International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 2 Issue: 9 2569 – 2571

Teaching Mathematics in Engineering Education through Technology

Mr.V. Naganjaneyulu [1]
Department of Mathematics
Al Habeeb College of Engg & Tech
RR Dist, India.

Dr.A.Ramakrishna Prasad [2]
Professor of Mathematics
JNTUH
Hyderabad ,India

***Abstract*--**This paper explains new methods on teaching mathematics through technology, which can improve students' knowledge in engineering education effectively. Also this paper presents mathematics methodology on problems solving graphically for engineering education by interactive and creative methods. Identifying the importance of teaching mathematics components (numerical solutions, graphical solutions and experimental methods) using technology. We used Geogebra as a technology tool to teach Numerical techniques (algebraic and transcendental equations) examples with graphical representation and had a immediate positive effect from the students on more understanding knowledge of mathematics for the future development.

Keywords: *Engineering education, Teaching mathematics, problem solving, Geogebra, Creative environment.*

*****

1. INTRODUCTION

In general, all engineering students should be familiar with the following mathematics topics, "Vector Calculus, Linear Algebra, Ordinary Differential Equations, Partial Differential Equations, Single and Multi variable Calculus and basic Probability & Statistics". Usually, all these topics are taught in separate mathematics subjects. They are usually not incorporated into the teaching of engineering subjects.

Teaching mathematics using technology has changed extremely during the last 5-10 years. In today generation many calculators are available for mathematical geometrical constructions. If we change the mode of teaching mathematics with computers then there are several kinds of mathematics softwares both paid and freeware is easy to get in the today's market. We are preferring freeware software Geogebra which can give deep understanding of algebraic and transcendental equations under numerical techniques. This significant change in availability raises the questions naturally concerning about teaching mathematics in engineering education at all different branches, questions concerning about mathematical content, learning, teaching and assessment.

2. WHAT IS GEOGEBRA

Markus Hohenwarter created free mathematics software GeoGebra, which is used for both teaching and learning mathematics from the school level through college level to the University level [1].This tool extends the concepts of dynamic geometry to the fields of algebra and mathematical analysis. Numerous research results suggest that this software package can be used to encourage discovery, experimentation and visualization in traditional teaching of mathematics. However, researchers suggest that, for the majority of teachers, the main problem is how to provide the technology necessary for the successful integration of technology into teaching mathematics. GeoGebra was created to help students gain a better understanding of mathematics. Students can manipulate variables easily by simply dragging free objects around the plane of drawing, or by using sliders. Students can generate changes using a technique of manipulating free objects, and then they can learn how the dependent objects will be affected. In this way, students have the opportunity to solve problems by investigating mathematical relations dynamically.

2.1 Geogebra is a Dynamic Mathematics Software, which integrates Geometry, Algebra(GeoGebra) and Calculus. It has elements of Dynamic Geometry Software (DGS) and Computer Algebra Systems (CAS). Runs on any platform that supports Java.

2.2 It is freely available for online installation from www.geogebra.org/webstart or downloadable for local installation at www.geogebra.org.

2.3 Examples at www.geogebra.org/book/intro-en.zip and at the wiki www.geogebra.org/en/wiki.Thoughts, help and queries are shared at the forum www.geogebra.org/forum .

2.4 Designed specifically for educational purposes, Geogebra can help students grasp experimental, Problem-oriented and research-oriented learning of mathematics, both in the classroom and at home.

The most important aspire of GeoGebra is to provide two presentations of each mathematical object in its algebra and graphics windows. If we change any object in one of these

 ISSN: 2321-8169
2569 – 2571

windows, its presentation in the other one will be immediately updated automatically. Computer Algebra Systems CAS (such as Mathematica, Maple, Matlab, Mathcad etc) and dynamic geometry softwares (such as Cabri Geometry, Geometer's Sketchpad etc) are powerful technological tools for teaching mathematics. Numerous research results suggest that these software packages can be useful to encourage students' discovery, experimentation and visualization in mathematics traditional teaching. However, researchers suggest that, for the majority of faculties, the main problem is how to provide the technology necessary for the successful integration of technology into teaching (Ruthven & Hennessy, 2004)[2].So, the suggested solution for teaching mathematics Geogebra is one of software packet for applying technology in the college level.

3. NUMERICAL TECHNIQUES EXPLORING THROUGH GEOGEBRA

Although our teaching methods are still traditional (using reference textbooks, lecture notes, lectures, assignments, mid exams and final exam) our plan is to try to make some changes in the way of work in order to make our teaching courses more effective and to improve the learning outcomes of our students. The goal is to use GeoGebra to provide an environment for active exploration of algebraic mathematical structures through multiple representations, or to show students some aspects of the mathematics that are not possible with pen and paper.

