

Teaching and Learning Mathematics: The Role of ICT

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Abstract—Today Information and Communication Technology (ICT) plays a constructive role in Indian education system. The importance of ICT in the teaching and learning of higher education is realised as we live in computer era where internet and different digital devices are extensively used.

In the fast-changing technology world, educational technology has gained momentum. If this advantage is not used to replace the traditional teaching and learning methods, both the teacher and the taught are not comfortable and as such the very purpose of classroom condition is defeated. ICT can successfully be employed to teach and learn Mathematics in which there are many prolonged calculation and figures are to be explained.

For example, if the complex Mathematical calculations are done on the blackboard, the teacher and students get bored as it is a tedious and time-consuming process. Even in Cayley-Hamilton theorem matrix multiplication of A^2, A^3 etc., for 2X2 or 3X3 matrices can easily be calculated in no time with encouraging interest if ICT devices like OHP, computer are used. It is not possible to draw the different shapes of 3D geometrical structures on the blackboard. This can be effectively shown and explained using ICT devices.

In order to overcome the problems arising from the traditional ways of teaching and learning and to enhance the quality of mathematical teaching and learning, there is an express need to deploy ICT extensively. This paper deals with Mathematical teaching and learning methods that can be made easy and interesting with the use of various ICT devices.

Index Terms— Information and Communication Technology (ICT), Mathematics, Geometrical Shapes, Problem Solving, Student

I. INTRODUCTION

Information and Communication Technology (ICT) signifies the impact of undivided communications and the combination of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and AV systems, which enable users to approach, store, broadcast, and mould data.

It is not easy defining Information and Communications Technology (ICT) if we take into account all its characteristics. However, ICT is defined on the basis of certain characteristics like its nature, techniques, tools, application etc. Whenever a definition is created, a new characteristic/tool is introduced which is beyond the definition range. So the following is can be the basic definition

“ICT indicates all accessories, uses and services that incorporate communication. ICT Tools are Computers, mobile phones, TVs, radios, satellite systems etc.” [1]

Every technology has its own characteristic advantages and disadvantages. Similarly, ICT has its own

characteristic advantages and disadvantages. The essential characteristics advantages and disadvantages of ICT are as follows.

Advantages:

- With the help of its tools, ICT aid the teacher to improve his ability of teaching
- It creates interest in student to effective learning as well as facilitating completion of task and communication between teachers and students.
- It generates practical thinking.
- It is an emulating factor in that all pupils can have access to it and work together.

Disadvantages:

- Due to the ever changing field of technology, the computer technology updates daily. Hence teachers/students require advance specialized training.

- If one part of the ICT tool is damaged, it can affect all users. For example, if internet is not available any one cannot work [1].

II. RESULTS & DISCUSSIONS:

Mathematics is the branch of science and technology that deals with the logic of structures, quantity and arrangement. It is the basic brick for everything in our daily works including cell phones, constructions, fine arts, money, engineering and even sports. Mathematics has a number of branches like algebra, calculus, trigonometry, geometry etc. Among these branches, geometry is a wonderful area of mathematics to teach while the same geometry is difficult for the students to understand due to its actual 3D nature [2].

A traditional mathematics teacher stands at the black board and draws geometrical structures on the board as 2D structure as shown in fig 1. But he explains the structures in 3D. It is perfectly clear to the teacher what the shapes meant for, and what parameters can be drawn and solved. But, the students are left with confusion leading to unnecessary pain and pressure. A majority of students think like “we shall never learn this geometry, but we want to pass the exam. We will have to learn it by heart” [2].

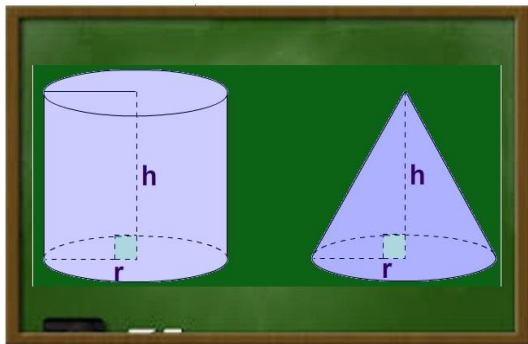


Fig 1: Traditional Geometry teaching in Mathematical Class room

It results neither in understanding of the student nor offers the power to apply mathematics in daily life. However, this problem can be partially solved by using models of different geometrical structures like cylinder, cone etc. But these models have fixed dimensions. The student can understand partially about the structures because these models are already used in his lower class learning. But in the present digital environment, student cannot be completely satisfied by this age-old traditional type of models. Therefore, the problem can still be not solved.

