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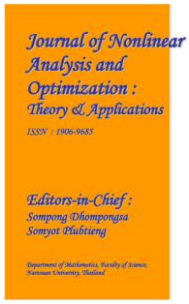

AN ANALYSIS OF THE PERCEPTION OF FACULTY IN LEVERAGING MATHEMATICAL SOFTWARE TO TEACH MATHEMATICS.

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Abstract:
Technology plays an important part in teaching and learning. There has been a considerable growth in the use of technology in teaching, learning and mathematics research. Teachers can help students develop an interest in mathematics irrespective of their age and help them excel the course by using mathematical software while teaching. Technology offers both an opportunity and challenge to teachers, to present new methods that will help students to develop better understanding of mathematical concepts and at the same time to constantly upskill themselves to be more efficient at using modern technological tools to supplement existing teaching methodology. Use of technology in mathematics connects abstractions to real-world settings, this addresses common misunderstandings and introduces more advanced ideas. As a result, students develop skills that is more centered towards learning core concepts and problem solving.This study aims to examine the use of mathematical software in teaching mathematics.

Key words:
Technology, Mathematical software, training, visualization

Introduction :

Knowledge of Mathematicsis needed in all aspects of our life. However, the fear of mathematics has affected student's interest in the subject since a long time. Mathematical anxiety seems to be a problem for many learners. This poses a great challenge to teachers as it is difficult to develop curiosity in mathematics amongst students. It is the responsibility of teachers to reduce fear and dislike towards mathematics and help students develop an interest in the subject.

The use of technology in education has grown rapidly over the years. To prepare students for the future and to help them learn better technology has to be integrated into teaching. Teachers face challenges in incorporating technology while delivering lectures. It has been observed that mathematical software is used while delivering course content unless it is mandated in the syllabus. This is mainly because of the lack of infrastructure, training tools, access to educational software and time constraint to complete the syllabus. Research has shown that when technology is integrated into mathematics teaching it helps students learn mathematical concepts better as it provides them with a more concrete visualization of the problem, thereby it reduces the effort required to solve the problem. Mathematical software generally presents the problem either diagrammatically or graphically and provides the solution immediately without students needing to spend time on tedious calculations. Thus, technology helps students to evaluate themselves independently and learn from their mistakes, so they are more engaged and motivated to solve mathematical problems. Computer Algebra Systems (CAS) such as Mathematica, Maple, MuPad, MATLAB, Mathcad, Maxima can be used as a powerful tool to solve problems in mathematics and aide students of all levels to understand the subject.

Review of Literature:

Modern mathematical software packages help visualize solutions. By means of software tools, graphic and animation, one can significantly increase the understanding of basic concepts and make

mathematics more interesting (Ochkov & Bogomolova, 2015).The integration of technology in mathematics teaching might increase an interest towards the subject and improve student's performance.Mathematics Instructors have a very positive attitude towards technology and continue using technology in their mathematics courses (Adamides, 2004). Use of MAPLE software tools in teaching and learning linear Algebra courses provides conceptual and clear understanding of the subject for the students. Computer Algebra Systems (CAS's) can be used as efficient tool to understand problems in algebra, calculusanduse of these systems will benefit undergraduates and postgraduate'sstudents in mathematics, engineering (Kilicman et al., 2010). The use of CAS in the teaching of mathematics can be channelized to maximize opportunities and support teaching & learning aspects(Kumar & Kumaresan, 2008). Digital learning in mathematics allows teachers to embrace a less formalized method of teaching that is interactive and interesting (Eddie M. Mulenga & José M. Marbán, 2020). Teachers need to be made aware of the availability of ICT tools and when to use it.This will help elevate all aspects of teaching and learning. Use of ICT can enhance and stimulate the learning experience and curiosity of the students (Barve & Barve, 2012). Student's achievements in mathematics can be positively impacted using technology, depending on the teaching methods used by the teacher and evidence suggest that pedagogy does indeed change with ICTs, the exact nature of change remains opaque (Hardman, 2019). Integration of ICT in mathematics education has a positive impact on both the teaching and learning process but there are few barriers to integrate it in various branches of mathematics (Das, 2019). Technological tools enable teachers to assist students in developing their knowledge and problem-solving skills. One such tool eZbirka further strengthened the teacher student relationship by helping students become more engaged in the classroom. It was observed that students were motivated to work, and the software helped teachers by revealing gaps in the pupils understanding of the subject. This helped the teachers to plan their lessons in a more efficient way(Radović et al., 2019).

Objective of the study:

To analyze the opinion of Mathematics teachers towards the use of mathematical software, and the potential of the software in enhancing the mathematical and technological skills of students.

Hypothesis:

H_0: There is no significant difference exists between male and female faculty members using mathematical software's in teaching mathematics**.**

H_1: There is significant difference between male and female faculty members using mathematical software's in teaching mathematics.

Methodology:

Target group & instrument used in data collection:

Data was collected solely from primary sources through an online google form. A questionnaire was created to gauge participants responses primarily on the following aspects: student's interaction with mathematical software and the impact of using mathematical software's while teaching to determine if there was an increased interest in the subject. To collect information for this study, the questionnaire was sent to mathematics faculties working in different colleges and universities in India. The responses to the questionnaire were designed such that it followed the five-point Likert scale standard. Descriptive analysis was done on the data collected through this study to find out the most influencing factors and t-test and independent t-test was used to test the hypothesis. SPSS software was used to conduct further analysis.

