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Challenges and opportunities in teaching science subject to children during COVID-19 pandemic

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Abstract
Technology is a boon as well as a bane. Boon to those who know it and use it well and bane to those who are not acquainted with its usage. In the current pandemic COVID-19 situation, technology has helped people in various ways which being getting and staying connected with our near and dear ones, carrying out with our usual work by staying safe at home and also providing online classes to the children. Teachers played a crucial role in helping children by helping them learn and stay connected to their learning environment. However, teachers had their share of challenges and opportunities while teaching children through the online or the recorded mode. The present study was conducted with the aim of understanding and assessing the opportunities and challenges a science teacher encounters while teaching children through the online mode or recorded class. 23 science teachers teaching in five different schools were approached to participate in the study. A likert type of rating scale was prepared to assess the frequency of technology usage as well as their opinion regarding the current situation. A google form consisting of 23 questions were prepared and sent to the participants. Qualitative analysis was done to assess the challenges and opportunities teachers have been facing in the current pandemic situation. The paper discusses the pros and cons of online and recorded classes.

Keywords: COVID-19, technology, online classes, recorded classes, challenges and opportunities

Introduction
In this crucial time of COVID-19, there has been a phenomenal change in the educational sector right from teaching to conducting examinations. The entire educational process has seen a change. This change and transformation has been in terms of conducting board examinations, school admissions, entrance tests of various universities and competitive examinations, teaching learning process, online classes, etc.
The major aspect affected in this pandemic are the structure of learning, teaching and assessment methodologies as well as the environment for teaching and learning. The schools have moved away from the conventional way of learning and teaching and adapted themselves to online and recorded classes. The pandemic situation has also highlighted the need for technological up gradation in school. The technologically equipped schools were able to sustain and continue with their education by providing online classes however, those schools not equipped technologically had challenges in providing instruction as well as to stay connected with their students. However, the private schools which could afford infrastructure and equipment's were providing the service whereas schools which had limited resources were taking backseat in providing the service. The pandemic has also significantly brought a change in the higher education sector, which is a critical determinant for the students to complete their education and country's economic future.

Modification in teaching and role of technology in schools during pandemic
The pandemic has transformed the traditional chalk–talk teaching model to technology based teaching. As per the report of Express Computer Ed-tech, technology has helped to stay connected with students at the time of pandemic. Technology has made possible that every child can have access to online classes in one way as well as it allowed the schools and colleges to widen their outreach and reach thousands of students by adapting to digital curriculum. Similarly, this disruption in education has pushed policymakers to figure an inclusive e-learning solutions as well as the digital divide.
A multi-pronged strategy is necessary to manage the crisis keeping in mind the current pandemic situation as well as the future requirement and build a resilient Indian education system in the long term.

Hence major modification is required for ensuring education for all in this time of difficulty. These modifications include development of software and open-source digital learning solutions thereby helping teachers to conduct online classes The modifications thus made was also helpful in developing skills like adaptability, collaboration, creativity, communication, etc., and thus scene of education reformed from being mere information passing mode to the development of various skills so as to help the individual succeed. The recent crisis has also brought about the importance of developing a good relation with technology especially in education. Technology has become the lifesaver for education and its beneficiaries during this pandemic by utilisation of resources in teaching. The innovative methods of education incorporating technology has helped in bridging the gap between the students and the teacher. The future of education will find no room to ignore the utilization of technology since it is the best platform to empower learning in an age that is integrating technology as a way of life. This technology is helping students to learn and grow themselves in education. India today in their article discussed the role of technology and apps wherein they are playing a crucial role in the education sector which being enhancing interaction, staying connected with parents and teachers for better communication, promoting remote learning, availability of online resources, cost-effective, sustainable as well as live-streaming lectures with real-time doubt solving.

