International Journal of Social Science Research (IJSSR)
Volume- 2, Issue- 4 | July - August 2025 ISSN: 3048-9490

Art-Integration in Science Education: A Constructivist Approach through the 5E Instructional Model

Kinjal Bohare[1*], Dr. Dinesh Chahal[2]
[1]Research Scholar, Department of Teacher Education, Central University of Haryana
[2]Professor, Department of Teacher Education, Central University of Haryana
***Email address**: boharekinjal@gmail.com

Abstract:

This paper analyses the role and effectiveness of Art Integration in science education, particularly in the context of Constructivist Pedagogy and the 5E teaching model (Engage, Explore, Explain, Elaborate, Evaluate). The purpose of the study is to understand how integration of arts develops deeper understanding of scientific concepts, creativity, and cultural sensitivity in students. The research is based on a qualitative-descriptive methodology, analysing national education policies (NEP 2020, NCF 2005, NCF-FS 2022), pilot studies such as the Delhi Arts Curriculum, and key educational theories. Research has shown how various art forms such as drama, music, painting, and storytelling strengthen students' engagement, exploration, expression, application, and evaluation at each stage of the 5E model. In conclusion, AIL transforms science education from being a mere academic subject to an inclusive, experiential and multi-intellectual process that promotes holistic development of students and equips them with essential 21st century competencies.

Keywords: Art Integrated Learning, Art Integration, Constructivist Approach, 5E approach

Introduction:

"Every child is an artist. The problem is how to remain an artist once we grow up."

(Pablo Picasso, n.d.)

One way to express oneself is via art. Like critical thinking and numerical awareness, it is crucial to view art as a learning domain. Children learn more about the world, other people, and themselves as they get older. The child learns to identify their own beliefs and value systems in the context of their social surroundings by being exposed to the outside world and reflecting on their own internal mechanisms. Art Integrated learning is a new concept given by National Education policy (2020) but it is mentioned in many previous commissions and policies in disguised way but now it is highlighted and topic of discussion everywhere at school level. NCERT and C.B.S.E. have developed instructional material for Art-integrated Approach including modules and activities. In today's education, traditional teaching of subjects alone is not enough. Children need to gain experiential awareness by combining art and culture with other subjects. To this end, CBSE has made Art-Integrated Learning (AIL) compulsory from Class I to X, so that all academic subjects like science, maths, languages, etc. can be taught through Indian art forms. NEP 2020 clearly states that various dimensions of arts can be used as the basis of discipline study, making the learning process experiential, cultural and

enjoyable. This approach not only makes academic concepts easier to understand, but also helps students develop early cultural self-awareness and 21st century competencies and skills.

CBSE's official circular Acad-54/2023 (25 April 2023) specifies that based on the suggestions of NEP-2020 and NCF-FS 2022, students must do at least one trans-disciplinary art-integrated project in each academic year.(Central Board of Secondary Education (CBSE), 2023) In Class IX-X, this project is included as part of internal assessment in all subjects. In these projects, CBSE has also made State/UT pairing compulsory under 'Ek Bharat Shreshtha Bharat' programme so that students can combine art forms of other regions with their subjects to promote cultural understanding and national spirit. In addition, the projects should be eco-friendly and use locally available materials without putting any Economic burden on parents. Thus, AIL has become not just art education but a multidisciplinary, inclusive, experiential and culturally based teaching tool that teaches students subject knowledge, creativity, social cooperation and cultural self-expression skills.(*CBSE Art Integrated Project & Circular PDF for Class 8, 9, 10, 11, 12 - Tech CBSE*, 2023)

Research Objectives:

1. To investigate how constructivist pedagogy and the 5E instructional model connect with Art-Integrated Learning (AIL) in scientific education.
2. To examine Indian educational policies and pilot study that encourage the inclusion of the arts in science classes in order to improve learning and student engagement.

Research Methodology:

This study takes a qualitative-descriptive approach founded in document analysis and theoretical interpretation. To investigate the integration of art into science education, important national education policies (NEP 2020, NCF 2005, NCF-FS 2022), pilot programs (Delhi Arts Curriculum), and theoretical frameworks (Constructivism, 5E Model) were critically examined. Supported by cognitive and sociocultural learning theories, the alignment of art-based pedagogies with each step of the 5E instructional model was mapped using thematic analysis.

