
Exploring the Use of Mathematics Laboratory in Teaching Mathematics at Secondary Schools: A Pilot Study

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ABSTRACT:

The teaching of mathematics should enhance the child's resources to think and reason, to visualize and handle abstractions, to formulate and solve problems. This broad spectrum of aims can be covered by teaching relevant and important mathematics embedded in the child's experience. Succeeding in mathematics should be seen as the right of every child. For this, mathematics laboratory teaching concepts give the suitable solution. In this study researcher intends to explore the justifications of the opinions of the mathematics teachers about the use of mathematics laboratory in mathematics teaching.

Key words: *secondary school, hard spot, mathematics laboratory.*

INTRODUCTION:

Pedagogical advancement or innovation of teaching-learning is a dynamic process. Curriculum reform as a dynamic process always gives special emphasis on mathematics learning especially at school level as because many international bodies or organizations as well as some national organization in our country have observed deficit in mathematics learning competency in comparison to other subject areas. Lately, our National Curriculum Framework 2005 [1] has sounded to introduce a new paradigm in learning climate in schools. This is officially named as 'Introduction of Constructivism' in the teaching-learning system. Expanding further the theme expressed in curriculum construction a new program was presented by the present researcher for introduction of mathematics laboratory concept in teaching-learning in mathematics which aims at concretization of mathematics behaviours while learning school mathematics. This had obviously been articulated in our national document "Learning Without Burden" (1993), the report of the committee under the Chairmanship of Professor Yash Pal. Professor Yash Pal not only suggested to reduce the

physical burden of the school learner but also to reduce the curriculum load, though his inner intension was to maximize learning. The present study was conducted on the firm believe that there is one of the ways through which the curricular loads may be reduced; one of these in the area of school mathematics is the use of mathematics laboratory.

Harping on the same tune, National Curriculum Framework 2005 [1] explicitly identifies the guiding principles and it has listed down as:

- “Concerning knowledge to life outside the school,
- Ensuring that learning is shifted away from rote method,
- Enriching the curriculum to provide the overall development of child rather than remain textbook centric,
- Making examination is more flexible and integrated into classroom life and,
- Nurturing an over - riding identity informed by caring concerns within the democratic policy of the country.”

From the first two principles it definitely appears that in mathematics, teaching can be improved and be joyful if principle of concretization and real life experiences becomes part and parcel of mathematics teaching at school level.

Okigbo and Osuafor (2008), Naik (2010)[2] have articulated the fact that in the modern day technology oriented society, the use of mathematics laboratory is essential for injecting joy of learning among the students while learning mathematics. Moreover, the CBSE curriculum has already introduced mathematics laboratory in mathematics teaching like other countries [5]. In the past, we also notice the use of manipulative in the Froebelian system[7] as well as Montessori system. [8]. Even in older days Chinese education has introduced Abacus in learning number operations [9].

Under the above backdrop, the present researcher assumed that the use of mathematics laboratory in mathematics teaching might be useful in school curriculum under the State boards and that any quality instrument in teaching-learning can function well when it is voluntarily adopted by the teachers.

Therefore, it is essential to know 1) how the practicing school teachers of mathematics perceive and judge the introduction of mathematics laboratory in mathematics teaching and

2) how much the curricular content be taught through the mathematics laboratory, is it the total content area or some selected area?

OBJECTIVES OF THE STUDY:

The study aimed at fulfilling the following objectives:

1. To collect the opinion of mathematics teachers in regard to the existence of hard spots in secondary school curriculum.
2. To analysis the reason behind these hard spots given by the teachers.
3. To identify and list down some hard spots in school mathematics.
4. To collect the opinion of the practicing mathematics teachers in regard to the use of mathematics laboratory in general and also for remedial measure towards hard spots.

OPERATIONAL DEFINITIONS:

Secondary school: The Bengali medium schools recognized by West Bengal Board of Secondary Education (WBBSE)

Hard Spot: Hard spot mean the content or a part of it which is difficult to learn and difficult to teach in the regular classroom environmental.

Mathematics Laboratory: The Mathematics Laboratory is a room, rich in manipulative material, to which children have ready access to handle them, perform mathematical experiments, play mathematical games, solve mathematical puzzles and become involved in other activities through proper guidance of teacher.

RESEARCH DESIGN: This research was basically a survey approach with some orientation to explorations of opinion finding their roots and also to implement them to actions. Therefore, the present researcher used a mixed approach in educational research.

SAMPLE OF THE STUDY: The present researcher selected 3 retired mathematics teachers and 14 servicing mathematics teachers with the following criteria:

- i. Teachers of Bengali medium.
- ii. Schools recognized by WBBSE.

