© JUN 2026 | IRE Journals | Volume 9 Issue 12 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I12-1718581

Impact Of Creative Arts Integration on Pupils' Interest, Comprehension, And Retention in Science Learning at Kingdom Heritage Model School, Goshen, Karu Local Government Area, Nasarawa State

CHONGVIRUM ALHAMDU GIFT[1], DR. SUNDAY O. IGBABA[2], DR. DANIEL J. CHIKADA[3]
[1,2,3]*Department of Theatre and Cultural Studies, Faculty of Arts, Nasarawa State University, Keffi, Nasarawa State, Nigeria*

Abstract- ***This study examined the impact of creative arts integration on pupils' interest, comprehension, and retention in science learning at Kingdom Heritage Model School, Goshen, Karu Local Government Area, Nasarawa State, Nigeria. Using a mixed-methods design that combined quantitative survey data from 80 pupils and qualitative insights from key informant interviews with six teachers and focus group discussions with 12 pupils, the study explored how instructional strategies such as drama, drawing, music, storytelling, and model-making enhance the teaching and learning of science at the primary and junior secondary levels. The findings reveal that creative arts integration significantly improves pupils' engagement, comprehension, and retention of scientific concepts, with 77.5% of pupils reporting better understanding when creative methods were used and 85% affirming that drawing or singing helped them remember science facts. Teachers observed increased classroom participation and improved memory, particularly when lessons involved songs, role play, and visual illustrations. However, the study also identifies barriers such as resource scarcity, time constraints, inadequate teacher training, and rigid curricular frameworks that hinder sustained implementation. Grounded in Social Constructivism and Participatory Communication Theory, the study argues that creative arts are not supplementary tools but essential strategies for making science accessible, enjoyable, and meaningful. Recommendations include curriculum revision, teacher professional development, and increased institutional support for creative pedagogy in Nigerian primary schools.***

Index Terms: Creative arts, science education, pedagogy, pupil engagement, comprehension, retention, Nigeria

I. INTRODUCTION

Science education occupies a central position in national development, yet many Nigerian pupils continue to struggle with its abstract and often intimidating content. In the face of this challenge, educators and researchers have increasingly turned to interdisciplinary and participatory teaching strategies as a way of bridging the gap between scientific theory and learner experience. Among these, the integration of creative arts into science instruction stands out as both a culturally resonant and cognitively stimulating approach. Creative arts, which encompass drama, music, visual arts, storytelling, dance, and model-making, offer multisensory pathways through which scientific ideas can be meaningfully explored and retained (Hardiman, JohnBull, and Carran 19).

In Nigeria, the dominant mode of science instruction has historically been teacher-centred, relying heavily on chalk-and-talk methods that inhibit learner engagement and curiosity. Research has consistently shown that such approaches fail to address the diverse cognitive and learning styles of pupils, particularly at the foundational stages of education (Oludipe and Oludipe 55). Mohammed, Reiss, and Hargreaves, in a study of Lagos State students, established that learners particularly valued collaborative group work, familiar real-world examples, and practical sessions in making sense of abstract scientific ideas (Mohammed et al. 28). These findings echo the calls for constructivist and participatory approaches that position learners as active constructors of knowledge.

© JUN 2026 | IRE Journals | Volume 9 Issue 12 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I12-1718581

Kingdom Heritage Model School in Goshen, Karu Local Government Area, Nasarawa State, is a faith-based institution recognised for blending academic learning with creative pedagogical practices. The school offers a compelling case study for examining how creative arts methods are implemented in the teaching of science subjects, what challenges arise, and how both teachers and pupils perceive the experience. This study is anchored in the specific objective of assessing the impact of creative arts on pupils' interest, comprehension, and retention in science learning, drawing on the broader research goal of evaluating the use of creative arts as a strategy for communicating science subjects at the school.

The study is significant because it addresses a gap in the existing literature, which tends to focus on older learners or Western educational contexts and rarely examines how localised, arts-based strategies operate within Nigerian primary classrooms. By investigating the creative-arts-science interface in a specific school context, this paper contributes empirical evidence that can inform curriculum developers, policymakers, and educators seeking more engaging and effective approaches to science instruction.