Policy and Curriculum Framework on Art Integrated learning

Delhi Arts Curriculum (2023): The Delhi Government and the NalandaWay Foundation introduced the Delhi Arts Curriculum to unite the arts into the regular school system and implement curriculum advancements. The curriculum aims to give kids rich, all-encompassing, and immersive experiences in the visual and performing arts through exposure to local and worldwide art, the development of critical socioemotional skills, and the acquisition of art-based competences across five art forms.

From July 2022 to March 2023, pilot study was conducted in 9 DoE schools in which Five methods of Art integration were used.

a. Art Exhibition: Five distinct kind of performing and visual art are covered in art exhibition for the students falls from the age three to ten, this method included dance, music, theatre, media arts, and visual arts.

b. Musical Poetry: Students between the age of 8 to 10 were involved in the musical adaptations of the poetry as part of their English and Hindi curriculum in order to sharpen their musical skills.

c. Musical Theatre: Students of the eighth grade took so much interest in tales that are meaningful to them in integrated art workshops. After then, the stories are used to design the theatre and roleplay.

d. Teacher Transformation: This approach boosts middle school teachers confidence also decreases their unwillingness to participate in the arts.

e. Artful School Transformation: This method transforms the school into a multisensory, funful, vibrant and creative setting.

The results of the pilot show that among middle school students, Musical Theatre is the most successful of the three student initiatives, followed by Art Exhibition and Musical Poetry. Poetry and musical theatre have the next highest feasibility scores, after art exhibits. But Musical theatre can be easily implement in languages but not in Science and Maths. (NalandaWay Foundation, 2023)

National Curriculum Framework for Foundational Stage (2022): The NCF-FS 2022 strongly advocates Art-Integrated Learning (AIL) for ages 3-8, urging teachers to blend arts (music, dance, drama, crafts) seamlessly into daily lessons rather than treating them as separate subjects. It recommends using art as a hands-on tool to teach core concepts like counting with clay or storytelling through puppetry while connecting lessons to local cultural traditions. The framework emphasizes creating joyful, creative classrooms where art enhances cognitive, motor, and social-emotional growth, aligning with NEP 2020's experiential learning goals.

"*Children express themselves, imagine, and create without any inhibition through the arts. The open-ended ness and playful qualities of the arts encourage self-expression, intuition, reasoning, imagination, and communication. Children need to be supported with ideas and opportunities to draw, paint, print, create collages, construct structures with blocks. Children also love moving, dancing, exploring, and improvising with their bodies and playing musical instruments states***".**(NCERT, 2022)

National Education Policy (2020):

NEP (2020) focuses on the promotion of Learning by Doing through experiments, hands on experience, field trips, project based learning and it motivates school to move from the traditional method of rote learning and memorisation by integrating with real life applications by ensuring enhancement of critical thinking, creativity and problem solving. Art Integrated Learning strongly advocates for Art-Integrated Learning (AIL) and Experiential Learning as transformative pedagogical techniques to make education more holistic, engaging and effective. Under Art-Integrated Learning, the policy mandates the incorporation of visual and performing arts such as music, dance, theatre, and crafts into core academic subjects like maths, science, and languages.

"Art-integration is a cross-curricular pedagogical approach that utilizes various aspects and forms of art and culture as the basis for learning of concepts across subjects. As a part of the thrust on experiential learning, art-integrated education will be embedded in classroom transactions not only for creating joyful classrooms, but also for imbibing the Indian ethos through integration of Indian art and culture in the teaching and learning process at every level",(Ministry of Education, 2020)

National Curriculum Framework (2005):

The NCF 2005 supports the importance of Art Integration in education to foster learning skills like creativity, critical thinking, and holistic learning. It supports the idea of making learning more interesting, fun, and significant as well. the arts visual, acting, and literary should be smoothly integrated into all subject areas. Instead of depending only on rote memorization, the framework promotes experiential and activity-based learning, where students use art to express their ideas practically and by hands on experience. Additionally, NCF 2005 encourages schools to offer requires resources for artistic innovation and suggests that teachers should also receive training on how to successfully include the arts into instruction. By the integration of arts with other academic areas education becomes more inclusive, pleasant, and culturally relevant.

