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RESEARCH ARTICLE

ICT USAGE STATUS IN THE TEACHING AND LEARNING OF MATHEMATICS IN SECONDARY SCHOOLS OF MIZORAM

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Abstract

The geography of the Mizoram state makes it a remote state. Due to its remoteness, connectivity and modern ICT application in teaching and learning remain a vital concern in the state. Therefore, it is an immediate need to know how teachers use information and communication technologies (ICT) in mathematics teaching. To understand how teachers use ICT, an investigation of the various factors that may impact ICT use in content areas such as mathematics is the need of the hour. This study investigates the availability and frequency of ICT use and examines factors contributing to the barrier to teachers' ICT use in mathematics teaching. This analysis showed that ICT resources are available to all the teachers in the region, the lack of interest in teaching in ICT is depends on the teacher's experience, the type of school does not determine the ICT implementation, whether it is government or private and ICT training programmes conducted by the government does not reach to all the teachers in the state. The finding can provide vital links to help stakeholders and the government for effective use of ICT in mathematics teaching.

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Introduction:-

The use of information and communication technology (ICT) in education is highly depend on teachers. The teacher's proficiency on the usage of ICT becomes critical factor in implementing it. Ever since the COVID-19 pandemic, the usage of ICT has become mandatory (Al-Rahmi et al., 2020, Calder et al., 2021). Although it has been known around that ICT could motivate and improve the student's learning experience. The teachers who handle the ICT and organise the learning session are subjected to several challenges (Baya et al., 2019). There has been challenges found mostly in the developing countries where the teachers and students have less exposure to the ICT. And it becomes critical in the learning experience. By ICT teaching, it refers to the usage of information and communication technologies, and devices in the form of presentation, animation, video and audio as a tool in delivering the teaching sessions.

Research on ICT in education has been increased a lot in the past five years, as the future of education is expected to be highly reliant on the usage of ICT. The learning experience through ICT and the teaching process are repeatedly analysed to deliver the best education for the students. The research studies often explored the barrier identification while implementing the ICT. Unlike other subjects mathematics is not easy to understand for anybody (Rodríguez-Muñiz et al., 2021). It highly depends on the teacher's knowledge for teaching through ICT (Chirinda et al., 2021,

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Das, 2021, Mukavhi et al., 2021) and there are challenges in doing so (Supianti et al., 2019). And it is often found in the research studies that the remote locations and developing nations are struggling in delivering the ICT mode of education (Dhakal, 2018, Agyei, 2021, Kamau et al., 2018).

One of the important aspect of researching the barriers in implementing the ICT is to provide quality of education to the students. The present study investigated the barriers in teaching mathematics through ICT, in perception of teachers. The study took a quantitative approach to identify the barriers in ICT teaching. And the study was carried out in Mizoram, India.

Literature Review:-

ICT do not result in positive outcome always, it depends on technology, and subject. And the educational policies should be carried out in such a way that it should focus on the outcome for the students. As it is not always end to be positive, a pilot test is required for any new strategy to identify and minimise the ineffective strategies (Fernández-Gutiérrez et al., 2020). The self-efficacy of the teachers could be improved corresponding to the support received from school and other factors such as attitude, gender, experience and attitude shown towards ICT (Trujillo-Torres et al., 2020). Authors have analysed mathematics teachers and found that young teachers with exposure to ICT shown more interest in implementing the ICT while teaching. Hu et al. (2018) have analysed the ICT skills has been reflected positively on students' academic performance. The availability of ICT access is a prominent factor for the positive performance on the student and however the same access in home resulted in the negative performance of the students. The usage of ICT had positive attitude among the students.

There is a gender difference observed in ICT exposure (Siddiq and Scherer, 2019) but it's not much bigger. The ICT knowledge for males are known to be better than females initially as it was based on just the literacy about ICT. However, based on the performance assessments, females tend to have better scores than the males. Kim (2018) used structural equation modelling (SEM) method to analyse the mathematical assessment of youths belonged to two group and found the education based ICT usage had positive outcome among the students and ICT usage had negative outcome when its used for generic purpose.