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- iii. Having at least master degree in mathematics and B. Ed degree.
 - iv. Having 8 years and above teaching experiences.
 - v. Having wide popularity as competent mathematics teacher
 - vi. Having critical attitude to mathematics teaching (in the eye of the present researcher)
 - vii. Having openness in thinking for modernization in teaching mathematics (in the eye of the present researcher)
 - viii. Those who are willing to cooperate.

METHOD FOLLOWED: Following steps were adopted by the researcher to conduct her research work.

- Step 1: Identification of hard spot in school mathematics by the researcher.
- Step 2: Organization of the identified hard spot in some major areas in school mathematics.
- Step 3: Development of opinionnaire format for realization of Step 1
- Step 4: Identification of mathematics teacher for opinionnaire survey.
- Step5: Collection and organizations the hard spots as suggested by the mathematics teachers.
- Step 6: Analysis the suggestion of the mathematics teachers for the use of mathematics laboratory in mathematics teaching

TOOL: Researcher has used an opinionnaire format that was developed by her for realization of identification of hard spots in school mathematics, suggestion for mathematics laboratory teaching in general especially for teaching of the hard spots.

DATA COLLECTION: Data were collected from 17 teachers.

ANALYSIS OF RESULTS: Researcher found that

1. About 94% of the total respondents agree that there are some hard spots in school level mathematics curriculum.
2. Respondents cited eight types of reasons against their opinion for hard spots in school curriculum.

Reason 1: Student does not know ‘how to learn’

Reason 2: Lack of use of teaching aids like charts, models in teaching activity

Reason 3: Use of Improper teaching method

Reason 4: Lack of instruments in normal classroom situation

Reason 5: Procedural weakness

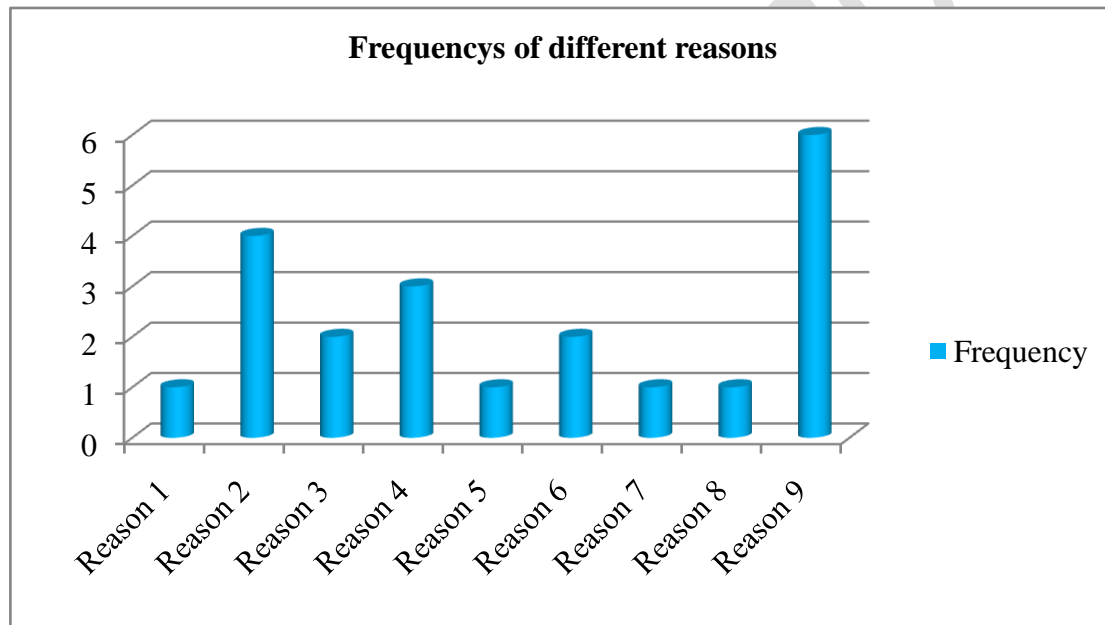
Reason 6: Citing & using no real life examples

Reason 7: Teaching method does help divergent thinking

Reason 8: Lack of practical application

Reason 9: No specific reason

Bar diagram for occurrences of different reasons given by each respondent:



3. Respondents identified more hard spots besides the hard spots identified by researcher.

Total identified hard spots

- i. Relating mathematics in everyday life and other branches of science
- ii. Abstract Mathematical concepts For examples:

Various formulae in Algebra :- $(a+b)^2$, $(a-b)^2$, (a^2-b^2) , $(a+b)^3$ and so on.

