Research Article

COMPUTER ASSISTED TEACHING FOR MIDDLE SCHOOL MATHEMATICS A CASE STUDY

Sutapa Chakraborty Pal and Debojyoti Pal

Vardhaman Dreams, D 603, Kaspate Wasti, Wakad, Pune – 411057

ARTICLE INFO	ABSTRACT
	ICT (Information and Communication Technology) has great potential for teaching and learning process at middle school level in India. The use of ICT has enriched the teaching- learning process with the help of computer. Also whatever is learnt through ICT, the contents can be retained for longer time as they use more senses of the students. To make things simpler and creating interest for Mathematics for the young minds through ICT tools, we will take the syllabus for class VIII under Maharashtra State Board for Education for Mathematics. Microsoft Excel spreadsheets and free software Geo Gebra are an excellent medium to apply different topics of mathematics and visualize the results. The topics has been shown and use of Excel and Geo Gebra has been explained for visualizing the topics under Mathematics.

INTRODUCTION

"Education has always been important but perhaps, never more so, in man's history than today. In a science based world, education and research are crucial to the development process of a country, its welfare, progress and security".

The Education Commission (1964-66) recommends mathematics as a compulsory subject for every school student. So, mathematics enjoys a unique position in every school curriculum. All of us knowingly or unknowing use mathematics in our day-to-day lifse. It ranges from household to industries, business, education, science and technology, fine arts, music, dance etc [3]. The National policy on Education NPE- 1986 also emphasizes that mathematics should be visualized to train a children to think, reason, analyze and articulate logically.

Yet many school students find difficulty with learning of mathematics and fail in mathematics. Out of many possible reasons for this truth, one cannot deny the role of teachers in framing a niche for Mathematics in the young minds. But it is burdensome to carry this notion on the shoulders of ill-equipped school Mathematics teachers.

In order to overcome the difficulties faced by the students, teacher should adopt different methodology in teaching of

mathematics like drill method, using different audio visual aids, computer aided instruction, etc. One of the methods is auto-instructional method. It is a method of individualized instruction. One of its forms is CAI (Computer Assisted/Aided Instruction) auto instructional teaching.

ICT (Information and Communication Technology) has great potential for teaching and learning process at school levels. The use of ICT has enriched the teaching learning process with the help of computer. It has brought innovativeness, and creativity in teachers in teaching learning process. Mathematics and computer are both important in today's life as they open the gateway of great opportunities in this modern world. Computer helps in improving the knowledge of mathematics and helps in making classroom teaching lively.

Body of Paper

Computer can play vital role in learning process as it can work with the imagination of students. Any concept in mathematics which can be explained with the help of pictures and this visual image can help students in understanding the concept at ease. Normal classroom lecture method student can get bored easily and can find it difficult to practice the sums. CAI works to increases the curiosity of students and they can learn with interest without any difficulty. Also whatever is learnt through ICT, the contents can be retained for longer time as they use

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*Corresponding author: **Sutapa Chakraborty Pal**
Vardhaman Dreams, D 603, Kaspate Wasti, Wakad, Pune – 411057

more sensory skills of the students. Researchers have found that the move from traditional paper-based mathematical notations to on-screen notations (including algebraic symbols, and also graphs, tables, and geometric figures) can have a dramatic effect on the minds of students. In comparison to the use of paper and pencil via board and chalk which supports only static, isolated notations, use of computers allows for "dynamic, linked notations" with several helpful advantages for the growing minds.

It is widely accepted that digital technologies (popularly known as Information and Communication Technologies or ICT) have the potential to strengthen and reform school education. However, in the absence of clear framework for program design, the impact on learning processes and outcomes from numerous attempts by different governments and other factors has not lived up to this potential.

To make things simpler and generating interest for mathematics for the young minds through ICT tools, we will take the syllabus for class VIII under Maharashtra State Board for Education for Mathematics. Without major cost burdens on ICT labs,Teacher training etc. and using one computer for the class and with basic Excel training for the teacher, we can aide learning of mathematics topic wise.The children will be able to apply the formulae learnt for each topic using ICT and analyze them on their own and develop their learning skills.