II. STATEMENT OF THE PROBLEM

Despite growing evidence that arts-integrated approaches enhance science learning, the creative arts remain largely underutilised in Nigerian primary and junior secondary schools. The dominance of conventional didactic methods, coupled with the absence of structured support for creative pedagogy, has left many pupils disengaged from science subjects. Ekarika, Okon, and Adie observe that the use of multiple intelligences teaching strategies significantly improved basic science outcomes compared to direct instruction methods, underscoring the urgent need to tailor instruction to diverse learning styles (Ekarika et al. 12).

At Kingdom Heritage Model School, there appears to be a deliberate effort to integrate creative arts into the curriculum, particularly in science teaching. However, there is no systematic assessment of how this approach is implemented, how effective it is, or what barriers it faces. This study therefore fills that gap by evaluating the impact of creative arts integration on pupils' interest, comprehension, and retention, while also examining the challenges that hinder its broader adoption. The specific objective of this paper is to assess the impact of the creative arts approach on pupils' interest, understanding, and retention of science concepts. The broader aims of the study include investigating the methods through which creative arts are integrated into science teaching, exploring teacher and pupil perceptions of the approach, and identifying the challenges associated with implementing creative arts in science classrooms.

III. CONCEPTUAL CLARIFICATIONS

Creative Arts in Education

Creative arts in education refers to the use of expressive forms such as drama, music, drawing, painting, dance, storytelling, and model-making as instructional tools to enhance learning. These forms are not merely decorative; they serve as cognitive scaffolds that allow learners to engage with complex content through familiar, sensory-rich experiences. Lukaka argues that engagement in the visual and performing arts stimulates both expressive and cognitive capacities, developing pupils' abilities for fluent, flexible, and elaborative thinking (Lukaka 4). In the context of this study, creative arts are treated as pedagogical strategies deliberately employed to communicate science subjects to primary and junior secondary pupils.

Science Education at the Primary Level

Science education at the primary level encompasses the teaching of basic science concepts, including biology, chemistry, and physics, as well as subjects such as home economics and agricultural science. The goal is not simply to transmit facts but to cultivate scientific literacy, curiosity, and evidence-based reasoning among young learners (Kadir, Tytler, and White 33). Given the abstract nature of many scientific concepts, primary education demands teaching approaches that make these ideas accessible, relatable, and memorable. Creative arts, in this sense, serve as a bridge between theory and practical experience.

Pupil Engagement, Comprehension, and Retention

Pupil engagement refers to the degree of interest, curiosity, and active participation displayed by learners during the learning process. Comprehension refers to the depth of understanding achieved, while retention refers to the ability to recall information over time. The three are closely interrelated: engaged learners tend to comprehend more deeply, and deeper comprehension supports longer-term retention. Research consistently shows that multisensory, participatory methods activate multiple cognitive pathways, thereby strengthening all three dimensions (Rinne, Gregory, Yarmolinskaya, and Hardiman 389).

IV. LITERATURE REVIEW

Creative Arts and Learner Engagement

The relationship between creative arts and learner engagement is well established in educational literature. Hardiman, JohnBull, and Carran, in a study using a randomised control trial across fifth-grade classrooms, found that students who received arts-integrated instruction retained science content as well as or better than those taught through traditional methods (19). Akinbobola and Afolabi also demonstrated that science students exposed to guided discovery and pictorial aids significantly outperformed peers taught through expository methods, highlighting how visual and creative scaffolds support cognitive development (Akinbobola and Afolabi 284). These findings underline that the arts are not peripheral to science learning but actively enhance it.

In the Nigerian context, Nwune, Chine, and Oguezue established a positive relationship between teachers' communicative behaviours, including clarity, responsiveness, and encouragement, and students' performance in basic science (Nwune et al. 44). Their work implies that when teachers deploy expressive and engaging instructional strategies, pupils are more likely to respond positively and achieve better academic outcomes. The creative arts approach builds directly on this insight by offering diverse communicative forms that go beyond verbal explanation to include song, performance, and visual representation.

