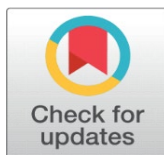
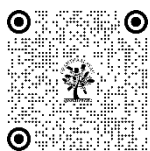


VISUALIZING MATH THROUGH WARLI ART: A CREATIVE APPROACH TO EFFECTIVE LEARNING

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ABSTRACT

Children always find mathematics a challenging subject, Sundaram an ex principal and Math educator in his book stated that “No other subject possibly evokes such strong and opposite emotional reactions as Mathematics does. This is the reason why in mathematics it is usually either “I understand it completely and love it” or “I cannot comprehend it at all and hate it.” There is rarely a middle ground. In many cases this “hate” develops into “math avoidance”, “math anxiety” or even “math phobia”.” Integration of Warli painting with Mathematics is used as one of the strategy for teaching learning. This research focuses on using Warli painting for mathematics teaching of class I students of English medium school of Pune city. The program was designed using warli painting to teach the concept of Addition and subtraction. The students were taught addition and subtraction using this strategy and few students were taught using the traditional teaching methods. A program was developed by the researcher and the effectiveness of the program was seen through implementation of the program followed by statistical analysis i.e. ‘t’ test was conducted to find out which was the more effective way for teaching mathematics to the students. The research was a mixed method research where both quantitative and qualitative techniques was applied. The feedback was taken from the students to know how useful they found this strategy in learning mathematic. The data was collected on a group of 30 control and 30 experimental students and true experimental design was selected. The results showed that the students in the experimental group enjoyed learning through warli painting and they understood the concept easily, they did not feel that they were studying.

Keywords: Mathematics Teaching, Addition, Subtraction, Warli Painting, Quantitative & Qualitative Techniques, Mixed Method, ‘T’ Test

1. INTRODUCTION

“It is not necessary that every man should be an artist. It is necessary that every man should have his artistic faculty developed, his taste trained, his sense of beauty and insight into form and colour and that which is expressed in form and colour, made habitually active, correct and sensitive.” Sri Aurobindo

“Without mathematics there’s nothing you can do. Everything around you is mathematics. Everything around you is numbers.”

Education is the most important and crucial part of an individual. Education prepares individuals to lead a successful and fulfilling life. Education improves the way one thinks, feels, behaves, it not only improves the person individually but also helps their community. Education enhances our critical thinking and problem solving skills. Education teaches the difference between right and wrong, the ethics and the morals. Swami Vivekananda has beautifully said “Education is the manifestation of perfection already in man. Like fire in a piece of flint, knowledge exists in the mind. Suggestion is the friction; which brings it out”. According to Dr. Radhakrishnan, “Education according to Indian tradition is not merely

a means of earning a living; nor it is only a nursery of thought or a school for citizenship. It is initiation into the life of spirit and training of human souls in the pursuit of truth and the practice of virtue.”

Rabindranath Tagore pioneered the idea of relationship between arts and learning. Many of his thoughts are captured in the book titled ‘Art — the Basis of Education’ written by his student Devi Prasad (1998).

Education in India is compartmentalized according to subjects. Mostly each subject is taught in isolation with the other, so children may lose the interest or might get bored easily. Currently, when subjects are taught to the students, they are taught in a very rigid and segmented way. However, the world is not segmented like our subjects. There is a lot of interdependency between different subjects. The integrated approach establishes explicit connection between knowledge and skills of individual subjects. Developing integrated practices can be a challenge in schools especially if the same monotonous routine is followed by the teachers. It is important to include the students actively in the establishment of these practices. This can be done very effectively through innovative strategies like integration of two subjects.

Integrating Mathematics with the art class will make the learning process enjoyable. Warli painting is a folk art of Maharashtra. It was created by tribal people of Maharashtra mainly from the people of North Sahyadri Range. Mathematics has a close association with Warli painting, shapes such as Triangle, Circle, square, dots and dashes are majorly used in making these paintings. The triangle depicts sacred mountains and human forms. The circle depicts the sun and the moon. The square represents the sacred space and the piece of land. Geometrical designs are represented by the dots and dash. Painting is an enjoyable activity, so taking advantage of this teachers can explain difficult concepts of addition and subtraction in a playful way. In this way along with learning a new folk art form the students can learn concepts of mathematics.