Research studies have explored in perception of the mathematics teachers, and their content knowledge, pedagogical knowledge and PCK knowledge. The teachers while using the ICT encounters barriers to overcome such as lack of resource, negative perception about ICT, teacher's pedagogical beliefs and leadership (Spangenberg and De Freitas, 2019). Also, Teachers should take on planning phase and carefully prepare and try to analyse the problems before sessions (Nurlaily et al., 2019). During the teaching session, the time allotment for all the activities to perform becomes insufficient. And for ICT related activities teachers required additional time for organising the activities and it depends on the student's cooperation as well.

Students also have been treated as barriers (Almanthari et al., 2020). Students are highly associated with the school and curriculum barrier. However the background of the teacher does not have any impact on the students. The perception of the students also important in identifying the barriers. Likewise studies have explored different ways to identify the barriers. In another study, the researchers have taken the perception from pre-service teachers and found that study year has no impact whereas the teaching style and gender have strong impact in teaching mathematics (Marbán and Mulenga, 2019). The most important fact is how the presented content in ICT is associated with goals of the lesson. The type of tools used while teaching mathematics is chosen on the basis of teacher's and student's comfort (McCulloch et al., 2018). And it was highly recommended to select the appropriate tools for teaching the specific content (Graham et al., 2020).

In summary, the above literature showed that the identification of barriers in mathematical teaching is essential and it depends on the teacher's and student's perception as well. Identification of barriers could lead to the problem and take appropriate actions to resolve it. So the presented study aimed to determine the barriers in the mathematical teaching through ICT.

Methodology:-

The methodology adopted for the present study is discussed in this section.

Research Design

The present study took a quantitative approach, to determine the barriers affecting the ICT implementation in the schools for teaching mathematics.

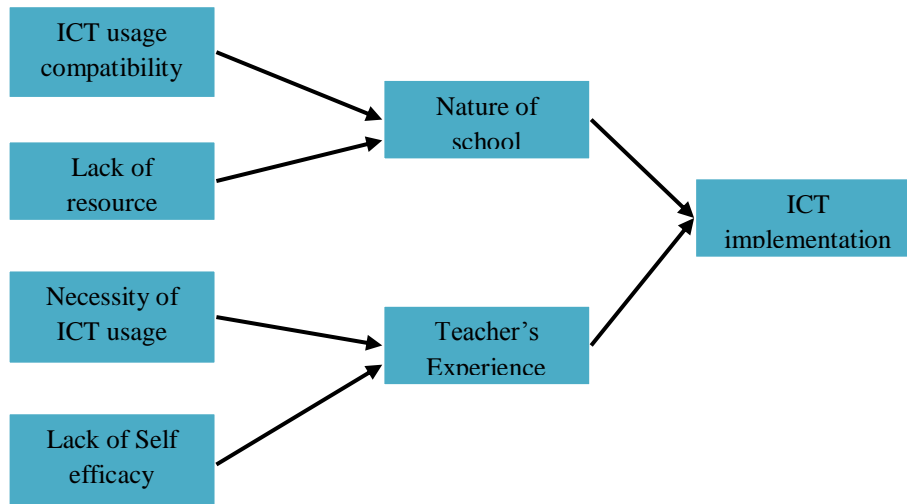


Figure 1:- Theoretical framework for the present study.

The presented study adopted the theoretical framework displayed in the fig. 1. Based on the literature review, the present study aimed to explore the barriers in the ICT implementation in the perception of the teachers. And the ICT usage and lack of resource are assumed to be associated with the nature of school, and necessity of ICT usage and lack of self-efficacy depends on the teacher's experience. Together all these variables could influence the ICT implementation. And the following hypothesis are framed for the study.

H1: Teacher's experience would have significant impact on the lack of interest in teaching.

H2: The ICT implementation barriers are associated with the nature of the school.

H3: The training provided by government have impact on the teacher's perception on training requirements.

Study Area

Mizoram, one of the states in India, is situated in the north eastern part of India, sharing 404 km and 318 km long international borders with Myanmar and Bangladesh respectively. Its Geographical location is 92°.15' E to 93°.29' E Longitude and 21°.58'N to 24°.35'N Latitude. The capital city of Mizoram state is Aizawl. There are 11 Districts and its area covers 21,081 square kilometres. In the 2011 census, there are 830 villages, 2, 22,853 households, 10, 97,206 population and literacy rate is 91.33%. Secondary education covers classes 9 to 12. High School cover classes 9 and 10 and Higher Secondary School cover classes 11 and 12.

