

Effectiveness of Art Integrated Strategy on Achievement in Mathematics among Secondary school students

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Abstract: Education scenario of India is going through an era of constructivism where innovative activities can be incorporated for transacting the content of any subject especially Science and Mathematics. Constructivist strategies are child centred and allow students to construct knowledge their own which is very much suitable to science learning. Some students consider learning subjects like mathematics is a fearful and irritating event which may prevent them from learning the concepts of those subjects properly and rightly. Art integrated strategy is a teaching learning strategy that uses fine arts and performing arts as primary pathways to learning. Art integrated learning practices can be made flexible not only for constructing knowledge but also for feeling and expressing it in the classroom environment with more comfort. Hence, present study is designed to check the effectiveness of Art integrated strategy on Achievement in Mathematics among secondary school students of Kerala. Investigator adopted quasi-experimental pre-test post-test non equivalent group design with sample consists of 67 students of Eighth standard from the two divisions in the same school of Kozhikode District..Lesson transcripts based on Art Integrated Strategy, lesson transcripts based on Constructivist method and achievement test in Mathematics are the tools used for the study. The mean achievement scores were studied and compared using test of significance of difference between means for large sample and ANCOVA. The findings of the study revealed that Art integrated strategy cannot be declared as strategy which is effective than constructivist strategy on Achievement in Mathematics among secondary school students even though it can be used for Mathematics transaction.

Key Words: Art Integrated Strategy, Art Integrated Practices, Mathematics Learning

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I. INTRODUCTION

Today, education scenario of India is going through an era of constructivism in which various innovative activities can be included for transacting the content of any subject. Constructivist strategies are child centred and based on developing thinking pattern of a learner. At the same time, brain based learning practices are also becoming popular all over the world based on many ideas put forwarded by Neuroscientists. Brain based learning and related methods are emphasizing the importance of action and activities in the process of learning. A classroom has to be alive with activities which are going to help in modifying overall perception to life along with learning. Art Integrated methods can offer advantages of the above two school of thoughts if necessary refining is made. Art integrated methods can be made flexible not only for constructing knowledge but also for feeling and expressing it.

Mathematics learning is often considered as fearful task to many students and finding more comfortable learning environment for Mathematics Learning is always a topic for research .Art integrated practices open up a vision of learning through expressions which give better space for students to freely interact with teachers. Smith (2004) studied about causes, effects, and preventative measures about math anxiety and found that students who have math anxiety face real and long-lasting consequences. There is always a necessity to experiment innovative practices to teach mathematics to attract all type of students to change the perception about the subject as something give discomfort in classrooms all the times.

In the curriculum framework of two year B.Ed program of National Council for Teacher Education (2014), drama and art education has included as a part of courses on Enhancing Professional Competencies (EPC). It is said that transformational education involves reflection, introspection and action with a deep relationship between the head, heart and hand.Drama based techniques can be helpful in developing many competencies of life and social skills among learners. The National Curriculum Framework (2005) emphasized that the school curriculum must integrate various domains of knowledge so that the 'curricular' encompasses all

and is not separated from the co curricular or extra-curricular. This has significant implications for the role of art, music and drama in education, to nurture children's creativity and aesthetic sensibilities.

Wandell, Dougherty, Ben-Shachar and Deutseh (2008) examined the association between music training and reading fluency. The investigators conducted their experiment in forty nine children in the age group of 7 -12. The results showed that the music training helps to improve reading fluency in students. Oreck (2006) investigated about the particular characteristics and dynamics that encourage or limit arts use in teaching. The study suggested that overall creative outlooks as opposed to specific skill sets was a major factor in determining arts use in classrooms. The teacher's ability to bring the arts into the classroom allowing students to truly explore and make discoveries, find and pursue problems, arrive at unique solutions, and communicate in multiple modalities –thus requires both an artistic pedagogy and an understanding of the aesthetic qualities of experience..Bahr and Christensen (2000) assessed the musical and mathematical ability in 85 ten year old students. Various mathematical skills and musical skills of students are analyzed. The results revealed that a significant correlation, but only for mathematical skills that hold a structural relationship to musical skills. The kinds of skills that were argued to overlap were not specified. Winner (2001) examined about arts and academic improvement and revealed that the arts have typically played a relatively unimportant role in American schools. Arts educators have tried to strengthen the position of the arts in schools. The arts could help children learn to read and write and calculate and understand scientific concepts. The reasoning was clear: perhaps schools under pressure would value threats because the arts strengthened skills in "valued" areas. This approach became a favoured strategy in the United States for keeping the arts in the schools.

Catterall (1995) also viewed that teachers who are supported for integrating arts activities make a noticeable change in their teaching. The study also suggested that the Support for the arts can occur at the school level, colleague level, and administrative level.

