

PROBLEMS OF ONLINE MATHEMATICS TEACHING AND LEARNING DURING THE PANDEMIC: A REVERBERATION IN TO THE PERCEPTION OF PROSPECTIVE TEACHERS

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ABSTRACT

Mathematics teaching and learning has been a special focus in the academic discourse due to its felt complexity in teaching and learning. This felt complexity originate from the teacher preparation process itself. Covid 19 pandemic had given a drastic blow to all the educational activities. This has affected the curricular practices in an unimaginable way. An attempt is made here to examine the various problems faced by prospective teachers in online mathematics teaching and learning during the pandemic period. Samples were selected from government/aided/unaided colleges using stratified random sampling technique with the help of a questionnaire developed for the purpose. Analysis of the data has been carried out by using techniques such as percentage, t test and ANOVA. It is concluded from the study that the several hurdles and difficulties has been there specific to mathematics teaching and learning and majority of them were unhappy with the online mathematics teaching and learning.

KEYWORDS

Perception, Online Learning, Mathematics Learning, Online Teaching

1. INTRODUCTION

All teaching procedures centred around three pivotal factors: the students, the teacher, and the subject. Out of these three factors, the teacher is the medium of communication between the other two. Pandemic has brought out drastic necessities in paradigms and operations to meet with the changing demands. Teachers of all levels were trying to adjust with the new normal. However, it is interesting to note that during the pandemic period, prospective teachers insisted on adopting “online mode” teaching to cope up with the existing practice. Here the important question raises: what is effectiveness output of online teaching and learning? Since it is a very new experience for prospective teachers, the effectiveness of online mode of teaching and learning needs to be considered as an important study to improve to prospective teachers who teach and learn very fundamental subjects, like Mathematics. Thus, “online mode” needs to be considered as a fourth important factor in addition to the above mentioned three facts; because of the new experience of handling classes by the prospective teacher without any prior knowledge and experience or training; as well as the learning experience gained by the students.

Online Mathematics teaching and learning, how much time should be allotted for mathematical education for helping them gain higher level competency and accuracy in basic computational procedural skills need to be strictly evaluated. Similarly, how much time needs to be allotted for learning higher order skills such as problem solving, problem presentation, solving complex problems, and transforming mathematical knowledge and skills to problems in non-mathematical disciplines is also to be considered. Mathematics as a subject is difficult to learn through online medium. Mathematics contains a number of concepts which require interaction, continuous support, monitoring from the teacher. These aspects were lacking in the online mode of teaching and learning. In the learning process the prospective teachers faced general problems such as lack of internet facility, problems with the learner's understanding level, problems with the absence of mind and less student-teacher interaction and they are losing the learning capacity

In March 2020, the COVID-19 pandemic forced many countries to close schools and universities. To help students continue learning, a common policy evolved was to provide instructions in the online context. Online teaching and learning are an unprecedented experience for most teachers and students; consequently, they have a limited experience with it. Mathematics is a subject which needs a lot of illustration for its effectiveness in the teaching and learning context. Hence it is interesting to analyse how mathematics teaching and learning customised to suit with the change in paradigm. In this context, this paper, tried to understand the varied problems and perspectives of online Mathematics Teaching and learning among Prospective Teachers During the Pandemic as perceived by the prospective teachers at secondary level

2. EMPIRICS AND LEARNING FROM LITERATURE

Substantive number of studies were done concerning problems faced by online mathematics teaching and learning in various forms by many researchers. However, only a few have come up with the form and pattern required for this study. Nevertheless, a review of the studies shown-below has thrown some light on the fact that problems faced by online mathematics teaching and learning are more or less related and dependent on each other.

The first reported work on the impact of online teaching and learning is by Li (2003) provides the information which can be useful in implementing rational changes to mathematics teacher education. The data analysis is concentrated on three areas: the math phobia issue, the equity issue and teachers' beliefs about the instructional use of technology.

Borba (2012) investigated the online mathematics education in Brazil within the context of research on digital technology over the past 25 years. Wherein, the researcher argued that Brazilian research on technology in mathematics education can be divided into four phases and then the author discussed in detail with an example that “blends” aspects of the second and third phases.

Larkin et al. (2015) examined the impact of a series of design changes to an online mathematics education course in terms of transactional distance between learner and teachers, pre-service education students' attitudes towards mathematics, and their development of mathematical pedagogical knowledge.