Study Population

The study population is the maths teachers who have experience of teaching mathematics through ICT mode of teaching to the high school students. The teachers from different school have been contacted through online communication to participate in the study. 96 respondents finally sent their responses.

Instrument

The present used the structured questionnaire to collect the data from the participants through the Google forms web application. The collected data is then sorted and imported into the IBM SPSS software for further quantitative analyse. The analysis of variance (ANOVA) test is used for analysing the comparison between the variable adopted in the study.

Results:-

The collected data is then sorted and imported into SPSS software for further analysis. Initially, the reliability test for the data collected is used. The Cronbach's alpha test is used for the present study's data, and results are displayed in table 1 and table 2. Based on the table 1, the collected dataset has complete valid data for all the items

and none were excluded. The Cronbach’s alpha value measure shown in table 2 indicates the collected data has good enough reliability for the collected 45 items.

Table 1:- Cronbach's Alpha Reliability test – dataset validation.

		N	%
Cases	Valid	96	100.0
	Excluded	0	.0
	Total	96	100.0

Table 2:- Cronbach's Alpha Reliability test.

Cronbach's Alpha	N of Items
.816	45

Data Distribution

The distribution of the collected data is displayed in the section.

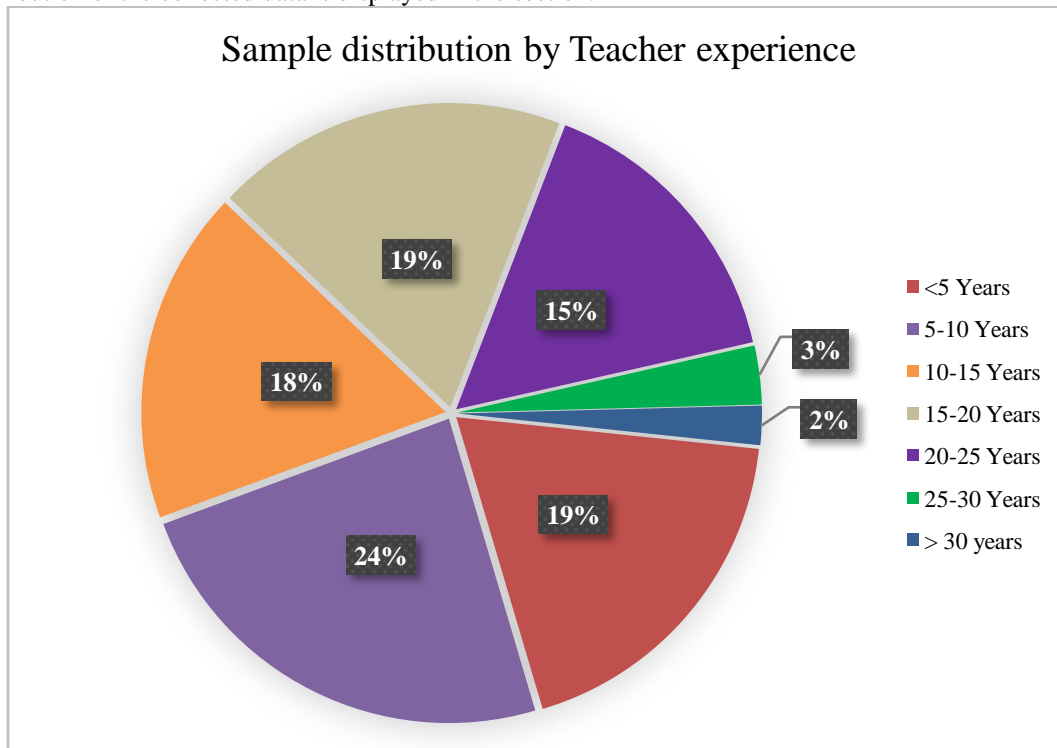


Figure 2:- Sample Distribution by Teacher Experience.