Various formulae in Mensuration: - The value of π , Area of circle, Surface area of sphere, Volume of cone, prism, pyramid.

iii. Converting Mathematical problems given in word into mathematical notation and language.

For examples: - Problems on H.C.F., L.C.M., profit & loss, Percentage in arithmetic, Problems in algebra, Mensuration, height and distance in trigonometry.

iv. Basic terms and their properties used in school geometry.

For examples:- alternate angle, corresponding angle, Interior angle & Exterior angle of triangle, Chord subtends angles at the circumference and so on.

v. Basic theories and rules used in school geometry.

For example: - Triangle with same base and height, Properties of Conic section, Theorems on parallelogram, Rule of congruence of triangle.

vi. Properties of transformation geometry.

vii. Conceptualization of trigonometrically ratios

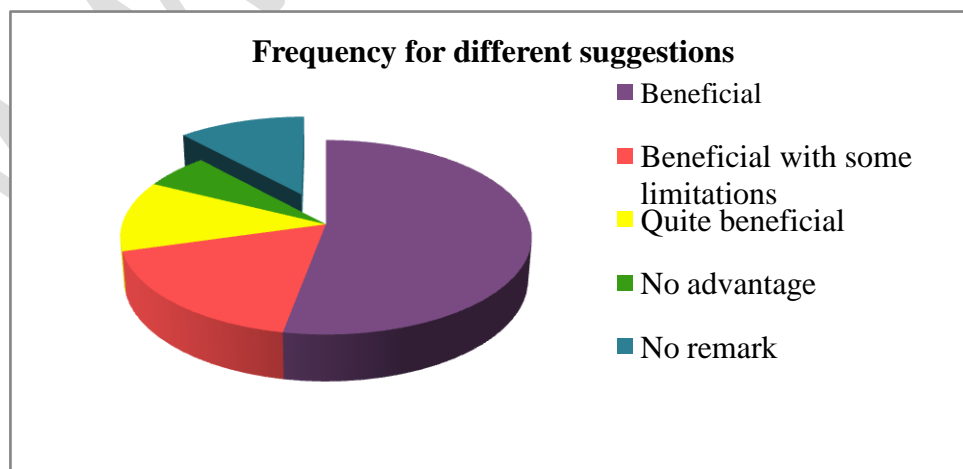
viii. Precision of construction.

ix. Graph of equation and inequation

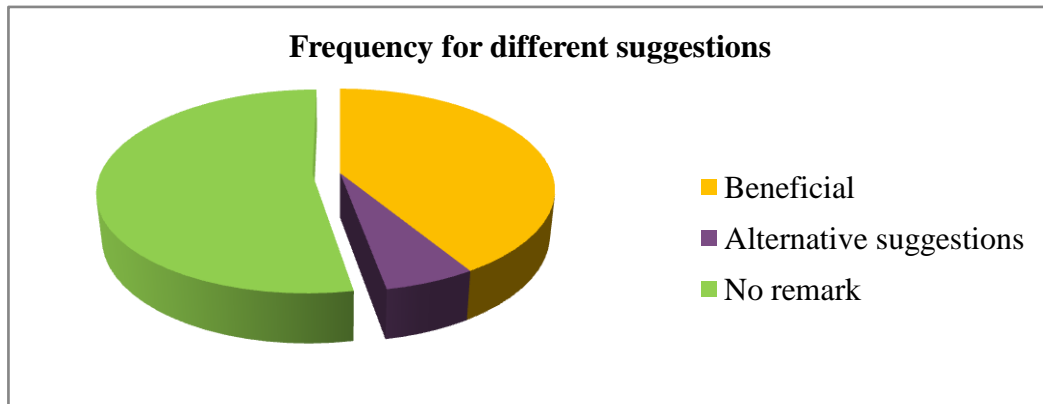
x. Compound interest

4. Above 50% respondents responds that use of mathematics laboratory is beneficial for mathematics teaching in general and 40% respondent suggested it is beneficial to take remedial measures towards those hard spots.

Pie chart: Suggestions for mathematics laboratory teaching in general



Pie chart: Suggestions for mathematics laboratory teaching especially for the hard spots



CONCLUSION:

After completion of the present study, the researcher came to conclusion that a single influence cannot be drawn out. But, at least some mathematics teachers are expecting the use of mathematics laboratory is beneficial for mathematics teaching.

LIMITATIONS OF THE STUDY:

A very small sample of mathematics teachers has been involved in identifying the hard spots. Only purposive sample was used. Tool used in the study had not standardized.

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