

Effectiveness of ICT on Online Mathematics Teaching and Learning in Secondary Schools of Mizoram during Covid-19 Pandemic

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Abstract

Since ICT has become such an important feature in everyday life, it is no wonder that it has also burrowed through the teaching and learning scenario making its presence felt in more ways than one. The coming of the Covid-19 pandemic, though a calamity in itself, provided an opportunity to find out the true effectiveness of ICT on online mathematics teaching and learning. The population under consideration was secondary teachers teaching mathematics. The findings clearly outlined the status of mathematics teachers when it came to teaching mathematics using ICT. It was discovered that mathematics educators did not consider ICT adequate to replace offline teaching, but they considered that it could supplement it. Besides, it was also observed that students themselves enjoyed teaching enhanced with ICT.

Keywords: Mathematics, ICT, online learning, pandemic, secondary education.

Introduction

ICT is an important part of today's world. In the world of education, regardless of the subject being taught, it is gaining importance with each passing year. Especially, in the light of the fact that teaching is a profession that needs professionals, who can impart the needed resources for the nation. ICT must become a part of teaching from the lowest levels so that students are exposed to technology from an early stage. For the early stage of development and possibility, teachers should be ready to make available modern technology, and within itself have to be made available. But, another important part of this is that even students, who are at receiving ends have to be ready to accumulate and impart knowledge through this medium, meaning they needed to be aware, of need to have the much-needed facilities, if, ICT is used in a remote manner, and connectivity also

have to be enabled, so that, two-way communication is enabled.

Mizoram is one of the states in India, situated in the northeastern region sharing 404 km and 318 km long international borders with Myanmar and Bangladesh, respectively. The geographical location of Mizoram is 92°15' E to 93°29' E Longitude and 21°58'N to 24°35'N Latitude. Aizawl is the capital city of Mizoram. There are 11 districts, 23 sub-divisions and 26 Rural Development (RD) Blocks. Its area covers 21,081 square kilometres. According to the 2011 census, there are 830 villages, 2,22,853 households, 10,97,206 population and a literacy rate of 91.33 per cent. School Education in Mizoram is categorised broadly as Elementary and Secondary. Elementary covers classes 1 to 8 and secondary covers classes 9 to 12. High School covers classes 9 and 10 and Higher Secondary School covers classes 11 and 12. As per Udise plus 2020-21 data, there are 712

High Schools with 4,306 teachers and 40,037 students, 198 Higher Secondary Schools with 1,900 teachers and 24,966 students.

Due to Covid -19 pandemic, schools have been totally closed in Mizoram. There are no other alternatives and so teaching and learning during this pandemic can be carried out using online mode only. With all these factors in mind, state-wide research was done with the following objectives:

Objectives of study

1. To study the challenges faced by the students and teachers in teaching and learning Mathematics during the Covid-19 pandemic.
2. To find out the effectiveness of ICT on online Mathematics teaching and learning at the secondary level of education in Mizoram during Covid-19 pandemic.

Research questions

The study was guided by the following questions:

- (i) What is the effectiveness of using ICT for the online teaching process of Mathematics in the secondary school of Mizoram during the Covid-19 pandemic?
- (ii) What are the barriers of using ICT for online Mathematics teaching in secondary school of Mizoram?

Review of literature

There are a lot of problems and confusion on the parts of the students as well as the teachers in online teaching during Covid-19 pandemic, as this is done without proper training, for smooth functioning of online learning will need proper training and resources. So, the teachers are in a stage of experimenting and trying their best for their students (Mishra et al. 2020). Students experienced a

dramatic change in mathematics education during the enforced Covid-19 lockdown and there needs to be quality support for students and teachers in the transition (Cardel et al., 2021). The training received for online teaching, the mismatch between pedagogy and learning styles of students, work-life balance pressure and assumptions about home life conditions, connectivity and availability of devices are the constraints to online teaching and learning (Singh et al., 2021). The lockdown situation is certainly an obstacle to the progress of education and mathematics education since most students do not have enough necessary devices (Das, 2021). During the Covid-19 pandemic, students had a positive mathematics self-concept, mathematics anxiety was at a moderate level, and already had mathematics self-regulated learning at a low level (Delima & Cahyawati, 2021). Digital learning environments will be with us forever, such that professional development and teacher preparation programs in mathematics education must focus on the implementation of the digital learning environment (Chirinda et al., 2021). Instructional technology, as a research field with several subdivisions, has played a major role in cushioning the effect of this pandemic on educational activities by serving as the only platform for instructional design, delivery and assessment platforms (Olasile Babatunde Adedoyin & Emrah Soykan, 2020). Covid-19 crisis ushered in digital teaching and learning experiences that clearly spelt out the existence of digital instructional and pedagogical gaps in mathematics education (Leckson & Deonarain, 2021). The Covid-19 pandemic has severely hit the academic sector due to the lack of proficiency in online teaching mode due to the technological and infrastructural lacuna (Biswas & Rahaman, 2021). The governments must ensure the availability of reliable communication tools, high-quality