Art integrated strategy is a teaching learning strategy that uses fine arts and performing arts as primary pathways to learning. According to Donavon and Pascale (2012) "Arts integration is the investigation of curricular content through artistic explorations. In this process, the arts provide an avenue for vigorous investigation, representation, expression, and reflection of both curricular content and the art form itself." The John.F.Kennedy Center for the Performing Arts defines art integration "as an approach to teaching in which students construct and demonstrate understanding through an art form. Students engage in a creative process which connects an art form and another subject area and meets evolving objectives" (Silverstein & Layne, 2010)

Deasy (2012) edited the research compendium named critical links which is a collection of studies that showcase how arts learning experiences affect the academic achievement and social development of children and youth. The focus of the above compendium is mainly distributed into five areas such as dance, drama, visual arts, music and multi-arts. The study displayed critical evidence connecting arts and student achievement. More than 65 distinct relationships between the arts and academic and social outcomes are reported. Based on analyzing various studies, Deasy (2012) identified six major types of advantages associated with study of art and student achievement namely reading and language skills, mathematics skills, thinking skills, social skills, motivation to learn and positive school environment

Silverstein and Layne (2010) describe that the creative process in the art integrated environment as a process which is not a one way flow of events. The heart of arts integration is engagement in the creative process. Arts integration encourages students to do more than repeating, copying or follow directions. They must create something that is original and of value. It includes many interacting phases and each phase is connected to all other. There are many descriptions of the creative process. The one provided here is a synthesis of ideas from various sources. The creative process in a art integrated learning environment is made visible as five open circles as follows:

- 1) Students imagine, examine, and perceive.
- 2) They explore, experiment, and develop craft.
- 3) They create.
- 4) They reflect, assess, and revise
- 5) Share their products with others.

Mathematics learning requires variety of innovative attempts to transact the concepts and content to overcome the hazards and fears associated with subject among young minds. Theories and studies in the field of art integrated education reveal positive impacts art integrated learning practices can create in the areas of skill development, self expression and creativity. Various curriculums and committee reports in India explain the benefits and actions to be taken in the direction of art integrated pedagogical path. Hence, developing and experimenting a strategy through art integrated format in a researchable form for enhancing mathematics learning can be a relevant and insightful.

II. METHODOLOGY

Objectives

1. To compare the mean pre-test scores of Achievement in Mathematics of secondary school students in experimental group and control group.
2. To compare the mean of post-test scores of Achievement in Mathematics of secondary school students in experimental group and control group.
3. To find out whether there exist any significant difference in mean gain scores of Achievement in Mathematics of secondary school students in experimental group and control group.
4. To find out the effectiveness of Art integrated strategy on Achievement in Mathematics of secondary school students

Hypotheses of the Study

1. There exists no significant difference in mean pre-test scores of Achievement in Mathematics of secondary school students in experimental group and control group.
2. There exists significant difference in mean post-test scores of Achievement in Mathematics of secondary school students in experimental and control group.
3. There exists significant difference in mean gain scores of Achievement in Mathematics of secondary school students in experimental and control group.
4. Art integrated strategy will be effective for enhancing achievement in Mathematics of secondary school students.

Method and Design

Experimental Method and quasi experimental Pre-test Post-test non-equivalent group design was used for the study.

Variables of the Study

Independent variable

Art Integrated Strategy

Constructivist method of teaching

Dependent variable

For the present study, Achievement in Mathematics is selected as dependent variable. Achievement in Mathematics is operationally defined as the score obtained by the students in the mathematics test developed by the investigators.

Population

The population consists of secondary school students studying in standard VIII who follows Kerala State syllabus.

Sample

The sample selected for the study comprised of 67 students of VIII standard belong to a school from Chevayur educational sub-district, Kozhikode, Kerala. Experimental group is comprised of 35 students and control group comprised of 32 Students.

Tools Used for Data Collection

1. Lesson transcripts in Art integrated strategy. (Niranjana and Arjun, 2016)
2. Lesson transcripts in Constructivist format. (Niranjana and Arjun, 2016)
3. Achievement test in Mathematics. (Niranjana and Arjun, 2016)

Statistical Techniques Used

- Test of significance of difference between means(t-test)
- Analysis of Covariance (ANCOVA)

Procedure

Lesson transcripts of Art Integrated Strategy were designed by incorporating 16 various art forms for transacting the Unit Ratio. Lesson transcripts in constructivist method for transacting the same unit and Achievement test were also prepared before starting the experiment. Achievement test in Mathematics was administrated as pre test in both groups before starting the transaction. Experimental group was taught through the lesson transcripts of Art Integrated Strategy. Control group was taught through Constructivist method. After completing the lessons, same achievement test was administrated as Post test in both the groups.

III. RESULTS, FINDINGS & DISCUSSION

Comparison of Pre-test scores of Achievement in Mathematics of the experimental and control groups

The Achievement in Mathematics of the Experimental and control group was measured before the treatment by using Achievement test in Mathematics. A comparison of means scores of pre-test scores for Achievement in

Mathematics was done. The data and results of the test of significance of difference between the pre-test scores of Achievement test in Mathematics for experimental and control groups is given in Table 1.