Analysis & Results:

Descriptive Statistics:

The data for this study was collected from 45 faculties teaching mathematics in Science & Engineering colleges and universities. Analysis was done based on frequency distribution of the opinion of the respondents and demographic details are given in table1.

Table-1: Summary Analysis of the Demographic Features using Frequency, Percentage

Particulars	Frequency	Percentage
Gender		
Male	27	60.0
Female	18	40.0
Total	**45**	**100.0**
Stream		
Engineering& Technology	26	57.8
Science	19	42.2
Total	**45**	**100.0**
Class		
UG	22	48.9
UG & PG	23	51.1
Total	**45**	**100.0**

Of the respondents 60% were male and 40% were female faculty members.Among the mathematics faculties who responded to the survey 42.2% belong to science stream and the remaining belong to Engineering & Technology. 48.9% of the faculties teach only undergraduate students and the remaining 51.1% teach at Undergraduate and Post graduate level.

One of the questions on the survey was to determine if teachers were aware of the various mathematical software's such as MATLAB, Mathematica, Geogebra, Scilab, SageMath, Maple available for mathematical problem solving. Maple is a commercial computer algebra system developed in 1980 by the Symbolic Computation Group at the University of Waterloo, it allows users to rapidly construct models for a range of mathematical problems. MathWorks created the programming and numerical computing platform MATLAB. A computational software tool utilized in many mathematical, scientific, engineering, and computing domains is called Mathematica. It is used for numerical modeling and simulations. Geogebra is a computer algebra system that can be used for graph sketching etc. An advanced numerically oriented programming language called Scilab enables users to swiftly build models for a variety of mathematical issues. Numerous areas of mathematics, including algebra, numerical analysis, calculus, number theory, combinatorics, graph theory, and statistics, are covered by the features of SageMath, a computer algebra system (CAS).

Table-2 : Software's used in Teaching Mathematics

Software	Responses	
	N	Percent
Geogebra	12	11.7%
Scilab	18	17.5%
Mathematica	21	20.4%
MATLAB	29	28.2%
SageMath	6	5.8%
Maple	5	4.9%
Any other software	12	11.7%
Total	103	100.0%

95.6%of the faculty use at least one of the software's listed above while teaching mathematics theory as well as during practical's to help students understand the concepts better and as a visualization tool to develop interest in the subject. Incorporating these tools as a part of the curriculum ensures that student will become aware about using these software's and thereby greatly benefit from them while learning.

Hypothesis 1:

Null Hypothesis: Opinion regarding the usage of mathematical software while teaching mathematics is equal to average level.

Table-3: t test for specified value (average=3) of statements on software usage

Statements on usage of software	Mean	SD	t value	p value

Students develop an interest in mathematics subject	4.52	0.593	12.305	<0.001**
Connect abstractedness to real world problems	4.48	0.593	11.953	<0.001**
Teachingbecomes simpler and effective	4.35	0.832	7.772	<0.001**
Make tedious calculations simple and faster	4.26	0.864	6.996	<0.001**
Provides collaborations among students	4.30	0 .822	7.609	<0.001**
Improvestheir mathematics grade	4.26	0.810	7.465	<0.001**
Enhancementof visualization	4.70	0.470	17.285	<0.001**

Note: ** denotes 1%level of significance

Since p value is less than 0.01 the null hypothesis is rejected at 1% level of significance with regard to all the statements on the usage of mathematical software's in teaching mathematics. Hence the opinion of faculties is not equal to average level. Based on mean score, opinion of all the faculties on all the statements on the usage of mathematical software's on teaching mathematics is above average level.

H_0: No significant difference exists between male and female faculty members using Mathematical software's in teaching mathematics**.**

H_1: Significant difference exists between male and female faculty members using Mathematical software's in teaching mathematics.

When applied independent t test, male faculty members with mean 31.38 and SD 3.75 and female faculty members with mean 30.33 and SD 3.80 gives t value=0 .696 and p value =0 .494. Since p value is greater than 0.05, there is no significant difference between male and female employees in the usage of mathematical software's in teaching mathematics.

All the faculty members are of the opinion that they should keep themselves updated in the usage of technology so that they can teach mathematics more effectively and help students develop an interest in the subject. To ensure that teachers are better equipped with using these tools and are aware of the new technological developments taking place training needs to be conducted quite often.

Conclusion:

The data collected suggests that majority of the faculties use software to teach mathematics in classroom. Digital tools, the faculty and the educational context plays an important role in integrating technology in mathematics teaching and learning. Technology enhanced learning improves the performance of the students, their commitment, and interest in the subject. It helps build confidence in their ability to learn mathematics, and thus improves their overall performance. It is known that mathematics has widespread usage across all fields. By using technology to teach mathematics, teachers can help foster curiosity in the subject which will promote mathematical aptitude It is important that teachers adapt to use newer learning methods and integrate these tools while teaching.

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