In a study by Bansilal, S. (2015) on the rapid global technological developments and that affected all facets of life, including the teaching and learning of mathematics. This qualitative study designed to identify the ways in which technology used and to explore the nature of this use by a group of 52 mathematics student teachers. It is recommended that the education department prioritise the provision of specialist mathematics software that can be used to improve learning outcomes in mathematics.

Adnan, M., & Yaman, B. B. (2015) considered a qualitative review of the perspectives of faculty members teaching mathematics about teaching mathematics online. Data analysis shows that the most important concern for mathematicians in teaching mathematics through online was the nature of mathematics as a discipline, while for mathematics educators it was the nature of the methodology in teaching mathematics. Istenic et al. (2016) explored an integrative approach in applying ICT in learning with specific reference to the formation of mathematics teaching capability in preservice teachers. The effect of online problem posing on students' problem-solving ability in mathematics were studied by Suarsana et al. (2019).

Recent contribution of interest by Aliyyah et al. (2020) provides an overview on the effect of the online collaborative learning between teachers, parents, and schools that impact student success. Broadly, the success of online learning in Indonesia during the COVID-19 Pandemic was determined by the readiness of technology in line with the national humanist curriculum, support, and collaboration from all stakeholders, including government, schools, teachers, parents and the community. This study explores the perceptions of primary school teachers of online learning in a program developed in Indonesia called School from Home during the COVID-19 Pandemic.

Fakhrunisa, F., & Prabawanto, S (2020) revealed the issues on the mathematics teacher's perception of online mathematics learning challenges and possibilities during the COVID-19 pandemic. This survey results indicate that educational experience is one of the significant factors that will vary the ability of teachers in presenting online learning. The analysis of survey results reveals that mathematics teachers had a positive perception of online learning implementation

Cao et al. (2021) investigated how teachers in China perceived the effects of online instruction on mathematics learning and examined the challenges they encountered when the country shifted to online instruction during the COVID-19 pandemic. Results showed that the teachers believed that the effectiveness of online teaching largely depends on student self-discipline. Analysis suggested a need to expand technology use during instruction, reshape the way teachers interact with students, and reorganize teaching methods in face-to-face classroom instruction.

Radmer, F., & Goodchild, S (2021) studied to explore lecturers' and students' experiences of online mathematics teaching and learning and to enable sharing of solutions to the challenges encountered. The study findings show that many students missed the social contact, being physically present at the university, and face to face interaction with their lecturers.

3. SIGNIFICANCE OF THE STUDY

Unlike the other sectors of life in India the progression of online culture has witnessed a slow pacing in education. There has been no concerted effort in a scientific and methodical manner to augment the

teachers in this regard. The teachers are not trained to use online learning and teaching mathematics, and there is a lack of teaching aids and materials and technological tools. A sudden shift from the site bound approach to online multiple line of approach has made the system more complex. The purpose of this study was to determine the problems of online learning and teaching about prospective teachers 'mathematical communication skills during this pandemic period and the problems of online learning about students' mathematical problem-solving skills during this pandemic.

The study aims to identify the issues that prospective teachers face during their online classes during the pandemic period. Mathematics teaching and learning faced more difficulty than the other subjects due to a lack of student participation and internet issues. In addition, various literature studies show that mathematics teaching and learning faced more difficulty than the other subjects. The study expected to explore problems experienced by prospective teachers in an online teaching and learning environment and how the epidemic influenced their online teaching and learning experience. This study also focused on the teaching, logistics, social, technological and psychosocial online teaching and learning problems experienced by prospective teachers in the wake of the pandemic.

4. OBJECTIVES OF THE STUDY

- To examine various problems faced by prospective teachers in online teaching and learning of mathematics during the pandemic period.
- To examine the different concerns of prospective teachers about the online mathematics classes.
- To examine whether there exist any significant differences of the perceived problems on the basis of the categorical variables.

Gender: Boys and Girls

Institution: Govt., Aided, Unaided

Locality: Urban and rural.

5. HYPOTHESIS

- There is no significant difference between the perceived problems on the basis of locality of the institution
- There is no significant difference between the perceived problems of online teaching and learning of mathematics among prospective teachers in terms of gender (girls and boys).
- There is no significant difference between the perceived problems on the basis of aided, government and unaided colleges.

6. RESEARCH METHOD

The study utilised a quantitative normative survey type research.

