iJRASET
International Journal For Research in Applied Science and Engineering Technology



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** ETPAM-2018 **Issue:** Conference **Month of publication:** March 2018

**DOI:**

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# STEM: A Model of Math Trail: A Creative Teaching Approach for Pre-Service Math's Method Teachers of Colleges of Education

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***Abstract: Mathematics is one of the core subjects in school education. Mathematics is generally considered a difficult subject to recall and memorize. Since Pre-service Maths Method teachers of colleges of education are future Math's teachers for schools they would be placed in, they need to be oriented with creative teaching approaches through which they can help students build in Mathematical concepts in a concrete manner. This paper discusses about this creative teaching approach STEM: A MODEL OF MATH TRAIL in capacity building of pre-service teachers and also attempts to gain an insight into the concept of Math trail, types of Math trails and its relevance to make the Math's concepts more clear and concrete. STEM: A MODEL OF MATH TRAIL would help the Pre-service Maths Method teachers to in-still in students a feeling of a mathematician through exposure to real life first hand experiences. This model would help in overcoming visualization of mathematics in abstract form to concrete form. This paper attempts to gain an insight in developing a STEM: A MODEL OF MATH TRAIL: for the pre-service teachers of Colleges of Education to enhance their creative teaching approaches. Thus Pre-service Maths Method teachers can play a significant role to make Mathematics subject more interesting and appealing to students, by using this model in teaching-learning process.***

***Keywords: 'STEM', Pre-service teachers, Colleges of Education.***

## I. INTRODUCTION

Mathematics is one of the core subjects in school education. Mathematics is a science of number and space, has its own language in terms of signs, symbols, terms, operations etc. Mathematics is generally considered a difficult subject to recall and memorize. It is considered a tough task to crack problems. Many children find it to be a difficult subject and develop aversion towards maths subject and suffer from maths phobia.

Since Pre-service Maths Method teachers of colleges of education are future Math's teachers for schools they would be placed, they need to be oriented with creative teaching approaches through which they can help students build in Mathematical concepts in a concrete manner. Engage students in such a way that learning of mathematics becomes a joyful and enjoyable experience. This paper discusses about this creative teaching approach STEM: A MODEL OF MATH TRAIL in capacity building of pre-service teachers and also attempts to gain an insight into the concept of Math trail, types of Math trails and its relevance to make the Math's concepts more clear and concrete. STEM: A MODEL OF MATH TRAIL would help the Pre-service Maths Method teachers to in-still in students a feeling of a mathematician through exposure to real life first hand experiences. This model would help in overcoming visualization of mathematics in abstract form to concrete form. Thus Pre-service Maths Method teachers can play a significant role to make Mathematics subject more interesting and appealing to students, by using this model in teaching-learning process.

### *A. Concept of Math Trail*

A typical trail consits of a sequence of designated sites along a planned route where students stop to explore math in the environment (Cross 1997; Richardson 2004).

Dudley Blaine, an Australian educator first developed the math trail concept as a way to promote active, meaningful mathematics learning beyond the classroom. Math trails make mathematics come alive for children by engaging them cognitively, physically, and emotionally.

Numerous math trail projects are conducted around the globe.

Math Trail helps the student in the following ways:

*1)* Encourages problem solving of students

*2)* The emphasis is on the journey through a problem rather than the answer

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*3)* Facilitates group work and working collaboratively together
*4)* They become Active learners – the learning is in the doing!
*5)* Familiarizes children with their surroundings
*6)* Trails emphasis the practical application of maths to the world around them
*7)* Maths is linked to everything in society –helps children make this link
*8)* Allows children to take responsibility for learning

*B. S-student Made Math Trail*

The math trail is created by the students on any topic of their interest with guidance and support from their mathematics teacher. This would encourage and motivate students for active participation, exploring a topic in-depth. For e.g. Students can do Math Trail by designing questionnaire about their own school building, playground etc.

*C. T-teacher Made Math Trail*

The math trail is created by the teacher on any topic of mathematics which the teacher feels that students find difficult and abstract to understand can be made concrete through Math trail. For e.g. Teacher can take the students on Math Trail to their local surroundings to understand hidden maths in their city and ask the students to prepare a project.

