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Effectiveness of Arts Integrated Learning (AIL) In Developing Conceptual Understanding in Science

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1. Introduction

Art integrated learning is an innovative approach to teaching and learning that ensures effective and joyful classroom transactions by engaging students' attention, motivating learners, supporting students' active participation in the classroom process, and enabling them to develop their thinking abilities.

Robinson (2013) defined arts integration into three categories: arts integration as learning through and with the arts, arts integration as a curriculum connection process, and arts integration as a collaborative engagement. Arts integration basically deals with the integration of various art forms with the curriculum to make learning meaningful and effective.

AIL involves the skills to plan and organize age-appropriate art experiences to make the learning of various subjects engaging and interesting, provide each learner with creative space for exploration, experience and expression and also meet individual needs and preferences. Art integration ensures experiential learning and construction of one's own knowledge with the help of various art forms. Art can be seen as entertainment for students, meaningful integration occurs when the classroom becomes a place of diversity, creative problem-solving, risk-taking, experimentation and learning (**Cornett**, 2006).

AIL helps students develop conceptual understanding in course subjects. **Giddens and Brady** (2007) concluded that teaching and learning aimed at promoting students' conceptual understanding complements the constructivist paradigm in promoting critical thinking and deeper understanding by focusing on students' prior knowledge, its application in multiple contexts, and their development of inter-related concepts.

Milligan and Wood (2010) described the idea of conceptual understanding as a provisional destination that involves learning from misconceptions, allowing for the expansion and construction of knowledge as an ongoing process. **Mills** (2016) stated that the inclusion of meaningful learning activities aided in the attainment of conceptual understanding and found that students gained conceptual understanding that included descriptions of meaningful learning activities that occurred in a social and active learning environment.

Conceptual understanding in Science ensures learning of scientific concepts scientifically and systematically so that one can be able to get the meaning by visualizing it. It is also about developing the critical and creative thinking skills which young people need to understand and progress in their learning effectively.

2. Rationale of the study

Arts integration is promoted as a powerful pedagogy to meet the needs of 21st century students. Teaching in and through arts can help learners imagine, construct and communicate a deeper understanding of themselves, communities and the world. NCF 2005 recommended that "Arts as a subject at all stages covering all four major areas, i.e. music, dance, visual arts and theatre… We must bring arts into the curriculum, incorporate them across all areas of learning as well as give them their own identity at relevant stages."

It also states that "the significance of India's heritage crafts, both in terms of their economic and aesthetic values, should be recognized as relevant to school education." Taking into account the above, the Central Board of Secondary Education (CBSE) has held discussions with several stakeholders including school principals, teachers, NCERT, arts professionals etc., and accordingly it has come to the fore that integration of arts with education will improve learning.

It is realized that creative thinking and problem-solving abilities are required in all subjects pursued by students at all stages. Hence, when art is integrated with education, it helps the child to apply art-based inquiry, investigation and exploration, critical thinking, and creativity for a deeper understanding of concepts.

3. Objectives

1. Conceptual understanding in science at the Secondary level.
2. To compare the effectiveness of art integrated education in developing conceptual understanding in science among boys and girls.
3. To compare the effectiveness of art integrated education in developing conceptual understanding in science among high achievers and low achievers.

4. Hypotheses

1. Art integrated education will have a significant impact in developing conceptual understanding in science at the primary level.
2. There will be no significant difference in the effectiveness of art integrated education in developing conceptual understanding between boys and girls.
3. There will be significant difference in the effectiveness of art integrated education in developing conceptual understanding between high achievers and low achievers.

5. Methodology

The present study is limited to one co-educational school of Haryana Education Department, Haryana, India and limited to two classes of 9th grade students. The study is limited to science teaching at primary level only. For this study, the researcher uses quasi-experimental design with experimental and control group. Here, art integrated teaching is taken as the independent variable and conceptual understanding is considered as the dependent variable. Here, art integrated teaching refers to science teaching through visual and performing arts and conceptual understanding.refers to student's understanding at the level of applying, analyzing, evaluating and creating in geography.

Gender and achievement level have been used as grouping variables in this study. Since the present study is based on secondary school students and includes both boys and girls; the researcher has selected two classes of 9th grade students from GMSSSS Dholera, M./Garh, Haryana, India as sample for the present study. Two types of instruments have been used for the present study. Instructional Instruments-Lesson Plans based on Art Integrated Education in Science for Class IX.

After getting approval from the school principal, the researcher visited the class and tried to build rapport with the students of selected classes of class IX. One class was taken as experimental group and the other as control group randomly. After that, the researcher conducted pre-test to assess the conceptual understanding of students of both the classes.

The students' marks from the pre-test are collected by the researcher for further analysis. Then the researcher started teaching science with the help of art integrated approach to the experimental group as intervention and the control group is taught using traditional method.

After teaching by using both traditional and arts integrated method, the researcher has conducted a post-test for both the sections taken as control and experimental group respectively and collected data from student's scores from the post-test. Collected data are analyzed.

6. Data analysis and interpretation

The investigator has used descriptive and inferential statistics for data analysis and made interpretations accordingly. The detailed data analysis as per the objectives of the study is presented in the following pages.

Effect of Arts Integrated Learning on Conceptual Understanding in Science.

The researcher has compared the conceptual understanding in science of control group (CG) and experimental group (EG) before and after the experiment using inferential statistics, which is presented in Table-A.