digital academic experience, and promote technology-enabled learning for students to bridge the disparities originated in the education system before and after Covid-19 catastrophe which is also inevitably necessitated for uninterrupted learning (Mishra et al., 2020). Before using digital platforms for mathematics learning, students need to be encouraged to practise and engage collaboratively within digital platforms (Jayaluxmi Naidoo, 2020). There is a need for secondary schools, with the help of the government and other stakeholders to promote the establishment of e-learning facilities countrywide (Mukuka et al., 2021).

Methodology

This part of the research was descriptive. The population included secondary school teachers teaching mathematics within the state of Mizoram. The Information schedule and opinionnaire were sent out to the entire population. Out of these, 348 teachers responded. Since there were a total of 774 mathematics teachers at the secondary level and 71 mathematics teachers at the higher secondary level in Mizoram, the responses made up 41.1 per cent of the population and were thus considered more than adequate for research. Since no selection was made, samples were completely random. Given the research objective, the researcher opted for an Information Schedule and Opinionnaire as the main tools. The opinionnaire had a total of three dimensions; each having a set of items in which respondents simply had to opt for a 'yes' or a 'no'. The data received was analysed in a qualitative manner making use of

descriptive statistics.

Overview of the profile of teachers at the Secondary level of education in Mizoram

Based on the Information Schedule that was administered by the researcher himself, it was found that out of the 348 responses that came, male teachers made up 80.2 per cent and only 19.8 per cent of them were females. This in itself proved the disparity that still exists in a state like Mizoram, which is a state in the northeastern part of India, that a subject like mathematics which is a highly abstract subject, is still favoured by the male of the population. Out of these, 23.9 per cent of urban and 76.1 per cent of rural teachers were identified, and since the data was collected through the online mode using Google form, it showed that both localities had teachers who could deal with online technology. This in itself was a positive finding, strongly giving evidence that rural teachers were not far behind in dealing with ICT at least at this level. Secondary school teachers made up 91.1 per cent of the responses and 8.9 per cent were from Higher Secondary Schools.

Findings regarding ICT compatibility of teachers

The tool was subdivided into three dimensions in keeping with the research objectives and the pandemic situation which necessitated the use of an online platform for teaching. On the dimension of ICT and teacher, there were 10 items. The results obtained were separately analysed in Table-1.

Table-1: A summary of findings of the result

Sl. No		YES		NO	
		No.	%	No.	%
	ICT and Teacher				
1	I have my own computer	193	55.5	155	44.5
2	I have my own smartphone	347	99.7	1	0.3
3	I do not know how to use Computers	42	12.1	306	87.9
4	I know how to use software for making e-content like pdf/slides/word etc.	274	78.7	74	21.3
5	I use readymade e-content like pdf/slides/word etc to teach my students	208	59.8	140	40.2
6	I can prepare my own teaching videos for student	268	77	80	23
7	I use readymade videos to teach my students	214	61.5	134	38.5
8	I can make e-content using my phone	228	65.5	120	34.5
9	I have received in-service training in ICT	188	54	160	46
10	It is difficult to carry on teaching using ICT	185	53.2	163	46.8

- 55.5 per cent of the sample mathematics teachers had their own computer.
- A small minority of 0.3 per cent among the sample teachers still did not have their own smartphone.
- An unexpected 12.1 per cent of the sample teachers did not know how to use computers, which is an essential part of ICT.
- A majority of them, i.e. 78.7 per cent of the sample teachers could use their software for making e-content.
- A small majority of 59.8 per cent of the sample mathematics teachers could make use of readymade e-content to teach mathematics.
- Among the mathematics teachers who responded, 77 per cent of them claimed to be able to make their own teaching videos.
- Another 61.5 per cent simply made use of ready-made videos.
- A healthy 65.5 per cent of them could make use of their smartphones to make e-content.
- It was noted that only 54 per cent of

the sample teachers had received ICT training.

- More than half of the sample teachers i.e. 53.2 per cent still found it difficult to teach using ICT.