Table 1
Data and Results of the Test of Significance of Difference between the Mean Pre-Test Scores of Achievement in Mathematics for the Experimental and Control Groups

Variable (Pre-test)	Mean	S.D	t-value	Level of Significance
1.Control group	3.94	3.98	2.53	0.05
2. Experimental group	7.43	7.03		

From the Table 1, it is evident that the t-value obtained for pre-test scores of experimental and control group is 2.53 which is significant at 0.05 level. This shows there exists significant difference between the means of the pre-test scores of achievement in Mathematics for the experimental and control groups. The experimental group performed better than the control group in pre-test scores of Achievement in Mathematics at secondary level.

Comparison of Post-test scores of Achievement in Mathematics of the experimental and control groups

The Achievement in Mathematics of the experimental and control group was measured after the treatment by using Achievement test in Mathematics. A comparison of means scores of post-test for Achievement in Mathematics was done. The data and results of the test of significance of difference between the post-test scores of Achievement test in Mathematics for experimental and control groups in given Table 2.

Table 2
Data and Results of the Test of Significance of Difference between the Mean Post test Scores of Achievement in Mathematics for the Experimental and Control Groups

Variable (Post-test)	Mean	S.D	CR	Level of Significance
1. Control group	11.98	6.85	2.44	0.05
2. Experimental group	16.2	7.28		

From the Table 2, it is evident that the t-value obtained for post-test scores of Experimental and control group is 2.44 which is significant at 0.05 level. This shows there exists significant difference between the means of the post-test scores of achievement in Mathematics for the experimental and control groups. The experimental group performed better than the control group in post-test scores of Achievement in Mathematics at secondary level.

Comparison of Gain scores of Achievement in Mathematics of the experimental and controlled groups

The Achievement in Mathematics of the experimental and control group was measured before and after the treatment by using Achievement test in Mathematics. Gain scores were calculated by finding the difference in the measures of pre-test and post-test. An analysis of mean gain scores for Achievement in Mathematics was done. The data and results of the test of significance of difference between the gain scores of Achievement test in Mathematics for experimental and control groups in given Table 3.

Table 3
Data and Results of the Test of Significance of Difference between the Mean Gain Scores of Achievement in Mathematics for the Experimental and Control groups

Variable (Pre-test)	Mean	S.D	CR	Level of Significance
1. Control group	8.05	4.12	0.76	NS
2. Experimental group	8.77	3.63		

From the Table 3, it is evident that the t-value obtained for gain scores of experimental and control group is 0.76 which is not significant at any level. This shows there is no significant difference between the means of the gain scores of achievement in Mathematics for the experimental and control groups. It is not possible to declare that the experimental group performed better than the control group in gain scores of Achievement in Mathematics at secondary level.

The above three tables were helpful to understand changes in achievement of students in both the groups. By taking the means of pre-test and post-test scores of both experimental and controlled group, achievements of students were analyzed using test of significance of difference between means.

Analysis of Covariance

The analysis of the pre-test scores of the experimental and control groups showed that they do not differ significantly in the achievement of mathematics. After the experimental treatment was given, it was found that experimental group was better than the control group on achievement in Mathematics. The greater post-test scores of the pupils in the experimental group than that of the pupils in the control group cannot be attributed to the application of the experimental variables to the experiment group. In this context it became necessary to analyse the data using the statistical technique called Analysis of co-variance (ANCOVA) by which the difference in pre-test scores of the two groups can be removed statistically, that they can be compared as though their initial status had been equated.

The summary of single factor ANCOVA for gain scores in achievement as dependent variables with pre-test scores as covariate which is given in Table 4.

Table 4
A Summary of ANCOVA for Gain Scores of Experimental and Control Group

Source	Type III sum of squares	Df	Mean square	F	Sig
Group	6.168	1	6.168		
Error	972.932	64	15.202	.406	NS
Total	5739.25	67			

The obtained F ratio was tested for significance. The table value of ratio for df (1, 66) is 4 at 0.05 level of significance. The table 4 shows that the obtained F ratio is 0.406 which is not significant at any level of significance. When the observation is made after means of gain scores have been adjusted, it is found that the means of gain scores of pupils in the experimental and control groups for Achievement in Mathematics do not differ significantly. The result obtained through test of significance of difference between means of gain scores also supports this result.

IV. CONCLUSION

The present study reveals that Art Integrated Strategy can be used for transacting Mathematics in Secondary school level. But, Art Integrated Strategy cannot be declared as a strategy which is effective than constructivist strategy on achievement in Mathematics among secondary school students. Study reflects the scope of experimenting Art Integrated Strategy in teaching learning environment of Science and Mathematics. This indicates the need of further research to understand and place art integrated practices in more fruitful way in our school curriculum. The right vision to implement art integrated practices in school and teacher education curriculum has to be properly investigated and formulated through more academic activities. Study also reveals about the opportunities for making feeling and visualising concepts in Science and Mathematics through art integrated activities.

Insights derived from the study reveal that there is a scope for enquiring about how art integrated practices reflects in interest and attitude in learning various subjects including Mathematics and Science. Results are also opening an invitation to conduct more experimental studies in innovative ways for understanding how art integrated practices function in cognitive, affective and psychomotor domains of learners. As art education and art integrated practices started finding a space among various Indian schools in recent years, these findings can be part of showing the right path of implementing those for in-service and pre-service teachers and teacher educators along with educational policy makers.

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