Storytelling and Narrative in Science Teaching

Storytelling is among the most powerful creative tools in science education because it translates abstract concepts into relatable narratives. Klassen and Froese Klassen argue that when scientific ideas are presented through well-structured stories, students engage more deeply and exhibit improved conceptual understanding, particularly in topics involving sequential processes such as the water cycle or photosynthesis (Klassen and Froese Klassen 22). Fisher's Narrative Paradigm Theory reinforces this point, suggesting that human beings are fundamentally storytelling animals and that ideas are more readily understood and retained when embedded in narratives (Fisher 347). For young learners in Nigerian classrooms, storytelling provides a culturally familiar and emotionally engaging entry point into scientific content.

Visual Arts and Science Comprehension

Visual arts, including drawing, diagramming, and model-making, have been shown to strengthen observational and interpretive skills, both of which are central to scientific inquiry. Tytler, Prain, Hubber, and Waldrip advocate for a representational pedagogy in which student-generated visual artifacts such as drawings, models, and diagrams serve as primary tools for constructing and communicating scientific understanding (Tytler et al. 47). When pupils draw plant parts, sketch the solar system, or construct models of the digestive system, they engage in active knowledge construction that reinforces spatial reasoning and deepens conceptual understanding. The data from this study affirm these claims, as drawing emerged as one of the most frequently cited and effective creative methods across multiple science topics.

Drama and Role Play in Science Learning

Drama and role play offer embodied, participatory forms of learning that are particularly suited to abstract or process-driven science topics. Tuveri, Steri, and Fadda, in a study involving 200 high school students in Sardinia, found that storytelling and theatrical performance significantly enhanced students' engagement and understanding of physics, particularly among those from humanities backgrounds (Tuveri et al. 56). Similar effects have been documented in primary school settings, where

role play helps pupils act out scientific processes, thereby converting abstract sequences into lived, memorable experiences. Hall and Thomson argue that drama and performance activities help learners negotiate shared meanings and foster inclusive participation, especially in multicultural settings (Hall and Thomson 63).

V. THEORETICAL FRAMEWORK

This study is grounded in two complementary theoretical frameworks: Vygotsky's Social Constructivism and Freire's Participatory Communication Theory.

Social Constructivism, as advanced by Lev Vygotsky, posits that learning is a socially mediated process in which knowledge is actively constructed through interaction with others within a cultural and contextual framework (Vygotsky 57). A key concept is the Zone of Proximal Development, which describes the gap between what a learner can achieve independently and what they can achieve with guidance from a more knowledgeable other. In the creative arts classroom, teachers scaffold pupils' understanding by embedding scientific content in drama, music, and storytelling, forms that are already familiar within pupils' cultural experience. The creative arts thus serve as cultural tools that support knowledge construction within social learning environments.

Participatory Communication Theory, rooted in Paulo Freire's Pedagogy of the Oppressed, advocates for dialogic, inclusive communication in which learners are positioned as co-creators of knowledge rather than passive recipients (Freire 68). The theory emphasises horizontal interaction, where learners shape the content and direction of meaning-making through dialogue, creativity, and negotiation. In the context of this study, creative arts represent a participatory paradigm in which pupils contribute to knowledge production through song, drawing, drama, and storytelling. Rather than receiving scientific facts from a teacher-authority figure, learners actively interpret, represent, and re-present scientific ideas through expressive forms.

Together, these frameworks explain why creative arts are effective: they situate learning within social and cultural contexts, they engage learners as active participants, and they enable knowledge to be constructed through dialogue, collaboration, and creative expression. Both frameworks challenge the traditional transmission model of education and advocate for approaches that honour the voices, experiences, and creative capacities of learners.

VI. METHODOLOGY

This study adopted a mixed-methods research design, combining quantitative survey data with qualitative insights from key informant interviews and focus group discussions. The qualitative component employed a case study approach to generate rich, contextual data from participants lived experiences within a natural classroom environment. The study was conducted at Kingdom Heritage Model School, Goshen City, Karu Local Government Area, Nasarawa State, Nigeria. The school is known for integrating creative and artistic practices into its academic curriculum and offered an appropriate setting for investigating the research questions. The target population comprised all science and creative arts teachers as well as pupils in upper primary and junior secondary classes (Primary 5, Primary 6, JSS 1, and JSS 2). A total of 80 pupils, 20 from each class level, participated in the quantitative survey, representing a balanced gender distribution of 41 males and 39 females. For the qualitative component, 15 participants were purposively selected: six teachers (three science teachers and three creative arts teachers) and nine pupils. Twelve pupils also participated in a focus group discussion.