6.1 SAMPLE SELECTED

The prospective teachers who are the students of various colleges of education at secondary level forms the population of the study. Out of these 120 prospective teachers of different aided, government and unaided colleges were selected. The samples were selected using

stratified random sampling technique giving the representation to gender, locale and types of institution of the study.

6.2 TOOL USED

A questionnaire has been prepared which comprehensively covers the different aspects of the problem under consideration. Both closed and open-ended questions were used. The items covered all the necessary dimensions of the variable i.e., Perceived problems and issues of online teaching and learning.

7. ANALYSIS AND INTERPRETATION

The Statistical techniques used for analysing the data were percentage, student's t-test, ANOVA. More specifically, students t-test used for the values of table 1 and 2; and ANOVA is used for the computational results in table 3.

Table 1: Significant difference between the perceived problems on the basis of male and female students. Note: *Indicate not significant at 0.05 level.

Subsample	Mean	Significant Difference	Mean Difference	Degrees of Freedom	't' Value
Female (N=108)	37.81	8.032	-1.611	118	-0.644*
Male (N=12)	39.42	9.802	-1.611	12.698	

The table 1, shows that the mean difference of female and male prospective teachers is -1.611. It can be seen that the 't' value is less than the table value of 1.96 at 0.05 level of significance. Hence it is not significant at 0.05 level. That is, it shows that there is no significant difference between female and male prospective teachers in their responses. The result is, the hypothesis is not rejected. It reveals that there is no significant difference in the mean score of prospective teachers' responses of female and male.

Table 2: Significant difference between the perceived problems on the basis of rural and urban areas. Note: *Indicate not significant at 0.05 level.

Subsample	Mean	Significant Difference	Mean Difference	Degree s of Freedom	't value
Rural (N=99)	38.11	8.515	0.825	118	0.491*
Urban (N=21)	37.29	6.634	0.825	35.534	

The table 2, shows that the mean difference of rural and urban prospective teachers is 0.825. The 't' value is less than the table value of 1.96 at 0.05 level of significance. Hence it is not significant at 0.05 level. It means that there is no significant difference between rural and urban in their responses. Thus, the result is hypothesis is not rejected and it shows that there is no significant difference in the mean score of prospective teachers' responses in rural and urban areas.

Table 3: Significant difference between the perceived problems on the basis of aided unaided, aided colleges. *Indicate not significant at 0.05 level

Type of Institution	Mean	Significant Difference	F Value	P Value
Aided College	37.37	8.527		
Government College	39.90	9.544		
Unaided College	37.77	7.175		

The mean scores of aided colleges have 37.37 and government colleges have 39.90 and unaided colleges have 37.77. Looking at the mean scores, it is clear that there is no significant difference between the aided, government and unaided prospective teachers. Since P value is greater than levels, the above hypothesis is not rejected at 5% level of significance.

8. PERCENTAGE ANALYSIS

Of the total sample, 11.7 percent of the prospective teachers are low level. 75.0 percent are moderate level and 13.3 percent are high level problems.

Out of the 108 female students, 12 percent in low level, 76.9 percent in moderate level and 11.1 percent in high level of problems faced by teaching and learning mathematics in online. The percentage of responses from prospective teachers of male, 8.3 percent low level, 58.3 percent moderate level and 33.3 percent in high level of problems faced by teaching and learning mathematics in online.

From the 99 rural area is 12.1 percent in low level, 71.7 percent in moderate level and 16.2 percent in high level of problems faced by teaching and learning in online mathematics. The percentage of responses from prospective teachers of urban areas is 9.5 percent low level, 38.1 percent moderate level and 16.2 percent in high level.

The percentage of responses from prospective teachers of aided colleges is 11.5 percent in low level, 76.9 percent in moderate level and 11.5 percent in high level of problems faced by teaching and learning in online mathematics. The percentage of responses from prospective teachers of government college is 14.3 percent low level 61.9 percent moderate level and 23.8 percent in high level. The percentage of responses from prospective teachers of unaided is 10.6 percent low level, 78.7 percent moderate level and 10.6 percent in high level of problems faced by teaching and learning mathematics in online.