Challenges in teaching using technology during COVID-19

Technology is perhaps the strongest factor shaping the educational landscape today. The common challenges faced by teachers when attempting to integrate technology in the classroom are access to resources, training, and support which are external barriers. There are some internal challenges faced by the teachers in this present situation that are attitudes and beliefs, resistance toward technology in the classroom, and their knowledge and skills. Assessment of these issues should be valuable to current and future educators, school administrators, as well as educational technology researchers. The external challenges can be addressed with the support of institution but the internal challenges should be controlled by self. The challenges a teacher encounters while incorporating technology are insufficient equipment and connectivity, lack of training, no professional development in new technologies which have limited their capability of using technology with full potential. With regard to attitude and belief constraint lack of confidence in skill and knowledge and lack in usage of technology in learning are the internal barriers for teachers during this pandemic. Teachers feel that they do not have enough competencies in using technology in teaching and they strongly believe that the control over class is limited in this COVID-19. Perhaps, education post-COVID- 19 will embrace learning's from science and emphasize a greater focus on issues that endanger our health, society, life and earth. The world will never go back to what it was during pre-pandemic so there is a requirement to adapt the education system and learning in future. When the challenges in teaching during the COVID-19 pandemic is being discussed, an article titled 'Teaching in a Pandemic: How Educators are handling the sudden shift to distance learning' by Jon Gorey have highlighted that teachers have opined that online classes do not allow them to read the pulse of the classroom to check whether the students have understood the concept or not. They further added that losing that personal interaction is one of the most difficult aspects of remote learning.

Need and Scope of the study

The current pandemic situation has taught us that life is very unpredictable and ever changing. We have to accept change and adapt ourselves according to the situation. Every aspect of life is look with different perspectives. Even education has changed a lot. Even though technology was an integral part of the education system, it has occupied a forefront in the current learning situation. The place of the teacher cannot be replaced; however technology has become a great support tool as well as the connecting medium between the teacher and the students. It has proved its worth in this testing time of pandemic. It has made the process of teaching learning possibility, students are able to learn and stay connected while staying safe in their home. Indeed technology has turned out to be a boom at this time. However like everything it has got its due drawbacks also. Teachers using the traditional way of teaching are now compelled to learn and use technology so as to teach children. Few might have learnt, adapted themselves according to the needs, others might still be struggling to accept the new demands and changes. Hence a need was felt to understand the attitude of science teachers in usage of technology, its challenges and opportunities during the COVID-19 time. The study also highlighted the requirements or needs of the teacher as well as the areas of technology in which they need to improve.

Aim of the study

The study was taken up with the aim of assessing the challenges and opportunities in teaching science to children during COVID-19 pandemic. The objectives undertaken was:

To identify areas of concern while using online technology to provide instruction to children during the COVID-19 pandemic

Method

The present study was on effort to conduct a survey to study the challenges and opportunities in science teaching during the COVID-19 period. The sampling technique employed was purposive in nature seeking science teachers teaching children using technology or providing classes either through online mode or recorded mode.

Participants

A total of 21 teachers teaching science subject either through online or recorded mode were selected for the study. The teachers were selected on the basis of their school which were providing online or recorded classes. The majority of the teachers were from private schools as these were the schools providing classes either through the online mode or recorded classes. The teachers selected were teaching upper primary children. Even though the questionnaire had demographic details, only few teachers filled the details. Hence details like age and gender is not given in the methodology. However, since the data was collected digitally, it was sent to teachers teaching in schools both in urban and semi-urban set-up. Not getting the

details like age and experience, itself became a limitation for the study.

Research Tool

A questionnaire was prepared in the digital form [using Google Docs forms] as it was difficult for the researcher to personally go and administer it on the selected group of teachers. The questionnaire consisted on 23 questions. A five point Likert scale was used to asses both the level of difficulty as well as the opinion of the teachers about the usage of technology. The questions were aimed at getting information from the teachers who offered either online classes or video recorded classes.

The areas selected for the questions were the frequency of taking the class, connectivity issues, availability of equipment's, power point presentation, availability of technical support for editing the recorded video time might aspect etc. the opinions of the teachers on components like accessibility, constraints in teaching, assessing the students, supervision, immediate feedback etc. were also covered in the questionnaire.