The topics for class VIII Mathematics MHSEB is listed below:

Arithmetic

Irrational &Real numbers; Square and square roots; cubes and cube roots.

Algebra

Indices, Polynomial, Factors of polynomial, Equations in one variable.

Mensuration

Area; Circumference and area of a circle ; Volume and surface area.

Geometry

Quadrilaterals; Parallel lines; Circle; Construction of quadrilaterals; Area of a circle.

Statistics

Statistics table; Joint bar graph.

Microsoft Excel spreadsheets are an excellent medium to apply different topics of mathematics and visualize the results. Basic training of Excel will be enough for the teacher to reveal the wonders of Excel spreadsheets in arithmetic, algebra, mensuration and statistic chapters.

Along with Exel spreadsheets, we have shown the use of another remarkable and student-teacher friendly software GeoGebra to demonstrate its utility in aiding mathematics teaching for VIII th standard. This software is free and can be downloaded easily. Also this being teacher friendly, can be used by teachers with few basic training on its use.

Let us see the use of Excel spreadsheets topic-wise

Arithmetic

Field of application-1. Approximation of real numbers including irrational numbers- the concept of decimal numbers, conversion from decimal to integers and vice versa, rounding off to specific no of digits, finding remainders in division of real no., absolute value of a real number.

Decimal to Integer with ROUND function

Formula Results

X	ROUND	X	ROUND
136.234	ROUND(B4, 0)	136.234	136
13.24	ROUND(B5, 0)	13.24	13
136.2347	ROUND(B6, 0)	136.2347	136
-2345.12	ROUND(B7, 0)	-2345.12	-2345
-2345.13	ROUND(B8, 0)	-2345.13	-2345
-265.12	ROUND(B9, 0)	-265.12	-265

Quotient & Reminder of Division of Real Numbers

Numerator	Denominator	Quotient	Modulo
5	2	2	1
10	6	1	4
15	4	3	3
-26	2	-13	0

Square & Square Root of a Number using POWER Function

Number	POWER(Number, 2)	POWER(Number, 1/2)
9	81	3
16	256	4
25	625	5
36	1296	6
49	2401	7

Cube&Cube root of a Number using POWER function

Number	POWER(Number, 3)	POWER(Number, 1/3)
8	512	2
27	19683	3
64	262144	4
125	1953125	5
216	10077696	6

Field of application for squares and cubes – A student learning how to find square of any number can use commands of excel to find squares of bigger numbers. A teacher can find a very good connectivity to other topic of mensuration with this concept. Taking number representing side of a square figure, the area calculation can be shown in GeoGebra. Thus visualization of square of a number in terms of area of a square box can create effective understanding in connection with squares and cubes of numbers.

The same concept can be applied in Exel for finding cube of a number and relating it to finding volume of a cube in Geo Gebra, apart from the normal application of finding cube and cube roots of very large numbers.

Mensuration

Introducing the concept of area of squares and volume of cubes through the arithmetic portion of squares and cubes have been already explained.

Now to visualize how to find area and circumference of a circle, the following commands of GeoGebraare sufficient.

Again the children can be shown through GeoGebra how changing radius and circumference can alter the area of the circle.

Circle
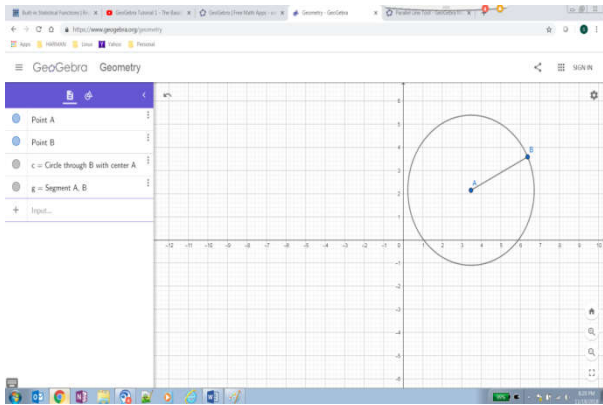
Statistics

All basic steps of statistics like,data selection,tabulation,finding average,sum ,frequency etc can be easily exhibited to the students through excel sheets.