Need of the study:

- This study would help to make use of the integration program developed by the researcher to be used in different schools for easy understanding of mathematical concepts and introduce them to the traditional art form.
- It would help to make the teaching learning enjoyable and interesting.
- It is a unique way of teaching and learning through which the students can learn our traditional art from which is need of an hour now.
- It can be used to teach difficult concepts in mathematics like addition, subtraction, different shapes such as triangles, circle.
- It makes understanding abstract concepts easier.

Statement of the Problem:

- To develop a program integrating Warli painting for teaching the concept of addition and subtraction in mathematics for students of class I, CBSE board English medium school and test the effectiveness of the program.

Objectives of the Study:

- To develop a program integrating Warli painting for teaching the concept of addition and subtraction in mathematics for class I, CBSE board English medium schools in Pune city
- To test the effectiveness of the program integrating Warli painting for teaching the concept of addition and subtraction in mathematics for class I English medium schools.
- To analyze the feedback of the program which was developed and implemented for the students of class I English medium schools.

Hypothesis of the study:

- **Null Hypothesis:**
There will be no significant difference between the mean scores of post test used for control & experimental group
- **Research Hypothesis:**
There will be significant difference between the mean scores of post test used for control & experimental group

Research Question:

How useful did the students find the integration of Warli painting for teaching the concept of addition and subtraction in mathematics.

Operational Definition:

Warli Painting: It is a tribal art form of Maharashtra. Geometric shapes like square, triangle and circle are used for this type of painting. Which is used to teach concept of addition and subtraction.

Effectiveness: It means the difference observed in the scores or performance of the students when taught by traditional methods and integration of warli painting and mathematics.

CBSE board: CBSE stands for Central Board of Secondary Education. It is a national level educational board in India that manages and conducts examinations for secondary and higher secondary.

Research Design:

The research adopts mixed method study where both quantitative & qualitative techniques are used in the same research.

Research Methodology:

- Quantitative: Experiment
- Qualitative: Feedback Analysis

Experimental design:

True Experimental Design where control & experimental groups are selected for the study

- **Variables in the study:** Independent variable: Integration of Warli painting and mathematics program.
- **Dependent variable:** Scores after using this integration program.
- **Population:** Students of CBSE board English medium schools from Pune city
- **Sampling Technique:** Non-Probability Sampling Technique: Purposive Sampling
30 students of control and 30 students of experimental group are selected by purposive sampling technique from one English medium CBSE board school of Pune city.

About the program - Integration of Art and Mathematics:

To teach the concept of addition and subtraction the researcher showed 10 different warli paintings to the students, she shared the information regarding the warli painting. Then researcher asked the students to count the number of triangles in painting 1. The students noted the answer then the students were asked to count the triangles from painting 2. Then the researcher explained how to add the triangles from both the paintings. Similarly, it was carried out for the remaining paintings. The concept of Subtraction was taught in the similar manner, the painting with a smaller number of triangles was subtracted from the painting with a greater number of triangles. To check the understanding the activity was carried out with the circles.

Limitations of the study:

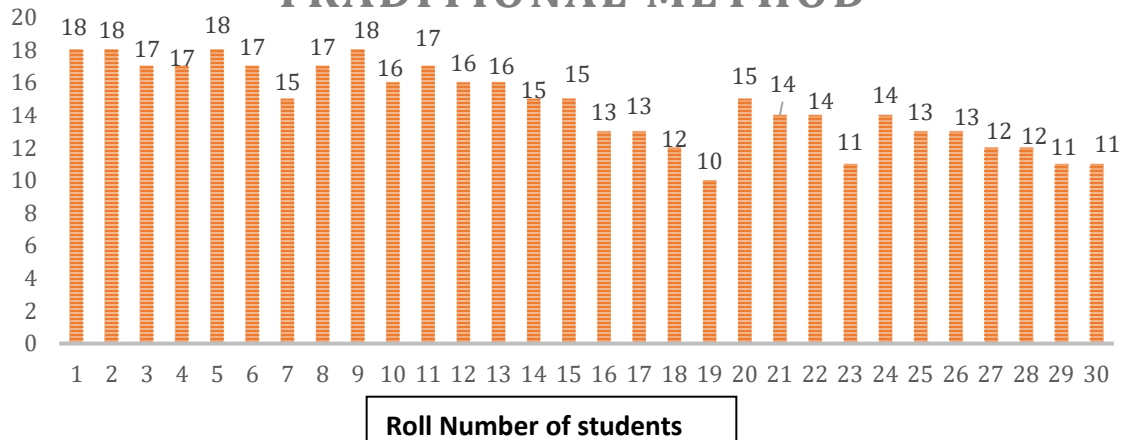
- The program is developed by the researcher
- The results will be solely dependent on the responses of the students