Results with respect to number of teachers providing online class

The tool was developed regarding the challenges and opportunities in teaching science subject to children. The items were based on challenges in teaching science subject through live online class and video recorded class. There were totally twenty three items in the tool and were spitted under 8 sub domains. The tool was digitized and the link was sent to the teachers personally. The respondents for the tool were science teachers from different schools. Figure 1 imposes the number of teachers providing online class during this COVID-19 pandemic.

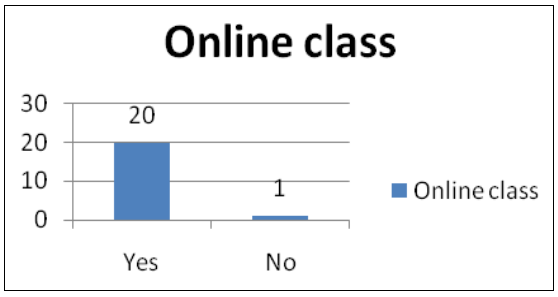

Fig 1: Number teachers providing online class

Figure 1 states the number of teachers providing online classes during this COVID-10 pandemic. There were totally 21 participants for the study among that 20 teachers were conducting online class for children and one teacher have said that online class were not provided to the children. The schools in rural areas have not started with their online class due to lack of resources.

Results with respect to mode of online class

A survey question for the mode of online class was developed wherein the number of teachers providing online classes in the form of live online class and video recorded class was collected.

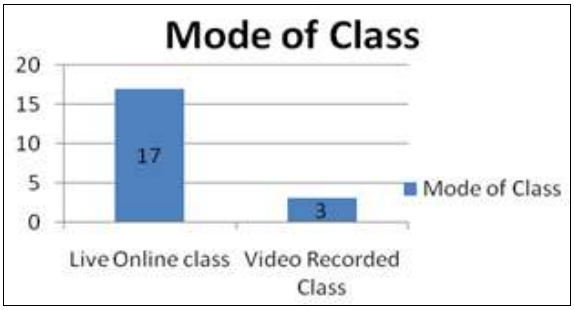

Fig 2: Mode of online class

Figure 2 shows the result with respect to the mode of online class for children during this pandemic. 17 participants indicated that they were providing live online classes for children during this pandemic and 3 participants have indicated that video recorded class has been sent to students. However among 21 participants, 1 participant was not directly involved in any mode of online class since the teacher faced difficulty to work through technology.

Result with respect to number of days online classes were provided to children

When the data was collected, the schools were still in the process of deciding the transaction mode. The figure below shows the frequency of classes provided. The tool developed for the purpose collected the details about the number of classes taken per week to children in this COVID-19 pandemic.

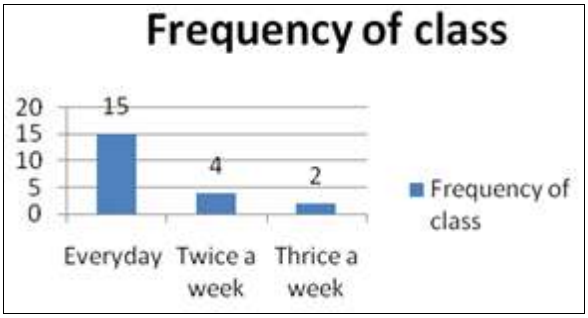

Fig 3: Frequency level of online class

Figure 3 indicates about the frequency level of online classes has been provided to children during this COVID-19 pandemic. Based on the survey 15 teachers says that they are providing online class every day, 4 teachers says that twice a week the online class has been provided and 2 teachers says that thrice a week it is been provided during this COVID-19 pandemic.

Results with respect to challenges during live online class

The tool was developed regarding the challenges faced by the teachers during the live online classes. The five point rating Likert scale was used to assess the level of difficulty in the areas such as connecting to children, availability of software, availability of equipment's such as mobile, laptop and desktop, usage of software and preparing and projecting resources such as PPT, online pictures, etc., during live online class. The figure given below shows about the response based on difficulty faced during live online class.