Yashpal Committee (1993) – Learning Without Burden

This commission recommended for the experiential learning and focusing to reduce learning through traditional methods.

"Learning should be connected with real-life experiences, and arts should be used to make education joyful."(Ministry of Human Resource Development, 1993)

National Policy on Education (NPE) – 1986

The National Policy on Education (NPE) 1986 laid early groundwork for integrating arts and hands-on learning in Indian education. While less detailed than later policies, it emphasized arts as essential for cultural preservation and recommended incorporating music, dance, and crafts into curricula to nurture creativity. It also mandated "Work Experience" (Shramik Vidya) as a hands-on learning component, connecting education to practical skills like pottery, gardening, and local crafts. The policy advocated for activity-based teaching to reduce rote learning, though it lacked specific implementation frameworks.

"The curriculum should include music, dance, fine arts, and crafts to foster creativity and cultural awareness."(Ministry of Education, 2020)

Indian Education Commission (1964-66) – Kothari Commission

The Kothari Commission (1964-66) strongly advocated for integrating arts and experiential learning in education, recommending that visual and performing arts (music, dance, drama, crafts) be woven into the curriculum as essential components rather than extracurricular activities. It emphasized hands-on, activity-based learning to connect education with real-life experiences, suggesting schools incorporate local crafts, fieldwork, and creative expression to make learning more engaging and holistic. While not using the modern term "art-integrated

learning," the commission laid crucial groundwork by positioning arts as vital for cognitive, emotional, and cultural development principles that later influenced NEP 2020.

"Art, music, dance, and drama should be recognized as important media of creative expression and integrated into school education."(Indian Education Commission, 1966)

Wardha Scheme / Zakir Hussain Committee (1937) – Basic Education (Nai Talim)

The Wardha Scheme of Education (1937), also popular as Nai Talim or Basic Education, fundamentally reimagined learning by placing handicrafts and productive work at the heart of the curriculum. Formulated by Mahatma Gandhi and formalized by the Zakir Hussain Committee, the scheme promoted for bespoke skills (like spinning, weaving, pottery, and farming) to serve as the primary medium for teaching academic subjects. Math would be taught by measuring fabric or counting yarns, for example, while geography and history studies would be connected to regional crafts and their cultural value. Using a "learning by doing" approach, students worked by hand not just to develop their skills but also as a means of understanding abstract ideas. Along with conserving India's traditional crafts, the program emphasized art as a democratic force that breaks down barriers between manual and intellectual labour.

"Education should be imparted through a productive craft, which should be the centre of all instruction."(Zakir Hussain Committee, 1937)

5 E Model in Science Education

The 5E teaching model was established in the late 1980s with the aim of transforming decades of science education research into a teaching cycle that teachers could successfully implement in their classrooms (Bybee et al., 2006). The 5E teaching model was created in 1987 by the Biological Sciences Curriculum Study (BSCS) as a science teaching and learning approach. The 5E model is a teaching sequence that incorporates features of earlier teaching models, such as the Atkin and Karplus learning cycle and the Science Curriculum Improvement Study (SCIS) learning cycle. The five phases of the 5E Model are engagement, exploration, explanation, elaboration, and evaluation (Martín & Bybee, 2022). The constructivist theory of learning, which views learning as a conceptual shift, served as the foundation for the cycle. Given this, it becomes sense to believe that the architecture of the model was based on a number of cognitive learning concepts. Actually, by the time the 5E Model was created, cognitive scientists had already recognized a number of these concepts, such as the levels of processing effect or the idea that memory functions by tying together diverse pieces of information that are connected by meaning. But other ideas, like the importance of retrieval in learning, were either the result of later research or, at the very least, backed up by a wealth of data discovered later.(Mayer, 2009).