The collected samples are comprised of mathematical teachers who were teaching mathematics in school education level and based on their experience the sample population is distributed and displayed in the chart shown in fig. 2. From fig. 2, it can be observed that teachers having experience in 5 to 10 years are present in majority and there were only 2 % of the teachers having more than 30 years of teaching experience.

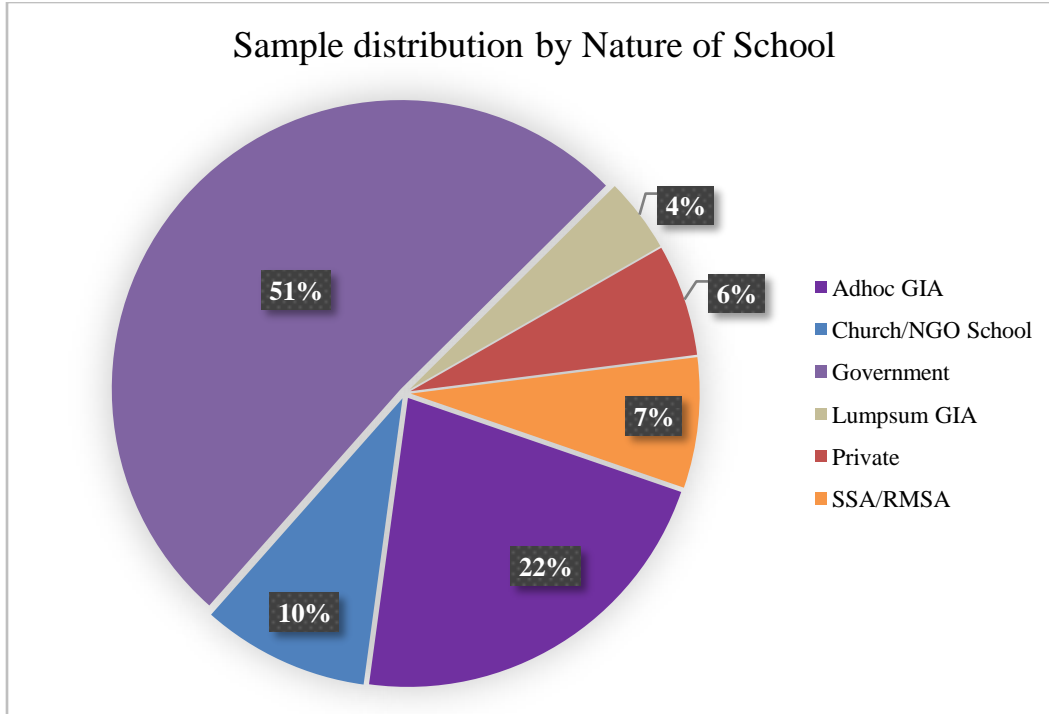


Figure 3:- Sample Distribution by Nature of School.

The sample distribution of the nature of school where these teachers have been working is distributed in the chart shown in fig. 2. The majority 50% of the teachers are working in the government school.

