

A survey on the use of ICT in Teaching Learning Practices in College Level Mathematics

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ABSTRACT

This study investigated the role of Information and Communication Technology (ICT) as a tool for effective teaching and learning of mathematics among college level students. The purpose of this study was to explore use of ICT in teaching and learning of Mathematics among college level students and teachers of mathematics. The researcher deployed an online survey form to collect data. Three questions, based on the objective of the study, were asked to both the teachers and students from different colleges and universities of India. The chi-square test was used to analyze the obtained data. The findings of the study are that, the use of ICT enhances teaching learning of mathematics, improves skills for solving mathematical problems and makes students interested in learning mathematics.

1. Introduction

Mathematics plays an important role in the development of science and technology. Science, technology and innovations play major role in the global economy. So, it is essential that Indian students should learn mathematics and science skills carefully to remain competitive with other countries. The statistical data are troubling when India ranked 72 in Program for International Student Assessment (PISA) - 2009 among the 74 participating countries. In order to compete with the international market in science and technology, mathematics and science teaching and learning methodology in India must be improved.

One way to enhance mathematics teaching and learning is the use of information and communication technology (ICT) [1],[5],[6]. ICT offers new and novel way to learn mathematics. In the last few years, the uses of ICT has been taken a great attention to the teachers in teaching and learning of mathematics in schools and colleges [7]. The modes of use of ICT are computer, internet, smart phone, projectors, A-V materials, videos etc. The more effective use of these tools in teaching learning practice of mathematics were greater understanding of the students for the subject.

Technology has advanced at a very high speed in the last ten years. For example, 10 years ago there was feature phones but recent days smart phone has been adopted in the Indian market. Globally, China will have the highest number of smart phone users (1.3 billion) in 2018, followed by India with 530 million smart phone users. The US, with 229 million users, will be in the third position [3]. According to Mobile Internet Report 2017, published by Internet and Mobile Association of India, the number of internet users in India is expected to reach 478 million by June, 2018 [4]. The young students from India are the most prolific users of internet services [4]. Majority of the students adopted the computer, smart phone and internet. Therefore, the educators also need to adopt educational technology in their teaching learning process. Teacher and their students have positive relationship in technology enabled classroom [2]. In the new digital society in the 21st century,

education system is facing great challenges from traditional ways to innovative ways of teaching and learning. Ministry of Human Resource Development (MHRD), Government of India has undertaken the project "National Mission on Education through ICT" to provide ICT enabled quality education to all the learners in India. MHRD, Government of India, has also launches ICT enabled learning platforms such as SWAYAM, e-PG Pathshala etc. Several workshops and training programs have been conducting to train the teachers in India.

The paper arranged as follows: Section 2 describes the objectives of the study. Research hypothesis is in Section 3. Data collection and analysis is in Section 4. Result and discussion in Section 5 and conclusion is in Section 6.

2. Objectives of the study

The major objectives of this study are to find out:

- Whether there is any difference in the opinions of the students and teachers about the use of ICT in enhancing the learning of the students of mathematics
- Whether there is any difference in the opinions of the students and teachers about the use of ICT in improving the mathematical problem solving skills.
- Whether there is any difference in the opinions of the students and teachers about the use of ICT in motivating and making the students interested in learning mathematics

3. Research Hypotheses

H₀₁: There is no significant difference in the opinion of students and teachers on the use of ICT in enhancing teaching learning practice of mathematics

H₀₂: There is no significant difference in the opinions of students and teachers about the use of ICT in improving the mathematical problem solving skills

H₀₃: There is no significant difference in the opinions of students and teachers on the role of ICT in motivating and making the students interested in learning mathematics

4. Data Collection and Analysis

The investigator deployed an online survey form to collect the data about the use of ICT in the teaching learning practice of mathematics from the college and university students and teachers. The online survey was conducted among the target population using Google Form, a freely available online platform powered by Google. The URL of the online form is <https://goo.gl/forms/SRAaCQILWmWkzclu1>. This online form was spreaded among students and teachers using the social media and email. To test the hypotheses there were three test items in the survey form. The test items are as followings:

Item 1. The use of ICT enhances teaching and learning of mathematics.

- ☐ Agree ☐ Strongly Agree ☐ Neutral
☐ Disagree ☐ Strongly Disagree

Item 2. The use of ICT improves student's problem solving skills.

- ☐ Agree ☐ Strongly Agree ☐ Neutral
☐ Disagree ☐ Strongly Disagree

Item 3. The use of ICT motivates and makes students interested in learning mathematics.