The offered art integrated learning is strong example of experiential learning that incorporates art and is firmly rooted in constructivist pedagogy. When it is especially based on the 5E Instructional Framework, which stands for “Engage, Explore, Explain, Elaborate, and Evaluate”. This approach is anchored in the theoretical work of cognitive psychologists such as Jean Piaget, Lev Vygotsky, and subsequently Jerome Bruner, who highlighted the

significance of active engagement, social interaction, and contextual learning in knowledge construction. (Bruner, 1991).

Theoretical Foundation: Constructivism and the 5E Model

According to constructivism, students actively create knowledge via experience as opposed to passively taking it in. (Piaget, 1954) asserted that learning is an active, contextualized process in which students construct mental models to make sense of the world. By emphasizing the social and cultural context of learning and putting forth the idea that language and interaction co-create meaning, (Vygotsky, 1978) developed this idea. The 5E model, created by (Bybee et al., 2006) at the Biological Sciences Curriculum Study (BSCS), translate into action these fundamental concepts. Students may interact with the material on a cognitive, emotional, and physical level thanks to the scaffold that the 5E framework offers, which naturally fits with art integration.

How Art-Integrated learning harmonize with the 5E Model

1. Engage (Curiosity and Emotional Connection through Art)

The "Engage" is the beginning of the 5E model which not only utilizes performing arts drama, skits, and role-play to trigger curiosity but establish emotional connection with the subject and the settings. For instance, when students embody microbes or dramatize the physical changes in adolescence, they associate themselves with the scientific ideas. This indicates the research and emotional engagement which contributes in enhancement of attention and memory (Immordino-Yang & Damasio, 2007). It also activates prior knowledge, a key element in constructivist learning(Ausubel, 1968).

2. Explore (Inquiry through Artistic Discovery)

During the Explore phase, students conduct investigations through hands-on activities and art-based inquiry model-making, scientific illustration, and collage making. For example, building a 3D model of mitochondria or creating a ecological pyramid collage can make easier for the learners to explore scientific phenomena experientially and practically. This stage reflects Piaget's idea of "learning by doing" and supports the development of problem-solving skills and critical thinking (Piaget, 1954). These methods also serve to multiple intelligences, especially visual-spatial and bodily-kinesthetic (Gardner, 1983), which makes science more accessible, multidisciplinary and inclusive.

3. Explain (Knowledge Construction through Narrative and Visual Literacy)

Art forms such as storytelling and picture talk are utilized in the Explain stage to facilitate concept clarification. When complex and abstract ideas like motion, photosynthesis, or cell functions are delivered as stories or interactive visuals, they become cognitively understandable and also contextually meaningful. (Bruner, 1991) argued that narrative is a powerful cognitive method that helps learners in organization and interpretation of experience. This pedagogical move also boost language and communication skills, as learners convey their understanding verbally and also visually.

4. Elaborate (Application through Creative Synthesis)

The Elaborate phas engage students in expansion of their learning by creating new artifacts, comic strips, fashion shows, shadow puppetry, wearable art, and more. These activities promotes critical thinking by requiring learners to synthesize and apply their knowledge in unique contexts. This phase also involves in enhancement of collaborative learning and empathy, especially in chapters like "Reaching the Age of Adolescence," where social-emotional learning also involved. According to (Dewey, 1938), learning becomes truly effective when it is connected to real-life and involves reflective application.

5. Evaluate (Holistic Assessment through Reflection and Performance)

In the Evaluate phase, art is used not just to test prior knowledge but to capture the depth of understanding, personal reflection, and emotional growth. Students complete quizzes, but also submit drawings, dramatic scenes, or written reflections, such as “One thing I learned + one art skill I enjoyed.” This harmonize with formative assessment practices recommended by Black and (Black & Wiliam, 1998), which emphasize assessment for learning rather than of learning. The inclusion of art-based evaluations ensures equity, allowing diverse learners to demonstrate understanding in different modalities to maintain inclusivity.