Discussion

The study found that teachers were in very different positions in their compatibility to use ICT. While a good 65.5 per cent of the sample teachers could make their own e-content on their smartphones, there is still nearly 12 per cent of them who do not know how to use a computer. Let alone create their own e-content. The fact that only around 54 per cent of the sample teachers had received ICT training revealed the huge backlog when it came to ICT training. Since 53.2 per cent of them still found it difficult to use ICT for teaching and learning, it was clear that ICT could not be used as a mandatory part of teaching. Given the high percentage of teachers who still do not know how to make use of this technology, the majority of

77 per cent of the teachers who could even make their own teaching videos put the state in a good position, but also highlighted that teachers were in very different positions when it came to ICT compatibility. Also, nearly half of the teachers still do not have their own computers at their service and convenient time. Strongly, indicated that they did not consider an investment in computers as necessary or wise. This in itself was rather disheartening, because

it brought into light the lack of education even among teachers themselves, on the utility of ICT.

Findings on the status of mathematics teaching during COVID -19 pandemic according to teachers

The second part of the opinionnaire was concerned with the teaching of mathematics in an online mode which was a necessity during the COVID-19 pandemic (table-2).

Table-2: Findings on the status of mathematics teaching

Sl. No.		YES		NO	
		No.	%	No.	%
	Teaching during Covid-19 pandemic				
1	I do not take an online class at all due to the non-availability of the internet or some other reason	90	25.9	258	74.1
2	During the Covid-19 pandemic, classes are taken through online mode only	243	69.8	105	30.2
3	I use Learning Management System (Google classroom, Moodle, Teachmint etc.) for online class	179	51.4	169	48.6
4	I use Google Meet for taking an online class	120	34.5	228	65.5
5	I use Zoom for taking online class	109	31.3	239	68.7
6	I use WhatsApp for content delivery	333	95.7	15	4.3
7	I use Facebook for teaching-learning	25	7.2	323	92.8
8	I shared video materials using Youtube	200	57.5	148	42.5
9	I give home-works through emails and WhatsApp	329	94.5	19	5.5
10	I use online classes to teach according to the school timetable (regularly)	244	70.1	104	29.9
11	I enjoy using ICT for teaching Mathematics	227	65.2	121	34.8
12	The teaching of mathematics through online mode is preferable to classroom	27	7.8	321	92.2
13	Teaching Mathematics using ICT should be continue to supplement normal classroom teaching even after Covid-19 pandemic	228	65.5	120	34.5
14	Covid-19 pandemic is a barrier for mathematics education	280	80.5	68	19.5

The following were the findings in various aspects of online mathematics learning:

- It was found that still 25.9 per cent of the sample teachers could not carry on online teaching due to connectivity and other issues.
- A majority of 69.8 per cent could take online classes, but still, the remaining 30.2 per cent had to resort to other means.
- It was revealed that slightly more than half of the teachers, 51.4 per cent of the sample teachers, could make use of online apps like Teachmint, Google classrooms and Moodle.
- A minority of the teachers, 34.5 per cent of them used Google Meet to teach, which is a free Internet Application available with good connectivity. It may also be bought and the bought variety carries some packages along with it.
- A slightly lower 31.3 per cent of the teachers used the Zoom application to teach mathematics.
- A solid majority of 95.7 per cent of the teachers use WhatsApp, a free online service, to teach.
- A small 7.2 per cent of the teachers use the Facebook Platform to teach.
- A good 57.5 per cent of the teachers shared teaching videos through YouTube.
- Another resounding majority of 94.5 per cent of the teachers give homework through emails and WhatsApp.
- A good but certainly not cent per cent, 70.1 per cent of the teachers could carry on teaching through the online mode regularly.
- A fairly good 65.2 per cent of them enjoyed using ICT to teach during the pandemic, but
- Only 7.8 per cent of them preferred online teaching to offline mode.
- A small majority of 65.5 per cent of the teachers wanted to supplement

offline teaching with online mode even when the pandemic is over and online mode will no longer be a necessity.

- A large 80.5 per cent of the teachers thought that Covid-19 is a huge barrier to the teaching of mathematics.

Discussion

While it was perfectly acceptable and even accepted that the majority of the teachers could make use of various online Apps to teach mathematics, it is worrisome to find 25.9 per cent that still could not make use of the online mode of teaching due to connectivity issues. Although 70.1 per cent of the teachers thought that they could continue classes regularly, a larger 80.5 per cent of them still felt that the Covid-19 pandemic was a huge barrier to the teachings of Mathematics. Indicating that although they could manage online classes, they still preferred offline classes. It was not surprising that only 7.8 per cent of them thought that online mode was better than offline mode. Although 94.5 per cent of them gave homework and assignments through online mode, only 65.2 per cent of them enjoyed using ICT for teaching. This strongly supports the fact that knowledge is not necessarily meant for learning and enjoyment, due to a lack of ICT knowledge. A small majority of 65.5 per cent were of the opinion that online teaching should be used as a supplement to offline teaching, many persons in this group belong to the ones who were of the opinion that Covid-19 is a barrier to the teachings of Mathematics. All of these responses point to the fact that the majority of the teachers, even though they could carry on online teachings, still preferred the traditional classroom teachings and do not consider the online mode of teaching as worthwhile, if the situation did not demand it.