Delimitations of the study:

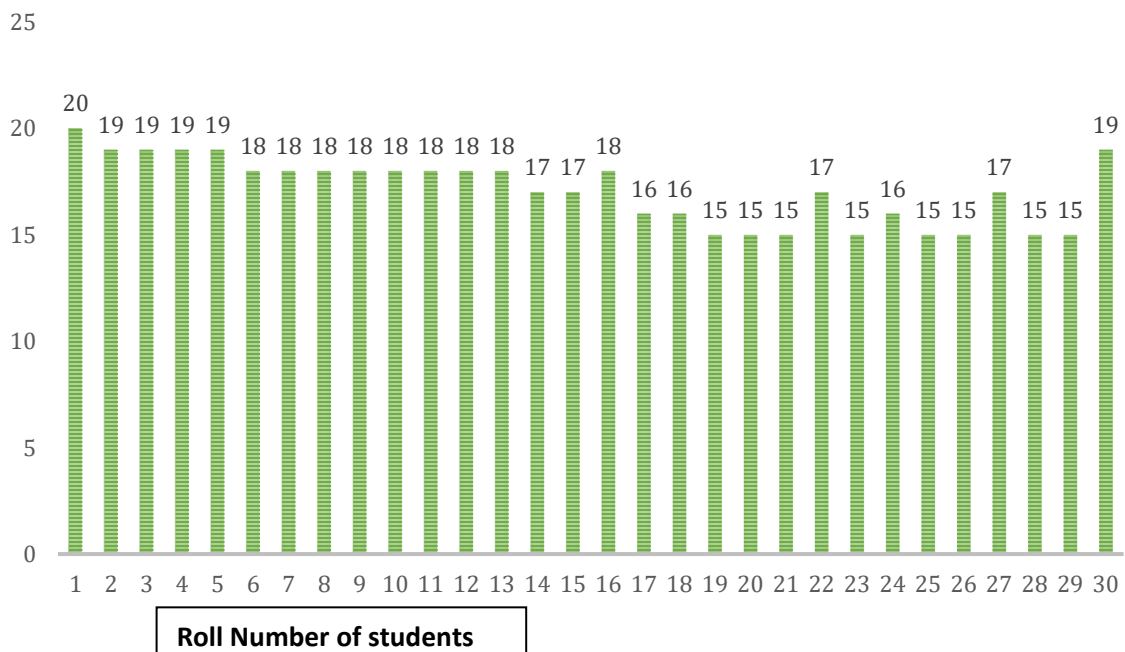
- The study is delimited to only grade I students.
- The study is delimited to only Mathematics Subject Addition and Subtraction concept.
- The present study is delimited to only one school of Pune city
- The study focuses on only CBSE board schools other board schools are not included in the study
- The study is related to only English medium schools

Data Analysis:

MARKS OBTAINED - CLASS I- B TRADITIONAL METHOD



MARKS OBTAINED - CLASS I- A INTEGRATION METHOD



Observation:

After analyzing the data following observations were done.

Basis	Class I A (Traditional method)	Class I B (Integration method)
Topper's marks	18	20
% of students who scored marks between 0 to 5	0	0
% of students who scored marks between 6 to 10	3	0
% of students who scored marks between 11 to 15	57	27
% of students who scored marks between 16 to 20	40	73

Average marks	14.6	17
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- There were no students who scored marks between 0 to 5 in both the classes, ie the class which was taught in traditional way and the class which was taught integrating arts and mathematics.
- 3% students scored between 6-10 marks in the class which was taught in traditional way and there were no students who scored 6-10 marks in the class which was taught integrating arts and mathematics.
- There were 57% students who scored between 11-15 marks in the class which was taught in traditional way, whereas there were 27% students who scored between 11-15 marks in the class which was taught integrating arts and mathematics.
- 40% of the students scored between 16-20 marks in the class which was taught in traditional way whereas 73% of the students scored between 16-20 marks in the class which was taught integrating arts and mathematics.
- The average marks of the class taught in traditional way was 14.6 whereas the average of class which was taught integrating arts and mathematics was 17.
- There were no students who scored full marks in the class taught in traditional way whereas there was one student who scored full marks when taught in integrating arts with mathematics.

