instructional strategies and learning materials during the experiment. When effective instructional methods such as computer-based teaching approaches are applied, they can motivate learners irrespective of their geographical location.

This finding supports the view of Martin and Akpan (2023) who emphasized that instructional approaches play a major role in promoting students' engagement and understanding in science learning. Their study suggested that when appropriate teaching strategies and materials are used, they can improve learning outcomes and interest among

students regardless of background or location.

The finding also implies that the integration of technology-based instructional approaches such as computer animation can bridge the educational gap that often exists between urban and rural schools. When properly implemented, such approaches provide equal learning opportunities for students and encourage their participation in science learning.

5. Conclusion

The study investigated the effects of computer animation and static graphics instructional approaches on students' interest in Basic Science. The findings revealed that computer animation significantly enhanced students' interest in Basic Science more than static graphics. Students exposed to animation showed higher mean gain scores, indicating that the use of dynamic and visually engaging instructional materials can stimulate learners' curiosity and motivation to learn.

The study also found that school location (urban or rural) had no significant influence on students' interest in Basic Science. This suggests that when effective instructional strategies and appropriate learning materials are employed, students can develop similar levels of interest in learning regardless of their geographical location. Therefore, the integration of computer animation in teaching Basic Science can serve as an effective strategy for improving students' interest in the subject.

Recommendations

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

1. Basic Science teachers should incorporate computer animation into their instructional practices to enhance students' interest and engagement in the subject.
2. Schools should be equipped with adequate ICT facilities, such as computers, projectors, and educational software, to enable teachers effectively use animation and other multimedia instructional packages in teaching.
3. Government and educational stakeholders should organize training workshops and seminars for teachers on how to develop and utilize computer animation and other technology-based instructional strategies.
4. Curriculum planners should integrate the use of animation and multimedia instructional materials into the Basic Science curriculum to promote innovative teaching and learning.
5. Since location was found not to significantly influence students' interest, equal provision of instructional resources should continue to be ensured in both urban and rural schools to sustain balanced educational opportunities.
6. Researchers should conduct further studies on the effect of computer animation on other learning outcomes, such as

students' academic achievement, retention, and problem-solving skills in science subjects.

Abbreviations

BSIS	Basic Science Interest Scale
ANCOVA	Analysis of Covariance

Author Contributions

Jonathan Ameh: Conceptualization, Methodology, Investigation, Validation, Writing –Original Draft, Project Administration, ,

Ngozi, M. Eya: Data Curation, Investigation, Formal Analysis, Writing - original draft.

Virginia Chinenye Mbanekwu : Writing–Review & Editing

Joan Agbenyo Emmanuel-Samson: Writing–Review & Editing

Janet Adedoyin Adeoye: Writing – Review & Editing

Conflicts of Interest

The author(s) declare that they have no known competing financial interests, professional affiliations or personal relationships that could have appeared to influence the work reported in this paper.

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