Conclusion: Why Art Integration Fits Naturally into the 5E Model

The art-integrated science modules exemplify a holistic pedagogical strategy that goes beyond content delivery. By combining constructivist learning theory with artistic expression, they create a rich, multi-dimensional learning environment that enhances cognitive, emotional, and social development. The 5E model serves as an ideal framework because it naturally aligns with the process of artistic creation and inquiry-based science education. This validates the idea that science and art are not separate domains, but rather complementary ways of knowing, both capable of provoking wonder, fostering empathy, and encouraging critical engagement with the world. In the current educational scenario, it is not possible to develop the complete intellectual, emotional and social potential of students only by the knowledge of the syllabus. In this context, art-enriched learning emerges as a multidimensional and inclusive teaching approach, which not only presents knowledge in a practical form but also develops creativity, critical thinking, sensitivity and cultural consciousness in students. The involvement of art in every stage of the 5E model (Engage, Explore, Explain, Elaborate, Evaluate) makes learning more effective, interesting and experiential. For example, complex scientific concepts can be conveyed to students in a simple and meaningful way through drama, painting, music, and stories. This not only deepens their understanding, but also supports the principles of Multiple Intelligences. Policy documents such as the National Education Policy 2020, NCF 2005 and NCF-FS 2022 have also encouraged learning through arts. Pilot projects like the Delhi Arts Curriculum show that the integrated use of arts in schools has positively increased student interest, engagement, and quality of learning. Hence, it is clear that the inclusion of art-enriched learning in science teaching is not just an option but a necessary innovation that does not limit students to memorizing facts but equips them with life-useful skills through experiential knowledge. This teaching method also assimilates Indian cultural values into education and prepares students as per the required capabilities of the 21st century.(Ministry of Education, 2020)

References

1. Ausubel, D. P. (1968). *Educational Psychology: A Cognitive View*. Holt, Rinehart and Winston.
2. Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, *5*(1), 7–74. https://doi.org/10.1080/0969595980050102
3. Bruner, J. S. (1991). The narrative construction of reality. *Critical Inquiry*, *18*(1), 1–21.
4. Bybee, R. W., Taylor, J. A., Gardner, A., Scotter, P. V., Powell, J. C., Westbrook, A., & Landes, N. (2006). *The BSCS 5E instructional model: Origins and effectiveness*. BSCS.
5. *CBSE Art Integrated Project & Circular PDF for Class 8, 9, 10, 11, 12 Tech CBSE*. (2023, April 28). https://techcbse.com/cbse-art-integrated-project-circular-project-pdf-for-class-8-9-10-11-12/
6. Central Board of Secondary Education (CBSE). (2023, April). *Circular Acad-54/2023: Art-Integrated Projects from Classes I to X with State-UT Pairing*.
7. Dewey, J. (1938). *Experience and Education*. Kappa Delta Pi.
8. Gardner, H. (1983). *Frames of Mind: The Theory of Multiple Intelligences*. Basic Books.
9. Immordino-Yang, M. H., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain, and Education*, *1*(1), 3–10. https://doi.org/10.1111/j.1751-228X.2007.00004.x
10. Indian Education Commission. (1966). *Education and National Development: Report of the Education Commission, 1964–66*. Ministry of Education, Government of India.
11. Martín, H. R., & Bybee, R. W. (2022). The cognitive principles of learning underlying the 5E Model of Instruction. *International Journal of STEM Education*, *9*(1). https://doi.org/10.1186/s40594-022-00337-z
12. Mayer, R. E. (2009). Constructivism as a theory of learning versus constructivism as a prescription for instruction. In *Constructivist Instruction: Success or Failure?* (pp. 196–212). Routledge.
13. Ministry of Education. (2020). *National Education Policy 2020*. Government of India. https://www.education.gov.in
14. Ministry of Human Resource Development. (1993). *Learning Without Burden: Report of the Yashpal Committee*. Government of India.
15. NalandaWay Foundation. (2023). *Delhi Arts Curriculum: Findings From the Pilot Study*.
16. NCERT. (2022). *National Curriculum Framework for Foundational Stage 2022*. National Council of Educational Research and Training.
17. Pablo Picasso. (n.d.). *Quote on Art and Creativity*.
18. Piaget, J. (1954). *The Construction of Reality in the Child*. Basic Books.
19. Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.
20. Zakir Hussain Committee. (1937). *Basic National Education (Wardha Scheme)*. Government of India.