



## USE OF GEOGEBRA AS A MATHEMATICAL TOOL IN SCHOOLS

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**ABSTRACT** GeoGebra is an interactive mathematics software program for teaching and learning mathematics in a new way. GeoGebra can help to solve algebra and geometry in a new way from primary level to university level. GeoGebra is an open source software program which is accessible to all. In this study researcher wants to know the awareness of the teachers of secondary schools, affiliated to Central Board of Secondary Education (CBSE) and compare to the schools of the Kerala State Education Board, which are already using the GeoGebra in their daily classroom teaching-learning process.

**KEYWORDS :** GeoGebra, Interactive software

**INTRODUCTION**

As the generations are changing, the methods of teaching and learning are also changing. The world of education is moving towards the use of Information and Communication Technology, teachers are using it for all the subjects, because the demands of the society are increasing day by day. So, why we should not introduce the ICT in the world of mathematics. Mathematics is a nightmare for a major portion of students because it does not contain any interactive audio-visual graphics. Even the National Council of Teachers of Mathematics (NCTM) Principles and Standards for School Mathematics dedicated, Technology as one of their six principles for school mathematics "Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning." [NCTM, 2000, p.N]. Now there is a need of introducing some software applications for geometric constructions and to solve algebraic problems. GeoGebra is one of the software application which can be used for this purpose.

**GEOGEBRA**

GeoGebra is an interactive software which can be used to solve the algebra, calculus and also helps to construct geometric figures in a 3-Dimensional perspective. GeoGebra is a modern software which can be used from primary school to university level in the field of mathematics. GeoGebra is created by Markus Hohenwarter. It has won many awards like Archimedes 2016, Microsoft Partner of the Year 2015, MERLOT Classics Award 2013 and many more. GeoGebra can be easily downloaded from its official website [www.geogebra.org/download](http://www.geogebra.org/download).

GeoGebra is a dynamic mathematics software for schools that joins geometry, algebra and calculus. On the other hand, GeoGebra is an interactive geometry system, you can do constructions with points, vectors, segments, lines, polygons and conic sections as well as functions while changing their dynamically afterwards. On the other hand, equations and coordinates can be entered directly. Thus GeoGebra has the ability to deal with variables for numbers, vectors and points. It finds derivatives and integral of functions and offer and command like Roots and Vertex [Book Introduction of GeoGebra version 4.4 by Judith & Markus Hohenwarter in 2008]. We can easily perform various activities like construction of circles, polygons, also find their areas, roots and a lot more to explore.

**Effect of GeoGebra on Primary and Secondary Level**

As the time is demanding the replacement of traditional chalk and black board with digital technologies. This replacement is starting from the primary schools itself. Mathematics is often treated as one of the most difficult subjects, but its value and usefulness cannot be omitted. So, as per the changing nature of the society, the teaching-learning process of mathematics is also switching from the traditional to modern methods.

GeoGebra is an open source software, which graphically demonstrate various mathematical activities. GeoGebra can introduce from primary up to university level. In primary and secondary level it is helpful in transforming the 2-Dimensional geometry into the 3-Dimensional world.

The various concepts like angles, triangles, quadrilaterals, cubes,

cubeoids etc. can be explained in a 3-Dimensional way which can help the students to learn in an interesting way.

A study was conducted by Mehmet Bulut, Hanife Ünlütürk Akçacıkın & Gürcan Kaya (Gazi University, Gazi Faculty of Education, TURKEY) to find out the effects of GeoGebra on the third grade primary students. The study was conducted with 40 students in two classes in Ankara. There were 19 students in the experimental group and 21 students in the control group. The experimental group was taught fractions with the help of GeoGebra and the control group was taught without the GeoGebra and one post test is taken and the results showed that student of experimental group scored more than the students of the control group. Thus, it is clear that using GeoGebra in the classroom teaching will help to clear the mathematical concepts among the students and it will also help to increase the students' interest.

A research conducted by Kaushal Kumar Bhagat & Chun-Yen Chang (National Taiwan Normal University, TAIWAN, 2015, 11 (1), 77-86) on a group of 50 students of standard 9th in the eastern part of India. He divided the students into two groups, experimental group and a control group, each group has 25 members. The experimental group and the control group were taught theorem on circles, experimental group was taught with the help of Geogebra but control group was taught with the traditional method and the result is collected by a post-test. The test clearly shows that Geogebra is a powerful tool for the teaching learning process of geometry in middle schools.

Likewise there are many researches conducted across the globe to show the effectiveness of GeoGebra as a mathematical tool.

**OBJECTIVE**

- The objective of this study is to know whether the teachers of the schools which are affiliated to Central Board of Secondary Education (CBSE), New Delhi are aware of the effectiveness of GeoGebra, a dynamic mathematics software or not, and are they using it in their daily classroom teaching or not.