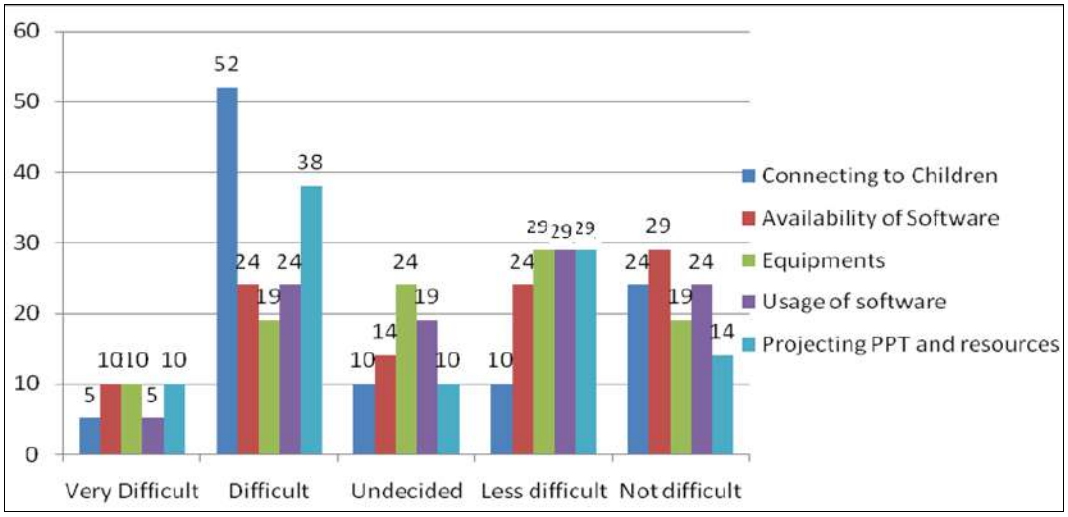

Fig 4: Challenges during live online class

The above figure indicates about the challenges faced by the teachers during the live online class. The results revealed that 52% of the participants had indicated that it is difficult to connect to the children, 38% of the participants indicated connectivity as a difficulty, projecting powerpoint presentation information and online resources during live online class, whereas 24% of participants says difficult in terms of availability and usage of software and only 19% of participants says that it is difficult to get equipment's. Less than 10% of participants have indicated that it is very difficult in all the aspects. These challenges could be attributed to the fact that since the teachers were new to the concept of providing their transaction digitally for the first time, they themselves required some time to learn it and get used to it.

Results with respect to challenges during video recorded class

During the pandemic, all schools were not providing online classes. Few schools were providing the transactional service through pre-recorded video wherein the teachers would record the lesson and send the video to the parents. However, the study tried to explore the difficulties the teachers faced while providing the pre-recorded class classes the areas considered were availability of resources, availability of technical support and availability of space and environment during video recorded class. The below figure shows about the response based on difficulty faced during video recorded class.