- ☐ Agree ☐ Strongly Agree ☐ Neutral
☐ Disagree ☐ Strongly Disagree

Total 112 online responses were received. Out of the 112 responses, 30 responses were submitted by the teachers and 82 responses were submitted by the students from different colleges and universities from India. Most of the responses were obtained from college and university of West Bengal. The data obtained from online survey is presented in the Figure 1 and Table 1, 3 and 5.

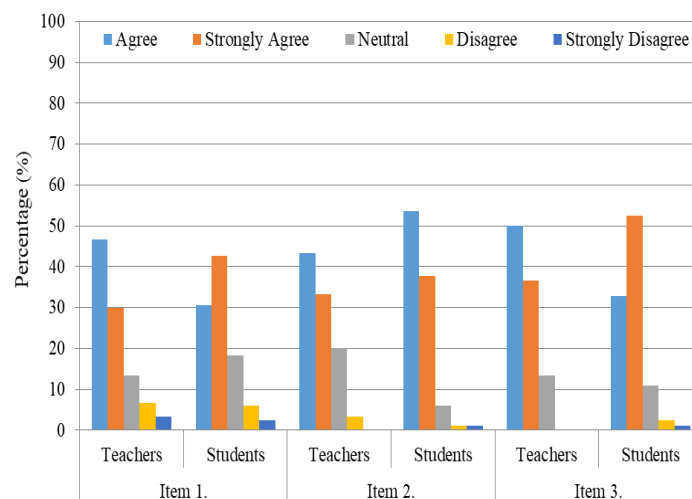


Figure 1. Graphical Representation of opinion of students and teachers for the each question.

$$\chi^2 = \sum \frac{(f_0 - f_E)^2}{f_E}$$

The suitable statistics to test the null hypotheses H_{0i} is χ^2 . Here f_E is the expected frequency under the null hypotheses H_{0i} for i=1,2,3 and f_0 is the observed frequency. The sampling distribution is a χ^2 distribution with degree of freedom (5-1)x(2-1) = 4.

Table 1. Response of Students and Teachers on the use of ICT enhances teaching learning practice of mathematics

Students	Response	No. of Students	Percentage
	Agree	25	30.4878
	Strongly Agree	35	42.6829
	Neutral	15	18.2927
	Disagree	05	06.0976
	Strongly Disagree	02	02.4390
	Total	82	100.0000
Teachers	Response	No. of Teachers	Percentage
	Agree	14	46.6667
	Strongly Agree	09	30.0000
	Neutral	04	13.3333
	Disagree	02	06.6667
	Strongly Disagree	01	03.3333

	Total	30	100.000
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Table 2. Expected contingency table corresponding to Table 1.

Students	Response	Expected No. of Students	Percentage
	Agree	28.5536	34.8214
	Strongly Agree	32.2143	39.2857
	Neutral	13.9707	16.9643
	Disagree	5.1250	06.2500
	Strongly Disagree	2.1964	02.6787
	Total	82.0000	100.0000
Teachers	Response	Expected No. of Teachers	Percentage
	Agree	10.4464	34.8214
	Strongly Agree	11.7857	39.2857
	Neutral	5.0893	16.9643
	Disagree	1.8750	06.2500
	Strongly Disagree	0.0836	02.6787
	Total	30.0000	100.0000

The computed value of χ^2 from Table 1 and Table 2 is $\chi^2_{cal} = 2.9458$. At 1% level of significance, the critical value of $\chi^2(4)$ is $\chi^2_{\epsilon} = 13.277$. Here, $\chi^2_{cal} = 2.9458 < \chi^2_{\epsilon} = 13.277$

and this lead to acceptance of the null hypothesis H01. Hence, there is no significant difference in the opinion of students and teachers on the use of ICT in enhancing teaching learning practice of mathematics.