**METHODOLGY OF THE STUDY**

To study the use of GeoGebra in the primary and the secondary schools, the researcher conducted a survey. Keeping in view the objective of the study, the researcher selected the sample through the convenience sampling technique. The survey was conducted in various schools which are in the nearby area of Perinthalmanna, Malappuram district, Kerala, India. The survey was held on 14 mathematics teachers from 5 different schools. The survey was done with a simple sampling tool which consists of 9 questions. In each question the teacher should have to write his own comment. With the help of the sampling tool, the researcher can easily fulfill the objective of this study.

**FINDINGS**

The sampling tool consists of 9 simple questions which has to be filled by the teacher itself.

- The first question of the sampling tool which asks about the best suitable method for teaching mathematics, a majority of the teachers suggested Activity Method as the most appropriate one, 6 out of 14 teachers suggested it as one of the best methods for

teaching mathematics. Some other methods were also suggested like project method, problem solving method, demonstration method, peer teaching or group discussion method, lab activity method and many more.

- In the second question it was asked that whether the teachers are only using the lecture method for teaching mathematics, all the teachers denied that they are not using only lecture method for the teaching-learning process of mathematics.
- In the third questions it was asked that whether the teachers are using some audio-visual techniques in the mathematics teaching, 13 out of 14 teachers said yes, they are using.
- In the fourth question it was asked that whether they are using any specific software for mathematics teaching, majority (7) of the teachers said No, that they are not using any specific software, just using YouTube or Google for it. But one teacher suggested Khan academy, two suggested Teachnext and the teachers of the Kerala State Education Board school suggested GeoGebra.
- As the fourth question, the fifth question also asks to suggest the softwares the teachers will use for teaching Geometry in their classrooms, 6 among 14 answered Don't know, 3 suggested the name of some other applications, but 6 answered GeoGebra.
- The sixth question wanted to know whether the teachers are aware about the software GeoGebra or not, 11 out of 14 said Yes, that they heard about GeoGebra.
- The seventh question asked the teachers what they know about GeoGebra. Most of the teachers (11) from Central Board of Secondary Education (CBSE) are not much aware of it, they just only heard its name and knows that it is a mathematical software used for geometry and algebra, even they haven't seen it before.
- The eighth question asks whether the teachers are using GeoGebra in their classrooms or not, but its answer can be predicted by the seventh question, as the teachers from Central Board of Secondary Education (CBSE) are not much aware of it that's why they are not using it in their classrooms.
- Tenth question asked the teachers that is the use of a GeoGebra will increase the interest of the students, almost all (13 out of 14) the teachers said that it will definitely increase the interest of the students and also help to make the teaching-learning process much easier. But a few teachers of the Kerala State Education Board School are saying that it is time consuming.

## DISCUSSION

During the whole survey, the researcher talked to many teachers from different schools, which are affiliated to Central Board of Secondary Education (CBSE) and the Kerala State Education Board. The researcher in his conversation found that Central Board of Secondary Education (CBSE) school teachers just only heard the name of GeoGebra, they are not as much aware of it, they don't know how to use it and what the benefits of using GeoGebra as a teaching tool for mathematics. On the other hand, the teachers of the Kerala State Education Board School know very much about about GeoGebra, and using it as a mathematical teaching tool in their classrooms, the mathematics books of the Kerala State Education Board are recommending the use of it, the books are also given full instructions for the usage of GeoGebra. While talking to them the researcher also found that most of the teachers either from CBSE or Kerala State Education Board schools say that GeoGebra is helpful in creating an interactive atmosphere in the classrooms, also helps to make clear the various concepts in a visual manner but apart from all the goodness the use of GeoGebra in daily classroom activity is time consuming.

From the above discussions with teachers and after reviewing the various researches, it is clear that GeoGebra can be used as an effective tool in mathematical teaching. The Kerala State Education Board has already implemented the usage of GeoGebra in their books, organizing various seminars and workshops to make the teachers aware of it. The teacher training institutes in Kerala are also training the future teachers to use GeoGebra in their practical teaching-learning process.

Like Kerala, the other state education boards and the CBSE should also

introduce the use of GeoGebra in the classroom teaching. If all the state boards of India and CBSE implemented the GeoGebra in their books and schools, it will definitely widen the mental horizon of the students.

## CONCLUSION

GeoGebra is a better platform for teaching mathematics in the classrooms from primary level to university level. It provides a dynamic, interactive and friendly environment to the students, also helps to increase their cognitive thinking power like creativity. It should be implemented by all the States' Education Board of India as well as the Central Board of Secondary Education (CBSE) like the Kerala State Education Board already did.

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