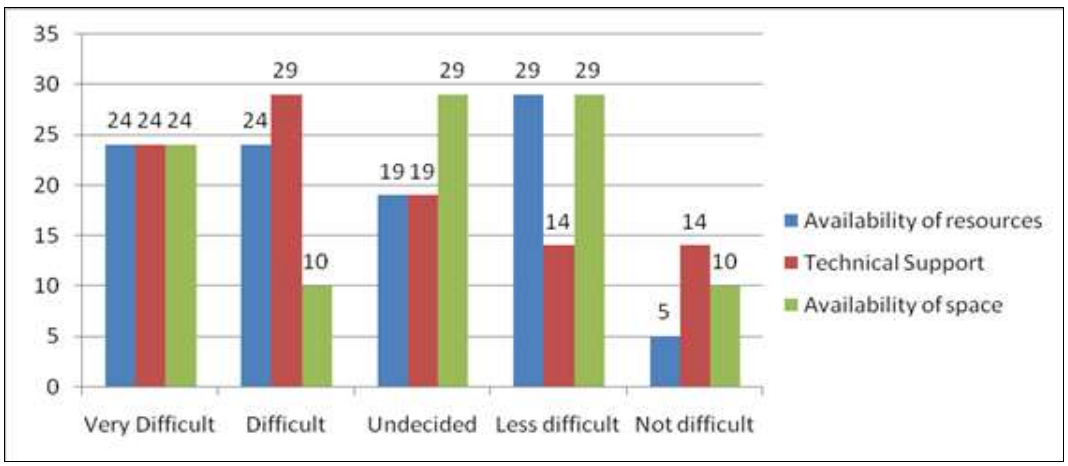

Fig 5: Challenges during video recorded class

Figure 5 indicates about the challenges faced during video recorded class. 24% of the participants encountered difficulty in terms of resource availability, 29% of the teachers had a challenging time in terms of technical support like video-editing, camera support etc. Technical support, availability of space and environment was another concern wherein 24% of the participants had difficulty. The pandemic in itself was very challenging and demanding for the entire world to handle. It was even more challenging for the teacher fraternity as they had to provide the learners with instruction to overcome the challenge of learning gap. Hence, those schools who didn't have the provision of providing online class, ensured that to continue learning, they provided the students with pre-recorded videos. Hence schools which didn't have upgraded technical service, also provided pre-recorded classes with the available resources. Hence the above result.

Results pertaining to the time management for online class during this COVID-19

Most of the schools have started their online class at school and some of the schools have given work from home for 50% of employees and in some all the employees are doing work from home based on the positive COVID cases in their respective areas.

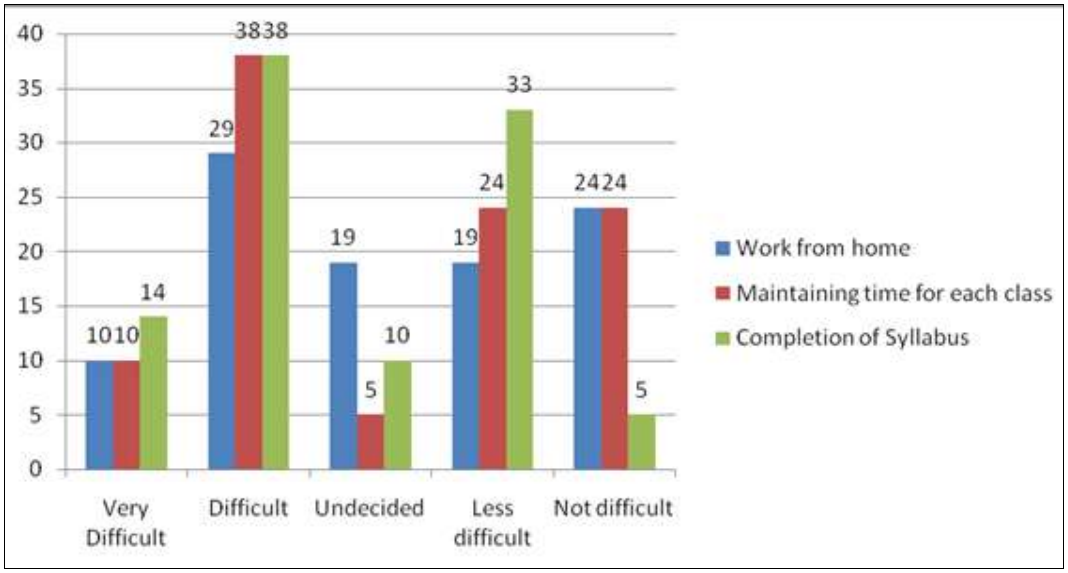

Fig 6: Time management for online class

Figure 6 indicates about the time managed by the teachers for online class during COVID-19. Since work from home option is available in many schools teachers need to manage their home activity and school activity in that 10% of teachers says that it is very difficult, 29% of participants said that it was difficult to manage time for both home as well as work activity. Time management in terms of completion of syllabus is also discussed here. The usual classes starts by June however due to this COVID-19 pandemic, the online classes started by middle of July 2020. Teachers had to rush for completing the syllabus during the academic year since the classes started very late and hence managing time for completing syllabus will be a challenging part for teachers. 14% of participants say that it is very difficult to complete syllabus within the scheduled time during the online class, 38% of teachers indicates that it is difficult, to manage timely completion of syllabus.