Calculation:

	Experimental Group (Integration method)	Controlled group (Traditional method)
N	30	30
ΣX	513	438
SS	72.7	173.2
Mean	17.1	14.6
t Test (t)	4.7	

Results:

Mean _a —Mean _b	T	df	P	one-tailed	<.0001
2.5	+4.7	58		two-tailed	<.0001

P>.05 indicates no significant difference detected between the variances of the two samples.

Group	Total no. of Students	Mean	Observed t value at 0.01 level	Observed t value at 0.05 level	Obtained t value at 0.01 level	Remark
Experimental Group (Integrated method)	30	17.1	0.79	0.59	4.7	Null Hypothesis Rejected
Controlled Group	30	14.6	1.41	1.06		

Interpretation:

The obtained value 4.7 was greater than the table value. The t test showed a statistically reliable difference between the score of the students who were taught by the integration method and the average score of the students who were taught in traditional way. From the above observations the following conclusions can be drawn. Class I students were taught addition and subtraction through warli painting. The students scored better when they were taught in the integrated way, they found learning through integrating mathematics and warli painting was very interesting. They had greater understanding of the concept. Most of the students believed that teaching using this method will help them comprehend the concept easily. They did not feel they were studying, they enjoyed painting and learnt the concept unknowingly.

Qualitative Feedback from Students:

The students found learning process interesting, they said they enjoyed the activities. They explored the topic through hands-on activities due to which they did not have to memorize and they understood everything easily. They gained experience with the topic and reflected more on what they knew. Most of the students did not know about warli painting, they were glad that they learnt something new and few of them even said that they will go home and make painting using warli art. They found the integration of warli with mathematics very innovative, they said they have never studied this way in the past. They were confident while performing the activities. The students enjoyed the overall teaching and learning process. The students felt they were more confident.

CONCLUSION

Isolated learning practices hamper the ability to see the greater picture. Hence, it is high time that we should start moulding our teaching by taking into consideration the NEP 2020. By integrating art with learning the 21st century skills like collaboration, creativity, communication and critical thinking can be cultivated amongst the students. Integration of art with learning also enhances the cognitive, psycho-motor and socio-emotional/ affective domains of the learners. It is observed that students enjoy playing with colours if given a choice they are naturally inclined to do painting rather than studying mathematics. This natural inclination of the students should be utilized to the optimum level for teaching and learning process. The use of this integration creates interest among the students and if used to its full potential can pave way for the successful establishment of interdisciplinary horizon. From the above findings it can be concluded that integration of art and mathematics can be used as an effective teaching method. However, this also indicates that teachers need to internalize this method with a positive framework in order to make such approaches a success.

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CONFLICT OF INTEREST

None.

REFERENCES

- Kugler, E., & Kárpáti, A. (2023). Teaching Mathematics through art: Developing spatial skills and digital literacy of children with learning challenges through visual arts education. *Arts-Based Interventions and Social Change in Europe*, 5(September 2020), 30–38. <https://doi.org/10.4324/9781003376927-6>
- Utoyo, S. (2019). *Improving Early Mathematical Skills Using Kinesthetic Games*. 293(Nfeic 2018), 96–99. <https://doi.org/10.2991/nfeic-18.2019.21>
- Rekha, & Bawa, S. K. (2018). Integration of Techniques of Art in Teaching of Mathematics : A Paradigm Shift in Methods of Instruction. *Remarking an Analization*, 3(6), 169–172.
- S, N. K. P. A. R. (2021). *Effectiveness of Art Integrated Strategy on Achievement in Mathematics among Secondary school students*. 26(11), 12–17. <https://doi.org/10.9790/0837-2611081217>
- Ward, R. (2006). Integrating Mathematics and the Visual Arts. *The Charter Schools Resource Journal*.http://www.cmich.edu/academics/educ_humanservices/units/EHSTCSRJ/Documents/Ward3.pdf
%5Cnhttp://www.cmich.edu/academics/educ_humanservices/units/EHSTCSRJ/Documents/Ward3.pdf
2019. Art Integrated Learning—Guidelines.