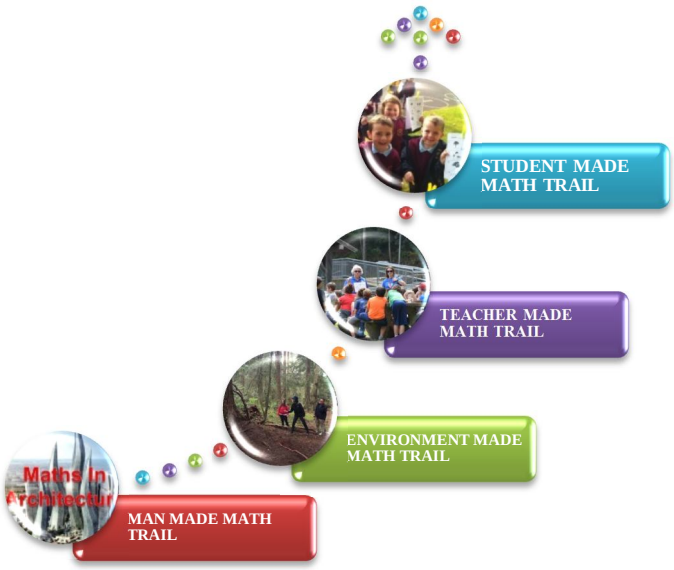



Fig.1. STEM: A MODEL OF MATH TRAIL

*1) E-Environment Made Math Trail:* Mathematics in environment can be used by the teacher to teach topics of mathematics. For e.g. A Math Trail in garden, in nature showcasing environment parallel venation in leaves, height of trees, number of whorls in flowers. trigonometry concept etc. can be taught using Math Trail.

*2) M-Man Made Math Trail:* Architecture in creatively designed buildings, bridges can be used by the teacher through Math Trail in teaching various concepts of Mathematics. For e.g. Buildings with triangle, Pentagon, Hexagon shape, Taj Mahal, Bridges etc.

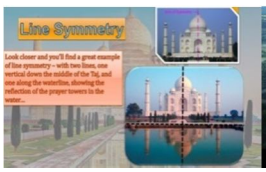



Fig.2.



Fig.3



Fig.4

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## II. LITERATURE REVIEW

*A. Review of Related Literature in India*

Abhijit V Banerjee of the Massachusetts Institute of Technology, journalist Swati Bhattacharjee, Raghabendra Chattopadhyay of the Indian Institute of Management, Calcutta, and Alejandro J Ganimian of New York University affiliated to the Abdul Latif Jameel Poverty Action Lab, a research centre based in the Massachusetts Institute of Technology published on October 15th,2017 on the website https://scroll.in/article/850763/why-children-do-well-in-street-maths-but-not-in-the-classroom-researchers-fault-teaching-methods conducted a research study on studying the mathematical skills of working children (under 16 years of age) in India. They went around markets in Kolkata buying vegetables, fruits, stationery and other goods from 201 children and teenagers employed there, assessing the skills of each. Some 90% of the children got the calculations for the transactions right in their first attempt and on their own. And nearly all of them got the answers right after being given a chance to correct mistakes, without the help of pen or paper. But when 117 of them participated in a written test, their performance dipped dramatically. They struggled with the addition, subtraction, multiplication and division that they had used effortlessly in the market transactions, or "street mathematics", when these were presented as "school arithmetic" – abstract numbers without any context and with only a set of rules or algorithms to solve them. Here, their performance matched the findings of large-scale learning assessments such as the Annual Status of Education Report. The annual survey has consistently reported low achievement in mathematics. This study shows that children are smarter in mathematics calculations when they are exposed to real life situations.

Sai Sumana P. IIT Guwahati, Veena S.Kambi, Sarada Research Labs, Sudharani R.Nakati, Sarada Research Labs, and Jagannathan Srinivasan Oracle Corporation, Nashua, NH Published in: Proceeding COMAD '14 Proceedings of the 20th International Conference on Management of Data Pages 87-98, Hyderabad, India — December 17 - 19, 2014 have emphasized that -MathTrails is an application developed to assess math skills of school students. It includes i) topic hierarchy to categorize the questions, ii) question template repository using which teachers can add different types of questions, iii) question play module to play questions, iv) student evaluation module to evaluate student performance, and v) recommender that recommends videos residing in a video repository. A key feature is that each interactive student session is treated as a walking trail in the property graph formed by topic and question nodes, and student evaluation involves operations on the property graph. The application is being used in the after-school program of Sri Sarada Academy of Excellence, Bangalore.

*B. Review Of Related Literature Abroad*

Mariond (Feb 3, 2015) through her website www.tes.com/teaching-resource/maths-trail-ideas-problem-solving-activities-6051814 Maths Trail Ideas - Problem Solving Activities discussed the Usefulness to promote thinking skills (PLTS) and teamwork. She has put up the resources useful to plan a maths trail around the school. She has put up The' Zone 4 activity 3' files examples of the notices that were put around the various areas of the school. She decribed how they were laminated back to back, and tied near the area. An example for a chess board painted on the ground in the playground is provided .