Table-A

t-value of post test scores of control and experimental group							
Groups	**Mean**	**Mean Difference**	**Standard Deviation**	**N**	**df**	**t-value**	**Sig.**
EG	17.3	2.7	1.5	34	33	8.6	0.001
CG	14.6		1.1	34			

From the table-A, it is found that in post test mean difference between control and experimental group is 2.7. The post-test mean of control group is 14.6 and post test mean of experimental group is 17.3. Standard Deviation and Standard Error of Mean difference for control and experimental group also vary in CG and EG.

The means are compared by using t-test and the calculated t-value is 8.6, which is significant at 0.001 levels. Hence, the hypothesis is accepted that denotes "there will be a significant effect of Arts Integrated Learning in developing conceptual understanding in Science".

Table-B

Groups	Mean	SD	Mean Difference	N	df	t-value	Sig.
EG	4.3	0.9	2.5	34	33	10.8	0.001
CG	1.8	1.1		34			

Table-B shows that the gain score mean of EG is higher than the gain score means of CG and the difference between the gain score mean of experimental and control groups is 2.5. The gain score values of EG and CG are compared using t-test and the t-value is 10.8, which is significant even at 0.001 levels. It can be concluded that art integrated education significantly develops students' conceptual understanding in science.

Comparison of Effectiveness of Arts Integrated Learning in Developing Conceptual Understanding of Boys and Girls.

The investigator has compared the conceptual understanding in Science of boys and girls in EG before and after the experiment by using t-test, which is presented in table-C.

Table-C

Groups	N	Mean	SD	Mean Difference	df	t-value	Sig.
Boys	18	17.6	1.2	0.7	32	1.4	0.168
Girls	16	16.9	1.7				

The table-C indicates that mean difference of boys and girls in post is 0.7 and t -value is 1.4, which is not significant at 0.05 levels. So, there is no significant difference in the conceptual understanding of boys and girls in experimental group.

Hence, the null hypothesis “There will be no significant difference in the effectiveness of arts integrated learning in developing conceptual understanding in Science among boys and girls” is accepted. It can be concluded that the Arts Integrated Learning is

Comparison of Effectiveness of Arts Integrated Learning in Developing Conceptual Understanding among High and Low Achievers.

The investigator has compared the post-test scores of high and low achievers in experimental group by using t-test, which is presented in table-D.

Table-D

Groups	N	Mean	SD	Mean Difference	df	t-value	Sig.
High Achievers	19	18.1	1.1	1.7	32	4.0	0.001
Low Achievers	15	16.3	1.3				

Table-D shows that the mean difference of post-test of high and low achievers is 1.7 and t-value is 4.0, which is significant at 0.001 levels. Hence, there is a significant difference in the conceptual understanding of high and low achievers in the practical effectiveness of arts group.

"There will be a significant difference in the effectiveness of arts integrated learning in developing conceptual understanding in science between high achievers and low achievers" is accepted.

It can be concluded that the Arts Integrated Learning is effective for high achievers more than low achievers in experimental group and high achievers have performed better than low achievers in post-test.

7. Major findings

1. There is a significant effect of AIL on developing conceptual understanding in science at the 0.001 level. Students taught through AIL develop better conceptual understanding in science than students taught through traditional teaching method.

2. There is no significant difference in the effect of AIL on conceptual understanding of boys and girls in science at the 0.05 level. Both boys and girls benefit equally from AIL.

3. There is a significant difference in the effect of AIL on conceptual understanding of high achievers and low achievers in science at the 0.001 level. High achievers develop significantly better conceptual understanding in science than low achievers due to AIL.

8. Result and discussion

The first objective is to study the effectiveness of arts integrated education in developing conceptual understanding in science. The results showed that there is a significant difference in conceptual understanding in science between students in the control and experimental group. This conclusion is supported by **Tucker** (2017), De **Moss and Morris** (2002), and **Hoyt** (1992).

The second objective of the study is to compare the effectiveness of arts integrated education in developing conceptual understanding in science between boys and girls. The result shows that there is no significant difference in conceptual understanding of boys and girls in the experimental group.

The third objective of the study is to compare the effectiveness of art integrated education in developing conceptual understanding in science among high achievers and low achievers. The result shows that there is a significant difference in conceptual understanding of high and low achievers in the experimental group. It was found that low achievers developed greater conceptual understanding after the teacher started using AIL in the classroom.

9. Educational implications

- Arts integrated learning is beneficial for geography teachers as well as social
- The lesson plans, learning resources and innovative ideas based on AIL

Science teachers should be motivated to make the dull and monotonous classroom process interesting, enjoyable and effective. Students' motivation to attend social science class regularly and attentively can be increased and maintained by implementing art integrated education in primary schools.

Moreover, the study contributes to reducing the dropout rate at the secondary level by making the school activity fun and enjoyable.

10. Conclusion

It is necessary for all institutions to adopt arts integrated learning approaches to encourage and support students in their learning. As this study has demonstrated, AIL is one of the effective approaches that should be introduced. However, a suitable environment must be created to facilitate this adoption.

Integration of visual and performing arts using locally available materials can play an important role, as seen in the present study. The combination of art form and subject matter has a good and positive impact on students, as they are more enthusiastic and interested.

This highlights the importance of integrating the art form with modern education strategies. Other elements that have a positive impact and really make a difference in art integrated education are the learning environment and learning experiences of the students which represent the cornerstone in influencing their behavior when working together, and thus influencing their achievement and understanding.

In the future, this can be a turning point for learning through hands-on experiences and other enjoyable learning strategies. Therefore, it is suggested to introduce AIL in all primary schools to make teaching enjoyable and effective.