Findings regarding teachers' opinion of students learning through ICT during Covid-19 pandemic

study covered students who are the most important judges to find out the effectiveness of ICT in the teaching of mathematics.

The third dimension in the present

Table-3: Effectiveness of ICT in the teaching of mathematics

Sl No		YES		NO	
		No.	%	No.	%
	Students' ability to use ICT				
1	All my students can access to internet facility	154	44.3	194	55.7
2	All students have at least one mobile phone at home for attending online classes	226	64.9	122	35.1
3	All students know how to use emails, WhatsApp and online classes	251	72.1	97	27.9
4	All students attend online classes regularly	140	40.2	208	59.8
5	No student has a problem with online classes	93	26.7	255	73.3
6	Students' achievements have gone up after online teaching (looking at term exams)	137	39.4	211	60.6
7	Students feel it difficult to understand by teaching mathematics through the internet	298	85.6	50	14.4
8	Students prefer online classes to offline classes	107	30.7	241	69.3
9	There is no difference in the achievement of students before and after online teaching	59	17	289	83
10	Students enjoy ICT-enhanced teaching aids even in offline classes	239	68.7	109	31.3

The following are the findings:

- A slight minority of 44.3 per cent of the teachers felt that all their students could access the internet and a larger section believed the opposite.
- Teachers revealed that 35.1 per cent of their students could not access online teaching due to the unavailability of at least one mobile phone at home.
- A large 72.1 per cent of them thought that students knew how to use emails, WhatsApp and online classes.
- Only 40.2 per cent revealed that students attended the online classes regularly.
- A small 26.7 per cent of them thought students did not have a problem with online classes.
- Looking at term examination results, only 39.4 per cent of the teachers were of the idea that students achieved better with online teaching.
- A large 85.6 per cent of them could opine that students did not respond well to the information given through the internet.

- Surprisingly enough, 30.7 per cent of the teachers still believed that students preferred online teaching to offline teaching.
- Nearly half of the teachers, i.e., 40.2 per cent of them believed that students' achievement improved after online classes.
- A huge majority of the teachers 83 per cent indicated that online and offline teaching modes did not have much of a difference on students' performance.
- Yet, 68.7 per cent of the teachers indicated that students enjoyed teaching through ICT.

Discussion

Teachers themselves felt that less than half of the students have good internet facilities. There are still 35.1 per cent of students who do not have at least one mobile phone at home. This meant that these students had to either blindly study on their own or go to their friends who have mobile and internet connectivity when classes were carried out. It did not take deep thinking to deduce that this was the situation in most rural areas where parents are at lower economic levels and internet connectivity is low and weak. It was 30.7 per cent of the teachers' opinion that students preferred online to offline classes. But the larger 69.3 per cent of the students were not in favour of it. Keeping in mind that nearly 35.1 per cent of them do not have a mobile phone at home, it was natural for this group of students to prefer offline teachings to online teachings. Since online classes were necessitated by the pandemic, it was inevitable, but it was clear that 73.3 per cent of the students, even among the ones who have good connectivity, have a problem with online classes. The students' achievement, looking at their examination marks, however, did not indicate any downward or upward change because of online classes. It was

surprising, looking at their opinion in other questions, that 39.4 per cent of them felt that students' achievement improved after online classes. And students also enjoyed ICT-enhanced classes according to teachings in line. The only thing was that they did not want it to replace offline teaching. About 85.6 per cent of the Mathematics teachers could see that their students did not understand Mathematics through the internet.

Conclusion

It was a rewarding endeavour to undertake a study that could reveal the situation of Mizoram when it came to the effectiveness of online Mathematics teaching and learning through ICT. It was clear that technology development in the state was not at par with the needs of the situation. Moreover, the disparity was seen among rural and urban schools when it came to the availability of facilities (Biswas & Rahaman, 2021). However, it was seen that, even in an amenable situation, teachers themselves were not wholly convinced about the use of ICT to teach, although a small percentage of them felt that students fared better after online teaching was initiated. Teachers have varying opinions regarding their compatibility with ICT. Some of them could even make their e-content while others did not even own their own computer, clearly indicating that ICT training has not reached 100 per cent of the teachers (Singh et al., 2021). It was felt that teachers themselves understood rather little about the many applications of ICT. Since this was the situation, it would be good if all teachers, regardless of their localities, were given training in ICT along with proper incentives to induce teachers to undergo training (Mishra et al., 2020). Since ICT is going to gain importance each day, it is important that students must not get disoriented when they

come to the world of work. Students should make ready to compete with the rest of the world and bring up the state of our nation to a situation where there will be a constant flow between technology and education as visualised by the National Education Policy 2020 itself.

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