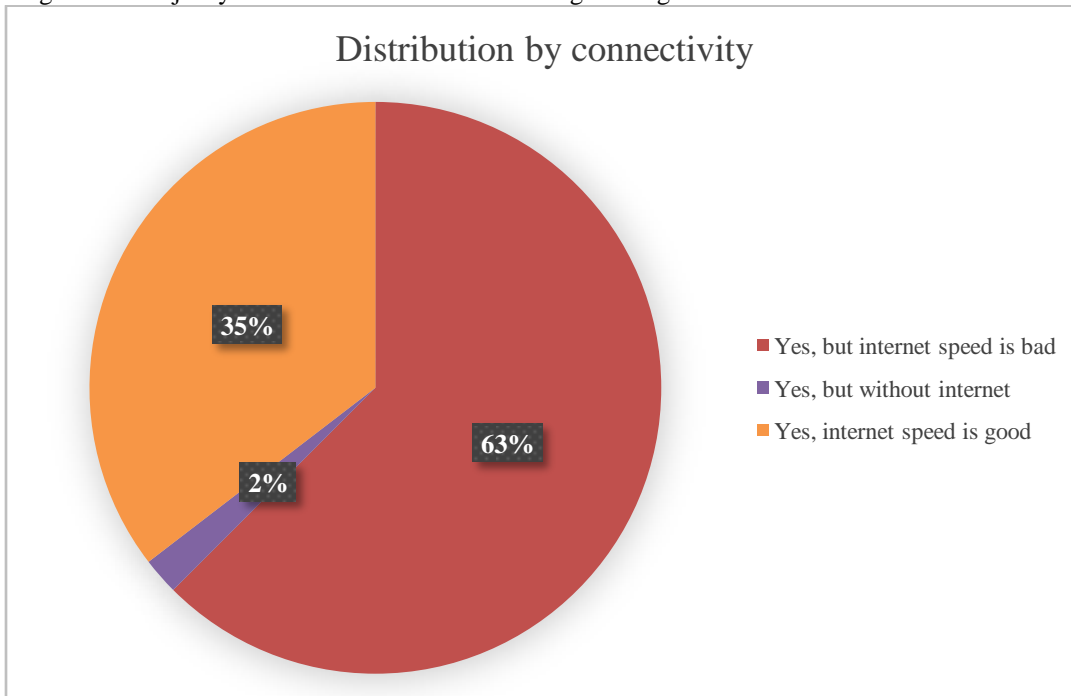


Figure 4:- Distribution by Connectivity.

The internet connectivity is essential for ICT implementation. The samples responded for the internet connectivity is shown in the chart in fig. 3. From the chart, it can be observed majority of the teachers had internet connectivity in their school, but the speed were slow and also there are 2% of the teachers pointed they have no internet connectivity. With recent development, the internet connectivity are being established in every schools without a

doubt, but the reliability of that connectivity becomes a factor in establishing modern education techniques. And it would be critical in the period of pandemic.

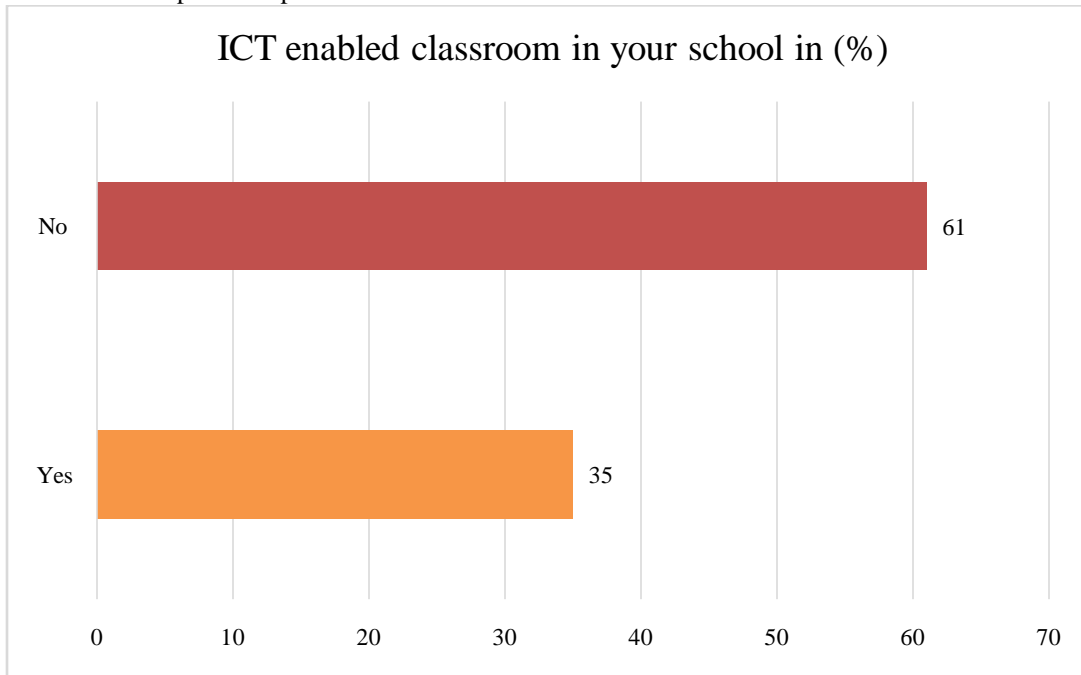


Figure 5:- Data about ICT enabled classroom in School.