Purposive sampling ensured that participants had direct experience with arts-integrated science teaching. Quantitative data were collected through a structured questionnaire administered to the 80 pupils. Qualitative data were gathered through semi-structured key informant interviews with teachers and a focus group discussion with pupils. Non-participant classroom observations were also conducted to document instructional strategies and learner engagement. Secondary data were drawn from relevant academic literature and policy documents. Data were analyzed thematically for the qualitative

© JUN 2026 | IRE Journals | Volume 9 Issue 12 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I12-1718581

component, with interview transcripts coded line by line and grouped into key categories. Quantitative data were analyzed using frequency counts and percentages. Ethical approval was obtained from Nasarawa State University, Keffi. Informed consent was obtained from all participants, and the study upheld confidentiality throughout.

VII. RESULTS

Demographic Profile of Respondents

The demographic profile of the 80 pupil respondents is presented in Table 1. The sample was drawn equally from four class levels, with a balanced gender distribution across all groups.

Table 1: Demographic Composition of Pupil Respondents

Class Level	Age Group	Male	Female	Total
Primary 5	9-14 years	10	10	20
Primary 6	9-14 years	10	10	20
JSS 1	11-15+ years	11	9	20
JSS 2	11-15+ years	10	10	20
Total		41	39	80

The balanced gender representation allows for equitable analysis of findings. The age diversity, particularly in the junior secondary classes, reflects broader patterns of delayed enrolment or class repetition common in Nigerian schools and has implications for how creative instruction is received across age groups.

Impact on Interest: Enjoyment of Creative Arts in Science

A central finding of this study concerns the marked increase in pupils' enjoyment and interest when creative arts methods are used in science lessons. As shown in Table 2, 50% of respondents strongly agreed and a further 31.25% agreed that they enjoyed science lessons more when teachers used creative arts like drawing or drama, yielding a combined positive response rate of 81.25%.

Table 2: Pupil Enjoyment of Science Lessons with Creative Arts

Response	Frequency	Percentage (%)
Strongly Agree	40	50.0
Agree	25	31.25
Neutral	8	10.0
Disagree	5	6.25
Strongly Disagree	2	2.5
Total	80	100.0

These figures confirm what Social Constructivism predicts: learners are most motivated when actively involved in meaning-making through familiar cultural forms. Pupils described creative lessons as fun, exciting, and less intimidating than conventional instruction. During the focus group discussion, one pupil noted, "Acting is exciting; I feel like a scientist." Another said, "Singing is fun because I can teach my siblings too." These responses indicate that creative methods not only sustain classroom engagement but also extend learning beyond the school environment.

The small proportion of neutral and dissenting respondents (18.75% combined) reflects the reality that not all learners benefit equally from the same methods. Some pupils expressed initial shyness in drama activities, and a few preferred individual, quiet study. This underscores the need for teachers to offer a variety of creative modalities to accommodate diverse learning preferences, consistent with Gardner's Multiple Intelligences Theory.

Impact on Comprehension: Understanding Science through Creative Arts

The data indicate that creative arts integration strongly supports conceptual comprehension. As shown in Table 3, 77.5% of pupils reported better understanding of science topics when creative arts such as storytelling or painting were used during lessons.

Table 3: Pupil Understanding of Science with Creative Arts

Response	Frequency	Percentage (%)
Yes	62	77.5

No	18	22.5
Total	80	100.0

Teachers' accounts further illuminate this finding. Teacher Two described how pupils who had previously struggled with the human circulatory system were able to explain it confidently after participating in a drama activity in which they acted as blood cells moving through arteries and veins. Teacher One similarly observed that pupils who learned the water cycle through a song could recall the correct sequence of processes during a written test. These accounts support the claim that creative arts bridge the gap between abstract theory and concrete understanding, consistent with Tytler et al.'s representational pedagogy.