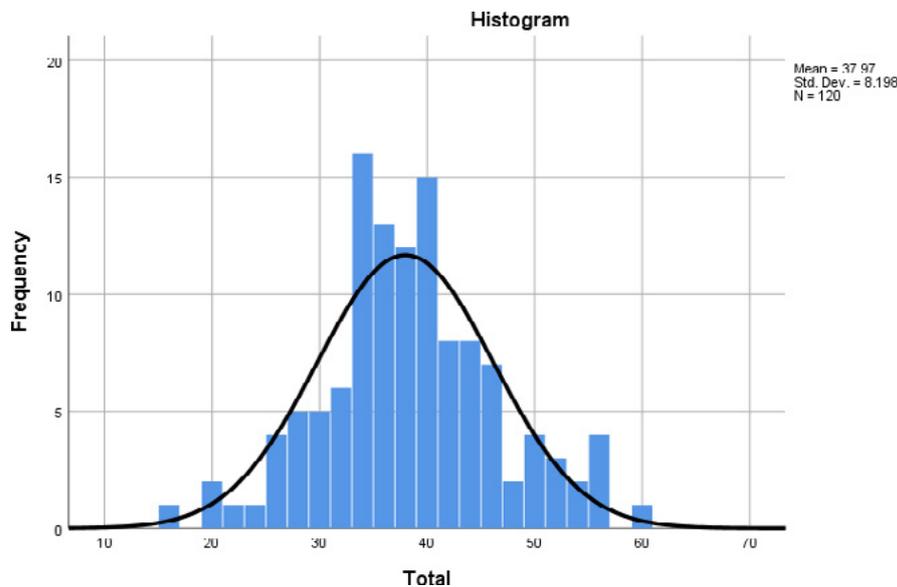


Figure 1. Histogram & normal distribution of the sample

9. MAJOR FINDINGS OF THE STUDY

From the study, the following issues have been identified in the perception of prospective teachers related to the online teaching and learning process: lack of internet facility, less student-teacher interaction, problems with the learner's understanding level, problems with the absence of mind, lack of student teacher satisfaction. In addition to the above issues, the prospective teachers faced the most challenging problem in teaching/learning process is problem-solving sessions in mathematics. In this study, we observed that the subject like mathematics, face to face classes are very much essential and it is more effective than the virtual classes and it is mostly not possible in the virtual learning/teaching process. To makeover these problems, the teachers must adopt more effective tools and gain adequate knowledge in the latest technologies. However, it may not be successful if the teachers were not provided special training for the same.

10. CONCLUSION

This paper, mainly focused the problems of prospective teachers and students experienced in teaching and learning of mathematics during the pandemic. The findings of this study revealed that most of the respondents (prospective teachers) were unhappy with online mathematics classes and prospective teachers faced several hurdles and difficulties while attending mathematics classes in virtual mode.

From the data, it can be revealed that teaching and learning mathematics subject through online classrooms are different and more challenging than learning the other subjects/disciplines and their understanding, enthusiasm for learning and understanding of mathematics are decreased during the online classes.

The prospective teacher also revealed that it was a difficult situation for them especially in the initial days, because for them the online classes are a first-time experience but gradually, they start to adapt to the new methods, and they start to consider this as an opportunity for innovation and experimentation. Most of the prospective teachers faced a lot of challenges during online classes due to less student-teacher interaction, internet issues, and lack of participation from the student side. They also found difficulties in problem-solving sessions which need good participation from both teacher and the student. Most of the prospective teachers agreed that it is more difficult to teach mathematics than the other disciplines.

The major hindrances evolved out for the effectiveness of online teaching and learning are: lack of internet, less student-teacher interaction, problems with the learner's understanding level, problems with the absence of mind, lack of student teacher satisfaction, solving a problem in mathematics that requires a lot of help from the prospective teacher, which is difficult to do through online classes.

The findings of the study made the authors to yield some implications. Some of the educational implications are as follows; provide internet facility, provide adequate training to teachers to integrate various ICT tools in online classes, provide support for the teachers to ensure the presence of the student in the class, use frequent assessment in online classes, to integrate interactive tools in online classes and to integrate different augmented reality in online classes.

11.RECOMMENDATION AND SUGGESTIONS

The following implications can be implemented by the government to improve the effectiveness of online classes: Provide free internet facility for all the prospective teachers in the state.

The following strategies can be implemented by the institutions to improve the effectiveness of online classes:

- Provide adequate training to teachers to integrate various ICT tools in online classes.
- Provide a smart classroom for handling online classes for the teachers.
- The following implications can be implemented by the institutions to improve the effectiveness of online classes:
 - Use frequent assessment in online classes.
 - Integrate interactive tools in online classes.
 - Integrate the new technologies like, augmented reality for more effective online classes.

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