The respondents showed the presence of ICT enabled classroom which creates the opportunity for the teachers to implement ICT in their school and majority of the answer turned to be NO (61 %). And it will be really hard for the teachers to implement the ICT in their schools. The presence of ICT enabled classroom could improve the ease of ICT implementation in the schools.

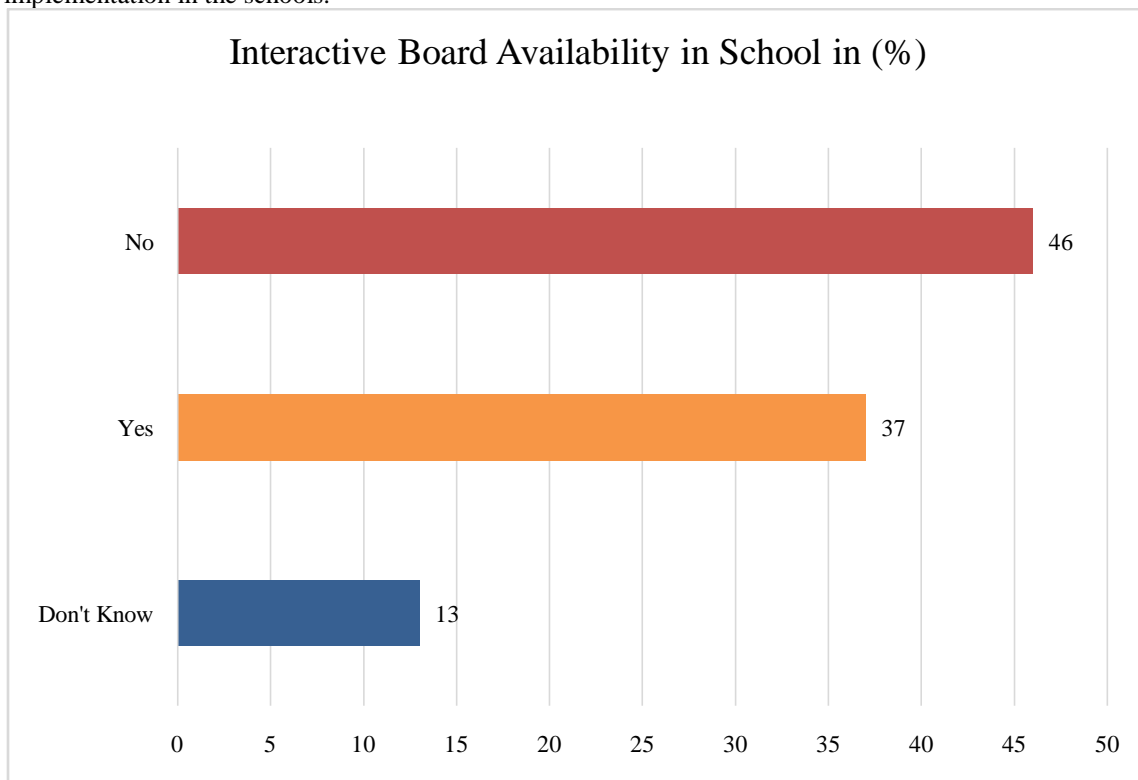


Figure 6:- Interactive board availability in school.

Similar to the earlier results, the response for the interactive board availability in school is indicates that some of the teachers have no idea about the facility availability in their school as shown in fig. 6. However majority of the respondents responded with No (46 %). But the fig. 7 showed that the teachers have the availability to the corresponding educational software to make the ICT content for the mathematical subjects.