To teach Algebraic and Transcendental equations under Numerical Techniques in engineering education, Most of the teachers are using Bisection , Regula-Falsi, Iteration and Newton Raphson methods to solve the problems for solutions with the help of objects: pen, paper and calculator. As part of our research work, we can teach or we can verify the answers of those problems effectively with visualised graphical solutions with the help of GeoGebra. These graphs are only possible with technology but not with pen, paper and calculator.

3.1 For example the algebraic equation: Find the root of the equation $x^4 - x^3 - 2x^2 - 6x - 4=0$ (see figure 1).

3.2 For example the transcendental equation: Find the root of the equation (x)tan(x)+1=0 (See figure 2).

In the present engineering education the teachers or students can solve the above Algebraic and Transcedental equations by using "Bisection, Regula-Falsi, Iteration and Newton Raphson methods". But we can solve these equations with "graphical representation" through GeoGebra. Switch on the GeoGebra home page and enter the function then graph will appear .Identify the intersection point of positive x-axis and the first line which gives solution of equation. Here teachers can teach effectively with graphical representation which is not possible by pen, paper and calculator.

GeoGebra can be used as a mathematics software tool to help students perform data analysis and inference and explore mathematical models. Students can work with a specially configured version of GeoGebra designed for a mathematics-learning environment (Figures1&2). This specially configured version of GeoGebra is only accessible by the students of the lecturer who has designed this version of GeoGebra.

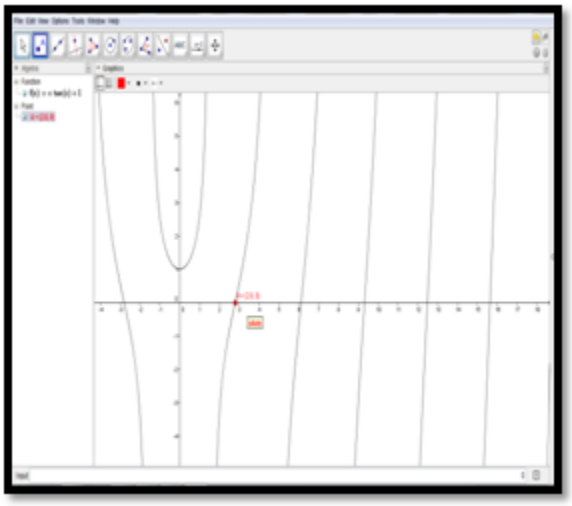

Figure 1: Finding the root of the equation:
$x^4 - x^3 - 2x^2 - 6x - 4=0$
(The solution is 2.73)

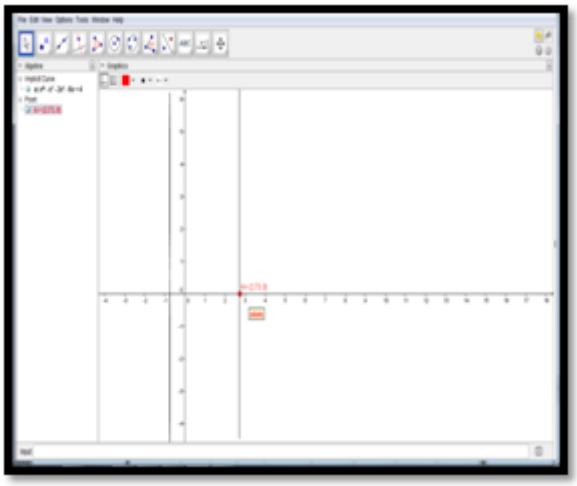

Figure2: Finding the root of the equation:
(x)tan(x)+1=0
(The solution is 2.80)

CONCLUSION

In this paper, we explained some opportunities and examples on how GeoGebra can be used effectively in engineering education to explore some basic concepts in algebraic and transcendental equations under numerical techniques. Finally we can conclude that GeoGebra has many possibilities to help students to get an intuitive feeling and to visualize adequate mathematics process. The use of this software tools allow the students to explore a wider range of function types, and provides students to make the connections between symbolic and visual representations.

REFERENCES

[1] Hohenwarter, 2001 GeoGebra. Available from www.geogebra.com
[2] K. Ruthven, S. Hennessy, S. Brindley (2004), Teacher representations of the successful use of computer-based tools and resources in secondary-school English, mathematics and science, Teaching and Teacher Education, Volume 20,Issue 3, pages 259-275.
[3] http://www.geogebra.org
[4] http://www.math.umn.edu/~rogness/mathlets/xSquaredSin1o verX/