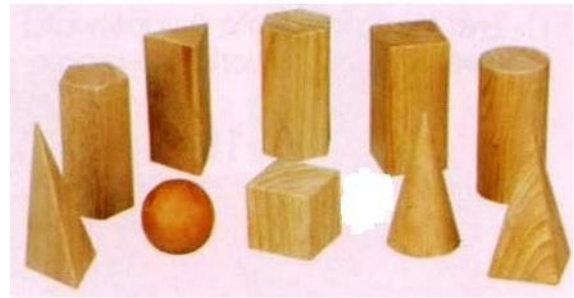


Fig 2: Traditional Geometry models used in Mathematical Class room

The 3D structures, which are not visualized by the 2D blackboard, can be visualized by using ICT tools such as combination of computer and internet. At present, computers are available with 3D view. Therefore, a mathematics teacher can show the 3D structures in class room using ICT tools. Alternatively, he uses a 3D projector. But these types of projectors are very expensive and sensitive. Comparing with a 3D projector, the computer is an inexpensive one and user-friendly. In this solution, not only fixed dimension structures are shown but also variable dimensions can also be visualized.

In the linear algebra, the Cayley – Hamilton theorem is one of the important theorems which involve matrix problems. The Cayley-Hamilton theorem states that substituting the matrix A for λ (characteristic Value) in characteristic polynomial results in the zero matrix. The powers of A (A², A³, A⁴ etc) procured by putting from powers of λ are defined by repeated matrix multiplication because A is matrix. The matrix A is a 2X2 or 3X3 or 4X4 etc order [3].

For example if $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & -3 & 2 \\ -3 & 1 & 1 \end{bmatrix}$, then the student

can solve $A^2 = \begin{bmatrix} -1 & 2 & 3 \\ 2 & -3 & 2 \\ -3 & 1 & 1 \end{bmatrix} \times \begin{bmatrix} -1 & 2 & 3 \\ 2 & -3 & 2 \\ -3 & 1 & 1 \end{bmatrix}$ and

$A^3 = \begin{bmatrix} -1 & 2 & 3 \\ 2 & -3 & 2 \\ -3 & 1 & 1 \end{bmatrix} \times \begin{bmatrix} -1 & 2 & 3 \\ 2 & -3 & 2 \\ -3 & 1 & 1 \end{bmatrix} \times \begin{bmatrix} -1 & 2 & 3 \\ 2 & -3 & 2 \\ -3 & 1 & 1 \end{bmatrix}$

Doing this type calculation is a tedious and time-consuming process. Also the student gets bored and even if it is solved, he doesn't know whether it is right or wrong [4].

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This type of complex matrix multiplications can be easily solved by using C-language program. C is a high-level and general purpose programming language that is ideal for structured programming, lexical variable scope and recursion. The C programs are easy to write and to modify. By using C program of matrix multiplication, student can easily solve 2X2 or 3X3 or 4X4 etc order matrices. Also there is no need of check whether the answer is right or wrong. The student feels maths is a funny subject. This is how the calculation is interesting and time-saving process.

```
ENTER THE SIZE OF FIRST MATRIX
2
2
ENTER THE SIZE OF SECOND MATRIX
2
2
ENTER THE ELEMENTS FOR FIRST MATRIX
2
2
2
2
ENTER THE ELEMENTS FOR SECOND MATRIX
2
2
2
2
FIRST MATRIX
.....
2      2
SECOND MATRIX
.....
2      2
MATRIX MULTIPLICATION
*****
8      8
8      8

ENTER THE SIZE OF FIRST MATRIX
3
3
ENTER THE SIZE OF SECOND MATRIX
3
3
ENTER THE ELEMENTS FOR FIRST MATRIX
3
3
3
3
3
3
3
3
ENTER THE ELEMENTS FOR SECOND MATRIX
3
3
3
3
3
3
3
3
FIRST MATRIX
.....
2      2      2
SECOND MATRIX
.....
2      2      2
MATRIX MULTIPLICATION
*****
12     12     12
12     12     12
12     12     12
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Fig 3: Matrix multiplication results by using C-program

In this way, ICT or ICT tools can improve the student's interest in learning Mathematics besides enhancing the effectiveness of teaching and learning. In this paper, only two applications of ICT in mathematical teaching are discussed. But the ICT can solve a number of issues present in all branches of mathematics.

III. CONCLUSION

This paper deals with Mathematical teaching and learning methods that can be made easy and interesting with the use of various ICT devices. By using ICT devices, the mathematics teacher can visualize 3D structures in the class room and creates interest in mathematical learning. Heavy complex mathematical calculations like A^2 , A^3 etc., for 2X2 or 3X3 matrices can easily be calculated in no time with fun with ICT Tools. The ICT can solve a number of issues present in all branches of mathematics with the help of ICT devices

REFERENCES

- [1] ICT, Wikipedia & Internet Source
- [2] Joris Mithalal, "3D Geometry and Learning of Mathematical Reasoning", Proceedings of CERME 6, January 28th-February 1st 2009, 2010
- [3] Mary E. Little, Teaching Mathematics: Issues and solutions, TEACHING Exceptional Children plus Volume 6, Issue 1, October 2009
- [4] Matrix Multiplication, Wikipedia