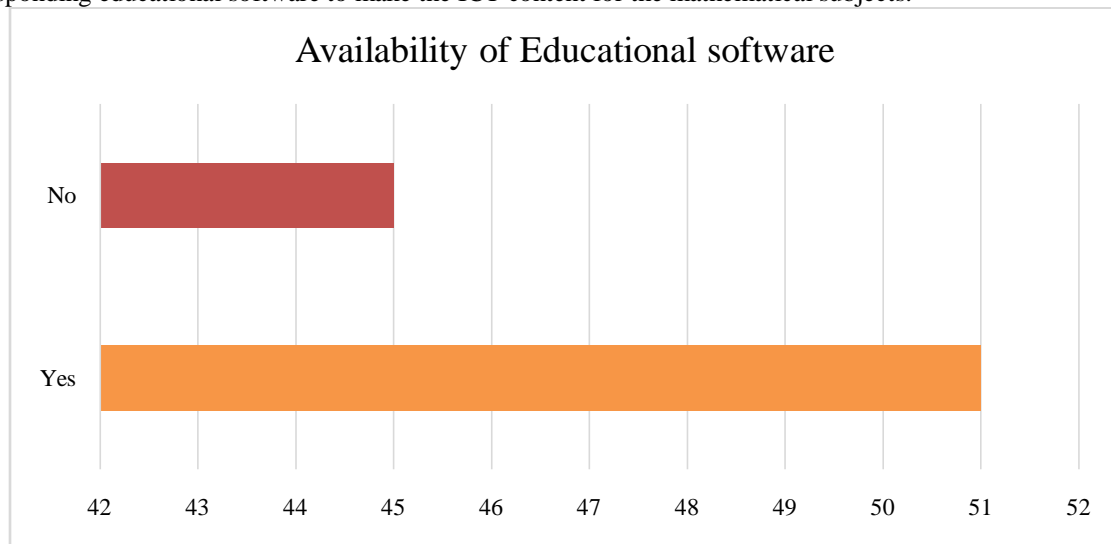


Figure 7:- Availability of educational software.

Hypothesis testing

The hypothesis formulated for the study would be tested here for the significance using the ANOVA test.

H1: Teacher's experience would have significant impact on the lack of interest in teaching

Table 3:- ANOVA for lack of interest and teacher's experience.

Lack of interest of teachers * Experience					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.998	6	1.833	2.449	.031
Within Groups	66.627	89	.749		
Total	77.625	95			

The table 3 shows the comparison between the lack of interest in using ICT and teacher's experience. And the significance shown in the results is about 0.31 which is less than 0.050, and it indicates the lack of interest in teaching in ICT is depends on the teacher's experience.

H2: The ICT implementation barriers are associated with the nature of the school

Table 4:- The ANOVA comparison for the barriers with the nature of the school.

item	Sum of Squares	df	F	Sig.
Outdated, incompatible or unreliable computers	89.656	95	.578	.717
Lack of adequate skills of teachers	70.958	95	.411	.840
Restrictive time table	79.490	95	.751	.587
Lack of administrative support	81.740	95	2.460	.039
Lack of technical support or advice	75.740	95	.469	.798
Lack of confidence regarding the use of ICT	95.406	95	.684	.637
Lack of funding	97.833	95	1.425	.223
Using ICT in teaching and learning not being a goal of the school	84.958	95	.895	.488
Insufficient number of internet connected computers	102.990	95	1.540	.185
The pressure to prepare students for exams and tests	81.958	95	1.079	.378

Inadequate space and infrastructural facilities	88.990	95	2.402	.043
Lack of flexibility due to time constraint and overload of work	82.240	95	.751	.587
No or unclear benefit of using ICT for teaching	81.625	95	1.296	.273
Lack of interest of teachers	77.625	95	.942	.458
Inadequate training is given to the teachers for using ICT in the classroom	90.500	95	.980	.435
Insufficient number of the interactive whiteboard or any other educational software	97.740	95	.713	.615
Not enough computers	83.625	95	1.596	.169

When the ICT implementation barriers are compared with the nature of the school, to understand does the school premises have influence on the ICT implementation, it turns out to be majority of the barriers does not associated with the type of school. From table 4, it can be observed that only two items showing significance (less than 0.050) that barriers are influenced by the nature of the school and the rest (greater than 0.050) are not influenced by the nature of the school. It can be interpreted as, the type of school does not determine the ICT implementation, whether it is government or private.