The 22.5% of pupils who did not report improved understanding may reflect inconsistencies in the quality of creative implementation or a mismatch between teaching strategies and individual learning styles. This suggests that while creative arts are broadly effective, their pedagogical design matters considerably.

Impact on Retention: Drawing and Singing as Memory Tools

Retention emerged as one of the most compelling benefits of creative arts integration. Table 4 shows that 85% of pupils affirmed that drawing or singing helped them remember science facts such as types of soil or sources of water.

Table 4: Retention of Science Facts through Drawing or Singing

Response	Frequency	Percentage (%)
Yes	68	85.0
No	12	15.0
Total	80	100.0

Table 5 shows that 80% of pupils strongly agreed or agreed that creative arts, such as posters or songs, helped them remember body parts and their functions.

Table 5: Retention of Biological Content through Creative Arts

Response	Frequency	Percentage (%)
Strongly Agree	38	47.5
Agree	26	32.5
Neutral	8	10.0
Disagree	6	7.5
Strongly Disagree	2	2.5
Total	80	100.0

These findings align with Rinne et al.'s experimental evidence that arts-integrated science instruction leads to superior memory retention compared with conventional teaching (389). The mechanisms here are clear: songs and rhymes encode information through rhythm and repetition, which are powerful mnemonic devices; drawings and models create visual anchors that make abstract concepts concrete and retrievable; and drama imprints knowledge through embodied, emotional experience. Pupils' descriptions during the focus group confirm this, with several noting that they could recall test answers more clearly because they could mentally replay a song or a roleplay scene.

The data also show that 82.5% of pupils had been taught about living and non-living things using item displays, and 81.25% reported that songs or rhymes were used in hygiene lessons. These high rates of exposure suggest that the school has made a deliberate effort to embed creative strategies across multiple science topics, contributing to the retention patterns observed.

Creative Methods and Specific Science Topics

The study also examined which creative methods were most effective for specific science topics. For the solar system, 41.25% of pupils identified drawing planets as the most helpful method, while 35% cited singing songs about planets. For the human body, 42.5% found drawing body parts most useful, and 35% cited drama activities such as acting as a doctor or patient. For simple machines, model-making with clay or cartons proved most effective for 40% of respondents, while drawing machines assisted 37.5%.

These figures indicate that different creative methods are better suited to different science topics, with visual and tactile methods particularly effective for anatomy, astronomy, and mechanical science, and musical methods stronger in health education and biology.

Teacher Perceptions and Challenges

Both teachers interviewed expressed broadly positive views of creative arts integration, recognising its potential to enhance engagement and understanding. Teacher Two, who used drama and storytelling as central instructional strategies, described pupils as being more curious, asking more questions, and anticipating lessons. This perception aligns with the Participatory Communication framework, which holds that learning is most transformative when pupils are positioned as active contributors rather than passive recipients.

However, both teachers highlighted significant challenges. Teacher One identified time constraints as the primary barrier, noting that creative activities consume more instructional time and make it difficult to complete the syllabus. Teacher Two pointed to resource scarcity, including the lack of props and costumes, and institutional resistance from colleagues who perceive the arts as distractions. These challenges are consistent with wider patterns identified in the literature: Lawal, Akpan, and Olorunfemi observe that structural constraints within education systems frequently limit teachers' ability to sustain innovative approaches (Lawal et al. 68).

Other barriers include inadequate teacher training in creative methodologies, the rigidity of examination-driven curricula, and the absence of institutional policies that formally recognise and support creative pedagogy. These findings suggest that while individual teachers can make a significant difference, systemic change is necessary to mainstream creative arts in science teaching.

VIII. DISCUSSION

The findings of this study offer compelling evidence that creative arts integration positively impacts pupils' interest, comprehension, and retention in science learning. The quantitative data, supported by rich qualitative accounts from both pupils and teachers, consistently affirm that creative methods transform science from an abstract, intimidating subject into an engaging, relatable, and memorable experience.