Avril Crack ( February 2011) in his article 'Meaningful Maths Trails' in the website https://nrich.maths.org/2579 nrich enriching mathematics has discussed that Maths Trails offer huge potential for learning experiences at all ages. He believed that the scope is endless and trails can be tailored to fit into certain topics, or include a whole range. He emphasized that it is important to be critical when constructing a trail or using one that already exists. He put up the questions such as - Are the pupils really challenged? He feels that we should be aiming to improve their mathematical thinking, not just their observational skills. He believes that the questions should provide opportunities for children to explore and develop strategies for solving a variety of problems. He feels that the change of environment can help to make them feel less threatened and perhaps more willing to offer suggestions. Managed in the right way, trails present a golden opportunity to enrich mathematical talk. This can be done at all stages of the trail - in the classroom preparation beforehand, doing the trail itself and during follow-up work.

Presidential Award winner Kay Toliver, from East Harlem, New York on the website http://thefutureschannel.com/wp-content/uploads/2016/10/Math-Trail-Futures-Channel.pdf *has discussed about 'math trail' that there is no way* re is no one "right way" to conduct a math trail. She discussed that the basic activity is simple: students observe the environment outside the classroom, to discover examples of math concepts that they are studying. She said that they can then create problems for others to solve based on their observations. She discussed how a series of observations and problems can be put together to create a "trail" that others can follow. She explained how the trail can lead participants into the community, or trace a route through the school grounds. She emphasized how a math trail can help students discover new things about their community at the same time that it sharpens their mathematical thinking.

Ana Barbosa and Isabel Vale (2016), School of Education of the Polytechnic Institute of Viana do Castelo, Portugal in the Journal of the European Teacher Education Network 2016, Vol. 11, 63-72 has discussed about 'Math Trails: Meaningful Mathematics

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Outside the Classroom with Pre-Service Teachers in which she emphasized the potential of the construction of math trails as a non-formal context in the teaching and learning of mathematics. This research is of qualitative nature and was developed with future teachers of basic education. It can be said that these future teachers showed a more positive attitude towards mathematics, broadening their perspective about the connections that can be established between mathematics and everyday life. Results suggest as well that despite the construction of the trail not being easy, as well as the process of designing the tasks that focused mainly on geometry, it was possible to identify traces of originality and involvement on the part of the participants.

*C. Research Gap:*

Thus from the above studies we can conclude that though there are many studies related to designing, organizing and execution of Math Trails abroad and in our country very few researches have been done on this topic. Very few studies on Pre-service teachers training for Math Trails have been conducted abroad and not in India. Since it has been observed that there are very few research studies on pre-service teachers using Math Trail. The investigator felt the need to develop **STEM: A MODEL OF MATH TRAIL** which would help the Pre-service Maths Method teachers to in-still in students a feeling of a mathematician through exposure to real life first hand experiences. This model would help in overcoming visualization of mathematics in abstract form to concrete form.

## III. OBJECTIVES OF THE STUDY

*A. The study Seeks to rEalize the Following Objectives*

*1)* To get the conceptual idea of 'STEM'- A MODEL OF MATH TRAIL for teaching Mathematics

*2)* To explain the role of 'STEM'- A MODEL OF MATH TRAIL to Pre-service Maths Method teachers for teaching Mathematics

*3)* To explain how this 'STEM'- A MODEL OF MATH TRAIL can be used by pre-service Maths Method teachers in future and how it could help to in-still in students a feeling of a mathematician through exposure to real life first hand experiences

*4)* To examine if 'STEM'- A MODEL OF MATH TRAIL can be used by Pre-service Maths Method teachers in future and how it could help in overcoming visualization of mathematics in abstract form to concrete form.

*B. Methodology And Data Analyzing of The Study*

This study encompassed the content matter from journals, related websites from the period of 2011to 2017. Data used in this study are secondary in nature. For the present study the 'STEM'- A MODEL OF MATH TRAIL was developed after going thoroughly through review of related literature, since it was found that there was no MODEL in existence to Pre-service Maths Method teachers on MATH TRAIL to make Mathematics subject more interesting and appealing to students and overcoming visualization of mathematics in abstract form to concrete form.