H3: The training provided by government have impact on the teacher's perception on training requirements

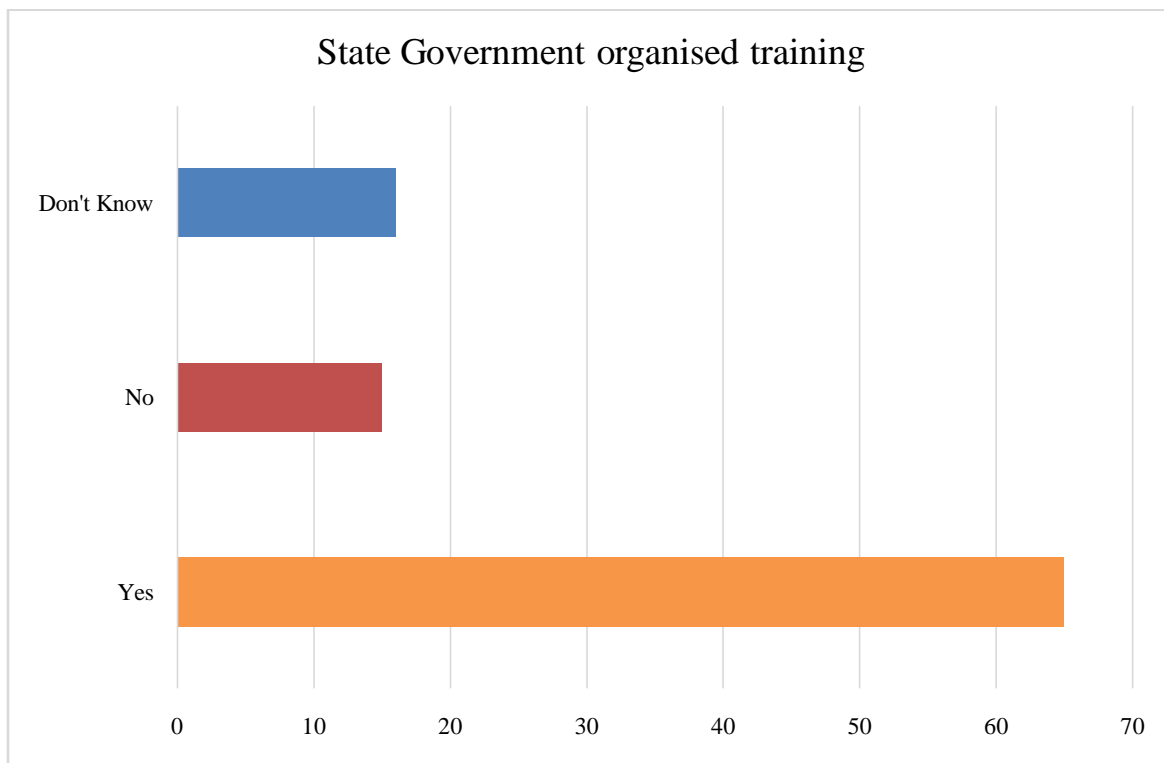


Figure 8:- State government organised training.

The ICT training organised by state government responses are shown in the fig 8. It revealed that majority of the teachers are aware of the training given by the state government. A proportion of teachers have no idea on the ICT training conducted by the government. This indicates that ICT training programmes conducted by the government does not reach to all the teachers in the state.

Table 5:- ANOVA results for training given to the teachers and state government organised training.

Inadequate training is given to the teachers for using ICT in the classroom * state government organised training					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13.632	2	6.816	8.246	.001
Within Groups	76.868	93	.827		

Total	90.500	95			
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Table 5 represents the ANOVA results for ICT training programme conducted by the teachers and the teacher's perception on inadequate ICT training among teachers have significance measure of 0.001. This indicates that the teachers still feel the necessity to be trained better in ICT usage for education.

Conclusion:-

From the finding of this research, the lack of interest in teaching in ICT is depends on the teacher's experience. The type of school does not determine the ICT implementation, whether it is government or private and ICT training programmes conducted by the government does not reach to all the teachers in the state.

So, teacher's experience is very important for ICT integration in teaching and learning. It is suggested that the government should conduct ICT training for teachers for successful implementation of ICT integration in teaching and learning of Mathematics.

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