The high levels of reported enjoyment (81.25% positive response) confirm what participatory communication frameworks predict: when learners are treated as co-creators rather than passive recipients, their motivation increases significantly. This is not simply a matter of making lessons fun; it reflects a deeper pedagogical shift in which the learning relationship is restructured around dialogue, creativity, and shared meaning-making. As Freire argues, education becomes transformative when it moves from a banking model, where knowledge is deposited into passive learners, toward a dialogic model, where learners and teachers construct understanding together (Freire 68).

The strong retention results, particularly the 85% who affirmed that drawing and singing helped them remember science facts, are consistent with constructivist explanations of memory. Vygotsky's emphasis on the role of cultural tools in mediating cognitive development is directly relevant here: songs, drawings, and drama are not merely decorative additions to lessons but cultural instruments through which pupils internalise and rehearse scientific knowledge within a social context. The act of singing a song about the water cycle, for example, draws on the same social and rhythmic practices through which children learn language and cultural norms outside school, bringing science into their everyday cognitive framework.

The comprehension gains documented across multiple topics further validate the theoretical claims of both Social Constructivism and Gardner's Multiple Intelligences Theory. When pupils draw the solar system, act out the digestive process, or make clay models of simple machines, they engage spatial, bodily-kinaesthetic, musical, and interpersonal intelligences simultaneously. This multimodal engagement creates richer cognitive representations that support deeper understanding, particularly for learners who may not respond well to purely linguistic or logical instruction.

The challenges identified in this study are significant but not insurmountable. Resource constraints, time pressures, and institutional resistance are real and systemic, but they can be addressed through deliberate policy interventions, curriculum reform, and professional development. The data show that even with limited resources, teachers who are motivated and creatively minded can implement effective arts-based strategies using locally available materials. The key is institutional recognition and support.

IX. CONCLUSION AND RECOMMENDATIONS

This study confirms that creative arts integration is a highly effective pedagogical approach for improving pupils' interest, comprehension, and retention in science learning at the primary and junior secondary levels. Drawing on both quantitative survey data and qualitative insights from teachers and pupils at Kingdom Heritage Model School, Goshen, the findings demonstrate that drama, music, visual arts, storytelling, and model-making transform abstract scientific content into engaging, memorable, and meaningful learning experiences.

The study also highlights structural barriers, including resource scarcity, time constraints, inadequate training, and examination-driven curricula, that limit the broader adoption of creative methods. Addressing these barriers requires commitment from schools, curriculum developers, teacher training institutions, and education authorities.

Based on these findings, the following recommendations are offered:

i. Teachers should be trained and actively supported to integrate creative arts into science instruction, with professional development programmes focusing on drama, storytelling, visual arts, and music as pedagogical tools.
ii. The curriculum should be revised to formally recognise creative arts-based strategies as legitimate and recommended instructional approaches within science subjects at the primary and junior secondary levels, with sufficient time allocation for their implementation.
iii. Schools should foster structured collaboration between science teachers and creative arts teachers to jointly design interdisciplinary lesson plans that align artistic expression with scientific learning objectives.
iv. Education authorities should support funding for low-cost teaching resources, creative materials, and lesson plan guides, while also implementing recognition mechanisms for teachers who innovate through creative pedagogy.
v. Future research should conduct longitudinal studies to track the long-term academic impact of creative arts-based science instruction, explore the integration of digital creative tools such as animations and interactive media, and conduct comparative studies between urban and rural school contexts.

REFERENCES

[1] Akinbobola, Akintunde Olusola, and Femi Afolabi. "Constructivist Practices through Guided Discovery Approach: The Effect on Students' Cognitive Achievement in Nigerian Senior Secondary School Physics." Bulgarian Journal of Science and Education Policy, vol. 4, no. 2, 2010, pp. 279-291.

[2] Aina, Jacob Kola, and Karin Langenhoven. "Teaching Method in Science Education: The Need for a Paradigm Shift to Peer Instruction (PI) in Nigerian Schools." American Journal of Educational Research, vol. 3, no. 1, 2015, pp. 26-31.

[3] Catterall, James S., Susan A. Dumais, and Gillian Hampden-Thompson. The Arts and Achievement in At-Risk Youth: Findings from Four Longitudinal Studies. National Endowment for the Arts, 2012.