*C. Significance of 'Stem'- a Model of Math Trail*

Mathematics should be closely connected with everyone's life. Mathematics is one of the core subjects in school education. Mathematics is generally considered a difficult subject to recall and memorize. Since Pre-service Maths Method teachers of colleges of education are future Math's teachers for schools they would be placed in, they need to be oriented with creative teaching approaches through which they can help students build in Mathematical concepts in a concrete manner. American educational philosopher John Dewey had the claim of "education is life". We can say that "mathematics is life". Freudenthal (1973) proposed the idea of realistic mathematics and indicated that mathematical education should be based on cognitive development in children, and treat realistic situations in their lives as a core allowing children the ability to apply mathematical knowledge through the activities of life and recognize the mathematical relation and laws from experience to further internalize the concept. The National Council of Teachers of Mathematics (2000) also emphasized that mathematics education at school should be based on the children's informal mathematical concept and experience developed in living situations, and the mathematical knowledge learned from school to design the question situations for children to discuss, solve, reason, prove and communicate. This STEM: A MODEL OF MATH TRAIL would help the Pre-service Maths Method teachers to in-still in students a feeling of a mathematician through exposure to real life first hand experiences. This model would help in overcoming visualization of mathematics in abstract form to concrete form. Thus Pre-service Maths Method teachers can play a significant role to make Mathematics subject more interesting and appealing to students, by using this model in teaching-learning process which would help in developing every child to become a mathematician through exposure to real life first hand experiences.

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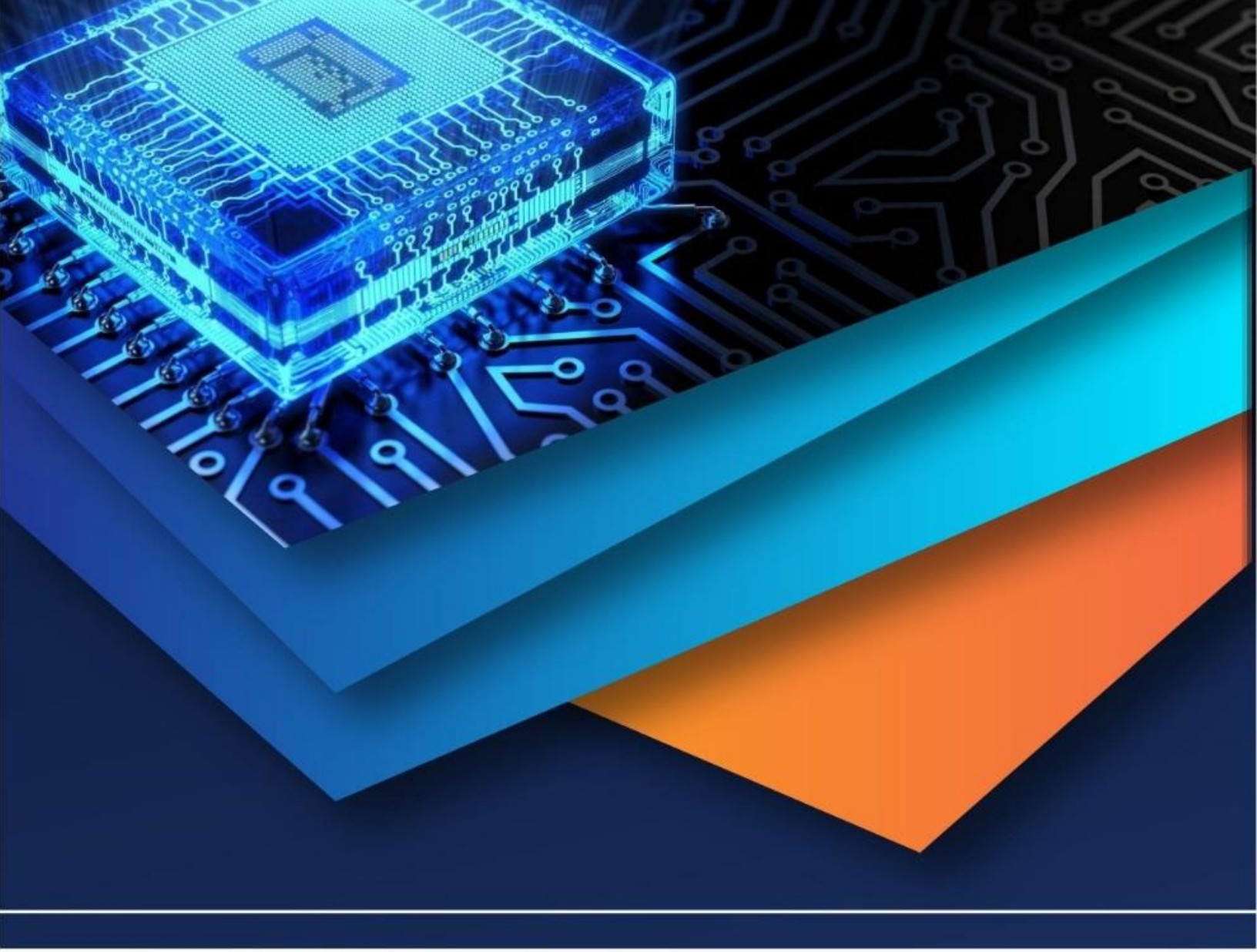
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