Table 3. Response of Students and Teachers on the use of ICT improves students problem solving skills

Students	Response	No. of Students	Percentage
	Agree	44	53.6585
	Strongly Agree	31	37.8049
	Neutral	5	06.0976
	Disagree	1	01.2195
	Strongly Disagree	1	01.2195
	Total	82	100.0000
Teachers	Response	No. of Teachers	Percentage
	Agree	13	43.3333
	Strongly Agree	10	33.3333
	Neutral	6	20.0000
	Disagree	1	03.3333
	Strongly Disagree	0	00.0000
	Total	30	100.0000

Table 4. Expected contingency table corresponding to Table 3

Students	Response	Expected No. of Students	Percentage
	Agree	41.7321	50.8929
	Strongly Agree	28.5536	34.6071
	Neutral	09.5179	09.8214
	Disagree	01.4643	01.7857
	Strongly Disagree	00.7321	00.8929
	Total	82.0000	100.0000
Teachers	Response	Expected No. of Teachers	Percentage
	Agree	15.2679	50.8929
	Strongly Agree	10.9821	34.6071
	Neutral	02.9464	09.8214
	Disagree	00.5357	01.7857
	Strongly Disagree	00.2679	00.8929
	Total	30.0000	100.0000

The computed value of χ^2 from Table 3 and Table 4 is $\chi^2_{cal} = 5.8179$. At 1% level of significance, the critical value of $\chi^2(4)$ is $\chi^2_{\epsilon} = 13.277$. Here, $\chi^2_{cal} = 5.8179 < \chi^2_{\epsilon} = 13.277$ and this lead to acceptance of the null hypothesis H02. Hence, there is no significant difference in the opinions of students and teachers about the use of ICT in improving the mathematical problem solving skills.

The computed value of χ^2 from Table 5 and Table 6 is $\chi^2_{cal} = 4.0433$. At 1% level of significance, the critical value of $\chi^2(4)$ is $\chi^2_{\epsilon} = 13.277$. Here, $\chi^2_{cal} = 4.0433 < \chi^2_{\epsilon} = 13.277$ and this lead to acceptance of the null hypothesis H03. Hence, there is no significant difference in the opinions of students and teachers on the role of ICT in motivating and making the students interested in learning mathematics.

Table 5. Response of Students and Teachers on the use of ICT motivates and makes students interested in learning mathematics

Students	Response	No. of Students	Percentage
	Agree	27	32.9268
	Strongly Agree	43	52.4390
	Neutral	9	10.9756
	Disagree	2	02.4390
	Strongly Disagree	1	01.2195
	Total	82	100.0000
Teachers	Response	No. of Teachers	Percentage
	Agree	15	50.0000
	Strongly Agree	11	36.6667
	Neutral	4	13.3333
	Disagree	0	00.0000
	Strongly Disagree	0	00.0000
	Total	30	100.0000

Table 6. Expected contingency table corresponding to Table 5

Students	Response	Expected No. of Students	Percentage
	Agree	30.7500	37.5000
	Strongly Agree	39.5357	48.2143
	Neutral	09.5179	11.6071
	Disagree	01.4643	01.7857
	Strongly Disagree	00.7321	00.8929
	Total	82.0000	100.0000
Teachers	Response	Expected No. of Teachers	Percentage
	Agree	11.2500	37.5000
	Strongly Agree	14.4643	48.2143
	Neutral	03.4821	11.6071
	Disagree	00.5357	01.7857
	Strongly Disagree	00.2679	00.8929
	Total	30.0000	100.0000

5. Result and Discussion

This study investigated the role of ICT in teaching learning of college level Mathematics. The study was a survey based and sampled among 112 teachers and students. The data obtained from above questionnaire was presented and analyzed in the above tables.

Opinions of the students and teachers about the first item on the use of ICT in enhancing teaching learning practice of mathematics has been analyzed in Table 1 and 2. The value of χ^2 leads to acceptance of the null hypothesis H01. The opinions of the students and teachers about the second item on the use of ICT in improving the mathematical problem solving

skills has been analyzed in Table 3 and 4. The value of χ^2 lead to acceptance of the null hypothesis H02. The opinion of the students and teachers about the third item on the role of ICT in motivating and making the students interested in learning mathematics has been analyzed in Table 5 and 6. The value of χ^2 again leads to acceptance of the null hypothesis H03. Thus the major finding of the study are

- There is no significant difference in the opinions of students and teachers on the use of ICT in enhancing teaching and learning practice of mathematics.

- There is no significant difference in the opinions of students and teachers about the use of ICT in improving the mathematical problem solving skills
- There is no significant difference in the opinions of students and teachers on the role of ICT in motivating and making the students interested in learning mathematics

6. Conclusion

This survey based study examines the role of ICT in teaching learning practice in college level mathematics. The researcher finds that there is no significant difference in the

opinions of the students and the teachers about the role ICT in enhances the effectiveness of teaching learning of mathematics, improving skills for solving mathematical problems and making students interested in learning mathematics.

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