[4] Ekarika, Joseph Paul, Anthonia-Mary Asanga Okon, and Felicia Edim Adie. "Effect of Multiple Intelligence Teaching Strategies on Students' Achievement in Basic Science in Cross River State, Nigeria." International

Journal of Education and Evaluation, vol. 8, no. 1, 2022, pp. 1-16.

[5] Fisher, Walter R. "Narration as a Human Communication Paradigm: The Case of Public Moral Argument." Communication Monographs, vol. 51, no. 1, 1984, pp. 1-22.

[6] Freire, Paulo. Pedagogy of the Oppressed. Herder and Herder, 1970.

[7] Gardner, Howard. Frames of Mind: The Theory of Multiple Intelligences. Basic Books, 1983.

[8] Greene, Maxine. Releasing the Imagination: Essays on Education, the Arts, and Social Change. Jossey-Bass, 1995.

[9] Hall, Christine, and Pat Thomson. Inspiring School Change: Transforming Education through the Creative Arts. Routledge, 2017.

[10] Hardiman, Mariale, Ranjini M. JohnBull, and Donna Carran. "The Effects of Arts-Integrated Instruction on Memory for Science Content." Mind, Brain, and Education, vol. 13, no. 1, 2019, pp. 16-28.

[11] Kadir, Liyana, Russell Tytler, and Filocha White. "Critical Thinking in Primary Science through a Guided Inquiry Pedagogy: A Semiotic Perspective." Research in Science Education, vol. 53, no. 1, 2023, pp. 27-47.

[12] Kim, Joon-Yung. "Enhancing Science Education in Ningo-Prampram, Ghana: Implementing Viable Hands-on Experiments and Science Fairs." Journal of Education, vol. 204, no. 1, 2024, pp. 45-57.

[13] Klassen, Stephen, and Cathrine Froese Klassen. "Science Teaching with Narrative: Practical Examples from History, Nature, and the Arts." Science Teaching: Narratives and Its Contribution to Science Literacy, edited by Stephen Klassen, Springer, 2014, pp. 1-30.

[14] Lukaka, Lubunda. "Art Education and Its Impact on Creativity and Critical Thinking Skills: A Review Literature." Journal of Education and Practice, vol. 14, no. 8, 2023, pp. 1-9.

[15] Mohammed, Sayibu, Michael Reiss, and Janet Hargreaves. "Students' Views on What Aids Their Learning of School Science in Lagos State, Nigeria." International Journal of Science Education, vol. 44, no. 1, 2022, pp. 18-39.

[16] Nwune, Eugene Ihejirika, Emmanuel Chine, and Nneka Oguezue. "Relationship between Students' Perception of Teachers' Communication Behaviours and Performance in Basic Science in Anambra State, Nigeria." Journal of Education and Practice, vol. 13, no. 9, 2022, pp. 37-47.

[17] Oludipe, Daniel, and Beatrice Oludipe. "Effect of Constructivist-Based Teaching Strategy on Academic Performance of Students in Integrated Science at the Junior Secondary School Level." Educational Research and Reviews, vol. 5, no. 7, 2010, pp. 347-353.

[18] Rahat, Ehtsham, Sana Akhtar, and Saima Matloob. "The Impact of Multimodal Communication on Learners' Engagement and Comprehension in Online Learning Environments among Science Students at the Secondary Level." Journal of Digital Learning in Teacher Education, vol. 40, no. 2, 2024, pp. 110-127.

[19] Rinne, Luke, Emma Gregory, Julia Yarmolinskaya, and Mariale Hardiman. "Why Arts Integration Improves Long-Term Retention of Content." Mind, Brain, and Education, vol. 5, no. 2, 2011, pp. 89-96.

[20] Tuveri, Marco, Giulia Steri, and Roberto Fadda. "Using Storytelling to Foster the Teaching and Learning of Gravitational Waves Physics at High School." Physics Education, vol. 59, no. 1, 2024, pp. 1-14.

[21] Tytler, Russell, Vaughan Prain, Peter Hubber, and Bruce Waldrip. Constructing Representations to Learn in Science. Sense Publishers, 2013.

[22] Vygotsky, Lev Semyonovich. Mind in Society: The Development of Higher Psychological Processes. Harvard University Press, 1978.