

The Use of Information Communication Technology in Solving Mathematical Problem

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Abstract

Mathematics is a one major area of science that is of great important that interrelate all other science. One of the important goals of mathematics is to transform a student into an individual with high decision power and creative solving problems and the power of reasoning. Information Communication technology tools and software are of great support for solving mathematical problem. Several application software are available for solving mathematical problem in different academic level. This research work gave a general survey of various mathematical software, ideas of their applications and their effects.

Key words: Mathematics, Information Communication Technology (ICT), computational software, Problem solving

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I. Introduction

Problem solving is one of the essential skills that are needed in all area of our everyday life. Problem solving requires some creative skills, critical thinking and also the ability to apply the ideas and knowledge acquired to a real world problem. Problem solving is an intellectual applicable tool that is developed and improves over time, Molnar *et al.* (2013). According to Adey *et al.* (2007) these mathematical problem solving skills are developed through detail training and materials. Mathematics is a major field in science that connects all other sciences. All sciences and other disciplines like philosophy, sociology, psychology, etc. are directly or indirectly based on the idea of mathematics, hence understanding its concepts is required.

Over the years, integrating Information Communication Technology (ICT) in education has gain increase. ICT provides assist in mathematics, it composes, edit, revise, calculates, make connections, visualize data, synthesize and solve problem, Joshi, (2017). Al-Hilli (2018) opted that the application of ICT in education has saves as a basis of motivation and innovation. The use of ICT in learning can help in the improvement of the quality of learning and education, Solar *et al.* (2013). The quality of mathematical computational packages has been improving rapidly and hence ICT is greatly integrated into the educational sector.

Mathematical Related Software

Modern mathematics involves the use of ICT tools/software which is used to solve mathematical problems. Several software have been developed each having specify area of application. Kumar & Kumaresan, (2008) highlighted some of these software related to mathematics.

Software	Started	Utility
Mathematica*	1998	General purpose CAS
Maple*	1985	General purpose CAS
MuPAD*	1993	General purpose CAS
MatLab*	1970	General purpose CAS
MathCAD*	1985	General purpose CAS
Magma*	1993	Arithmetic Geometry, Number Theory
SciLab	1994	General purpose CAS
Maxima	1998	General purpose CAS
YACAS	1999	General purpose CAS
SAGE	2005	Algebra and Geometry Experimentation
Macaulay2	1995	Commutative Algebra, Algebraic Geometry

GAP	1986	Group Theory, Discrete Math
GP/PARI	1985	Number Theory
Kash/Kant	2005	Algebraic Number Theory
Octave	1993	Numerical computations, Matlab-like
Singular	1997	Commutative Algebra, Algebraic Geometry
CoCoA	1995	Polynomial Calculation
Gnuplot	1986	Plotting software
Dynamic Solver	2002	Differential Equation
R	1993	Statistics

Table 1: Some mathematical software and their application area. (Kumar & Kumaresan, 2008) The star (*) one are commercial software. The others have free access.

Application of ICT Tools/Computational Software

Over the years various studies has been carried out on the use of modern technological tool in mathematics. Herdianto *et al.* (2020) studied the feasibility of ICT-based learning media to improve students' abilities in solving mathematical problem related to the industrial revolution 4.0, their results showed that ICT-based learning media were valid to use in terms of the results from media experts validation. It also meet practical and effective in learning mathematics and can improve student's problem solving ability. Also, in 2020, Letchumanan *et al.* used a quantitative and qualitative method to investigate how ICT tools were used by academicians in mathematics department to promote higher order of thinking among university students. Mkomange *et al.* (2013) investigate the prospective mathematics teachers' beliefs on the usage of ICT in class room mathematics problem solving. The study shows that there is no connection between study level and gender as it affects student teachers prospective beliefs about the use of ICT in classroom. Drigas and Karyotaki (2016) studied online and other ICT-based training tools for improvement problem solving skills. They opined that an interactive learning environment that supports information sharing and discussion among group member and facilitators should embed a collaborative problem solving task. Dewi *et al.* (2020) used a quantitative method to analyze a mathematical problem solving ability based on self-efficacy in ICT-assisted pre-prospect and learning model. The study indicated that there is a direct proportionality between the mathematical problem solving ability and self-efficacy. Lan *et al.* (2021) analyzed the impact of ICT on mathematical problem solving ability. They did a comparison between class using Hawgent and conventional methods. Their results showed that Hawgent promotes students' problem solving skills. Hu (2022), expounded the application of computer technology in mathematical modeling problem. The effective application of the Maple software was explored by Sallah *et al.* (2021) to reduce student teachers' error in an integral calculus. They recommended that Maple assisted instruction in teaching and learning of integral calculus should be encouraged. Dharmadhikari (2023), studied the challenges associated with the use of ICT tools in the learning environment. The study shows that in order for students to effectively utilize ICT tools to enhance their learning experiences, the challenges associated with the use of these tools in learning environments need to be addressed.

Effect of ICT Usage in Solving Mathematical Problem

Most students see mathematics to be very difficult and encounter a lot of error in the process of trying to solve mathematical problem. Several studies have employed ICT tools to analyze mathematical problem. Goos (2010), mentioned that ICT helps students to learn and understand mathematics quickly, effectively and accurately. Guzeller and Akin (2012), shows that ICT helps to improve mathematics results, attitude, anxiety and self-efficiency. Joshi (2017) mention four basic steps in the process of solving mathematical problem; understand the problem, create a plan or a solution, implement the plan and examine the solution obtained. Bataineh *et al.* (2019) examined the use of MATHEMATICA software as a supporting tool for the teaching learning process for derivative and its applications. They affirm that the use of computer algebraic software (CAS) tools helps to develop better understanding in mathematics. Setiyani *et al.* (2020) studied the effectiveness of students' activities by using Quizizz on mathematical problem-solving skills. Their work shows that there is an effect on students' learning activities by using Quizizz on problem-solving skills and they concluded that Quizizz is effective in improving mathematical problem solving skills. Therefore the application of ICT in education is an irrefutable necessity.

According to Herdianto *et al.* (2020), the ability to understand a concept can improve a person's ability to solve a mathematical problem. They also opted one major objective in learning mathematics is the ability to solve problem, therefore, using ICT in learning mathematics is a way to improve mathematical problem solving ability, Alim *et al.* (2015). Panduro (2023), shows the great influence of GeoGebra in the achievement of mathematical skills. Al-Hilli (2019) investigated the use of software and technology in solving mathematical problem for speed up learning process. The results showed the use of ICT is effective in changing student's

attitudes towards mathematics. Aidoo *et al.* (2022) were of the opinion that using the knowledge of ICT in problem solving process will help students to see where there are errors and receive appropriate assessment.

II. Conclusion

Information communication technology tools/software has great significance in solving mathematical problem. It helps to improve the quality of learning and enhances problem solving ability. It is seen that the use of mathematical software is virtually applied in all aspect of mathematics and it will lead to great outcome if these software are effectively used. Several software has been developed to aid mathematician with their specific area of applications.

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