The method of visualizing and interpretation of the tabulated data can be shown beautifully by joint bar graphs through excel commands.
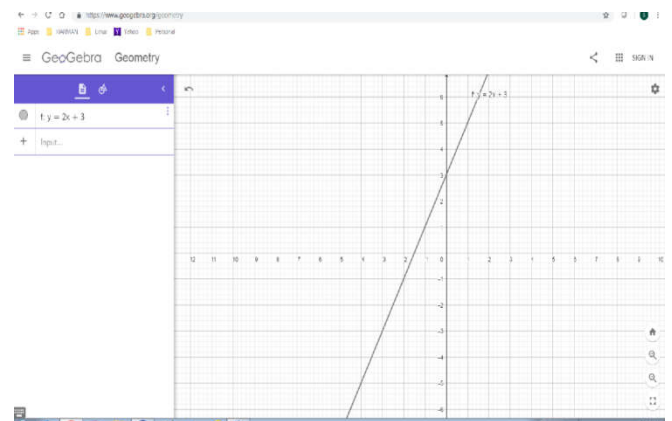
Statistical Table

Data = x_i	Frequency = f_i	xi * fi
2	3	6
3	0	0
5	6	30
7	1	7
9	2	18
12	8	96
15	3	45
Total fi =	**23**	**Total xi * fi =** **202**
Mean = (Total xi * fi) / Total fi =		8.782608696

Data	freq
2	3
3	6
5	2
8	7
9	5
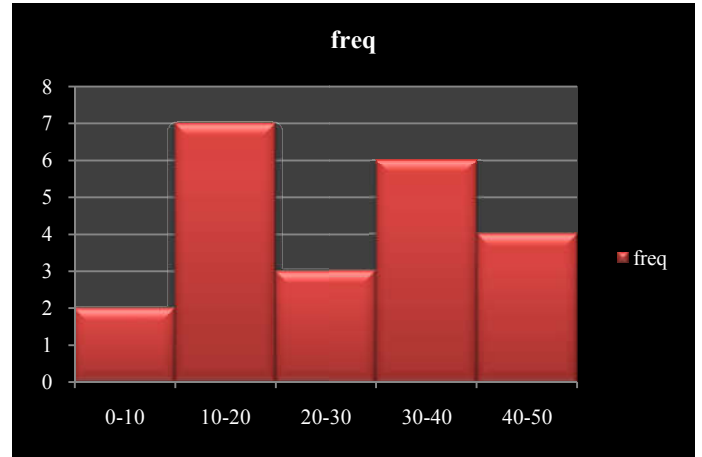
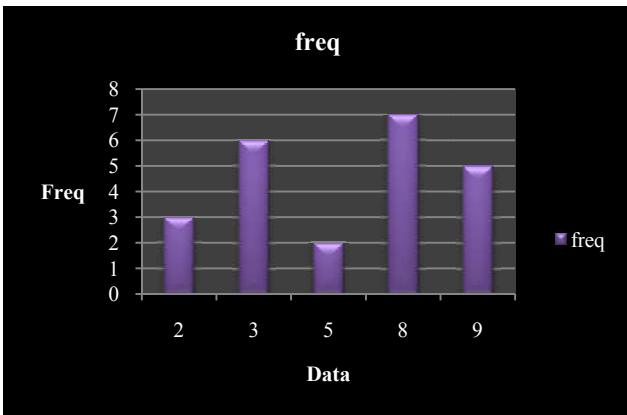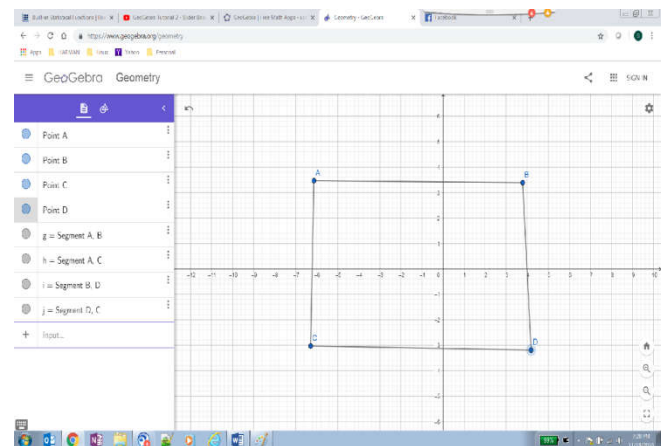| class -interval	freq
0-10	2
10-20	7
20-30	3
30-40	6
40-50	4

Algebra- The concept of straight line using points graphically can be shown as below;
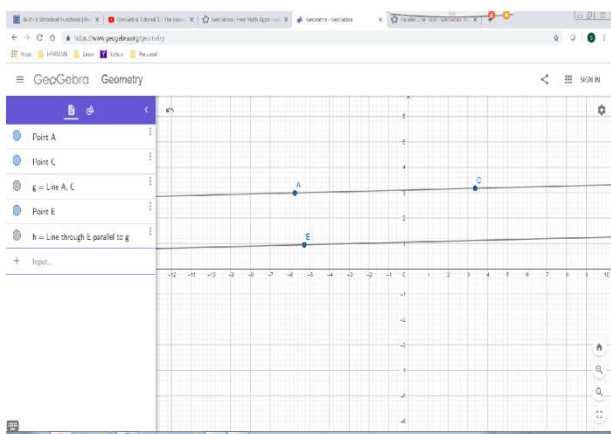
Equation of a Straight Line

Geometry

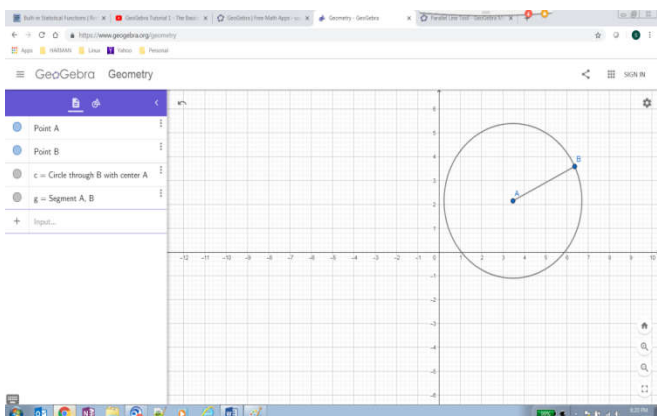**Quadrilaterals-** The concept of quadrilaterals can be build in the software like this:

Parallel Line

Circle

CONCLUSION

Thus we showed in the above example how ICT can helps teacher in planning a Mathematics lesson for middle school.

This paper presents a few selected examples to validate this case study. In fact many more applications like cube/cuboid formation, construction of 2D figures, many arithmetic operations can be shown with either of the two ICT tools mentioned above.

The use of ICT through Exel spreadsheets and the ease of obtaining information on free educational softwares on the Internet will helps the teacher to empower themselves .It gives teacher the opportunity to learn current innovations in teaching that may be utilized in his/her her class to strengthen pupils' learning process. It adds further information about the topic that is currently being taught by them .and thus teacher can make the content more attractive and purposeful for the students. Thus a teacher can successfully impart education characterized by collaborative learning, multidisciplinary problem-solving and promoting critical thinkingskills as highlighted by National curriculum framework 2005 (NCF 2005).

References

1. The use of computers in MathsEducation:A paradigm shift from Computer Assisted Instruction towards Student Programming by DrEmin Aydin
2. ComputerAssisted Instruction in Teaching of Maths-IOSR-Journal of humanities and social sc by PramilaRamani& Harsh Patadia
3. Role of Computer in Teaching-Learning Mathematics-DrVasantBarve and DrMinalsiBarve
4. Role of Technology in Teaching-Learning Maths.-PratimaNayak-K V Fort William Kolkata.
5. ICT implementation in school education in India- a report by Tata Trusts and IT for Change.
6. Using CAS inMathematical classrooms.-B.Kramarski& C Hirsch.
7. Use of Mathematical software for Teaching and Learning Mathematics- S Kumaresan&Ajit Kumar.
8. Project: Using ICT in learning and teaching Maths-Yuen Tung Shuen.
9. Need and importance of STEM Education in Indian schools –DrMalti.
10. Microsoft Excel
11. GeoGebra Software

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