Results pertaining to difficulties and opportunities for teaching Science subject during COVID-19

Science is a subject which needs more demonstration, experiments and explanations to make the children understand the concept. Teaching science subject through online class was a challenging task for teachers. The developed tool also aimed to collect details such as ease of use technology and software, availability of resources and its constraint, supervision of students during test, lack of supervision and its repercussion like copying and malpractice during test, lack in immediate response and difficulty in clarification of doubts and lack of clarification of doubts in recorded video class. The following figure indicates about the difficulties faced while teaching science subject.

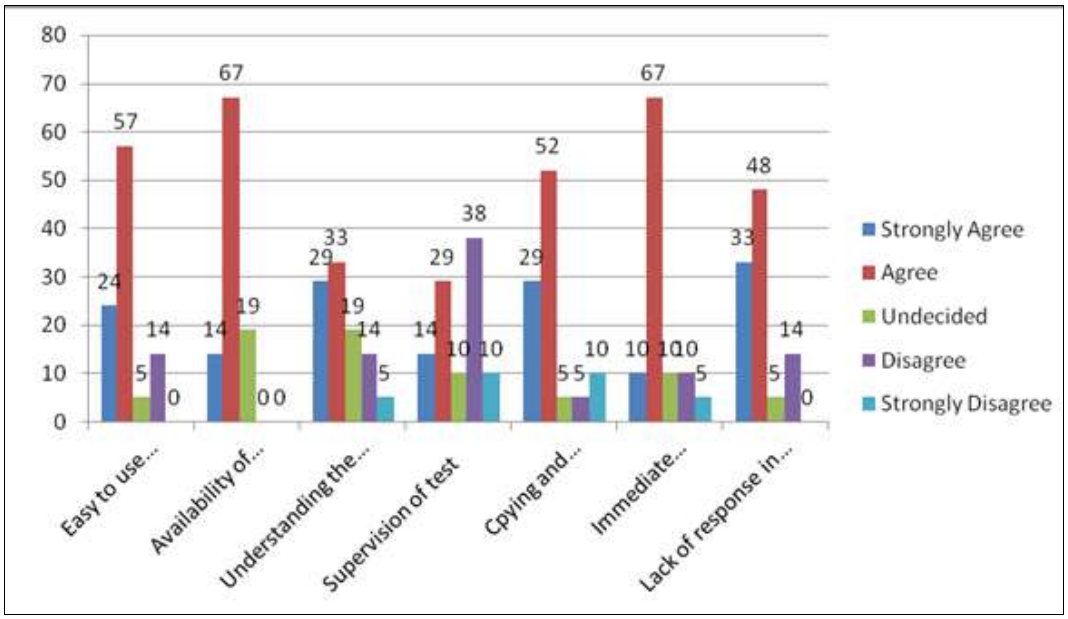

Fig 7: Difficulties and opportunities in teaching Science subject

Figure 7 shows about the difficulties and opportunities faced by teachers in teaching Science subject during this COVID-19 pandemic. 24% of participants strongly agree that science teaching during COVID-19 has become easy through technology and software, in terms of constraint in availability of resources, 67% have strongly agreed that they

had difficulties in resource mobilization. The other problems discussed were supervision during test became limited in online class; the teachers may face difficulty to supervise children in group during online class for which 14% of participants have strongly agreed for the statement. Students might take advantage like copying during test due to lack of supervision by teachers, 29% of participants have strongly agreed to the above statement. Other challenges which the teachers have highlighted are in terms of immediate response and clarification of doubts in group online live class for which 67% of them have strongly agreed to the statement, recorded video class might provide lack of opportunities for immediate doubt clarification during the class, for which 33% of participants have strongly agreed. Thus, even though technology has provided the opportunity to stay with connected during the pandemic time, it has its own challenges and difficulties.

Results with respect to skills developed or learnt in teaching during COVID-19

COVID-19 this pandemic has changed many aspects with regards to education; it has changed the belief, thoughts and process of education. Teachers have developed many skills in teaching during this COVID-19 period. The following figure shows result about the improvement in technical knowledge and skill for conducting online class and development of confidence in using the software.

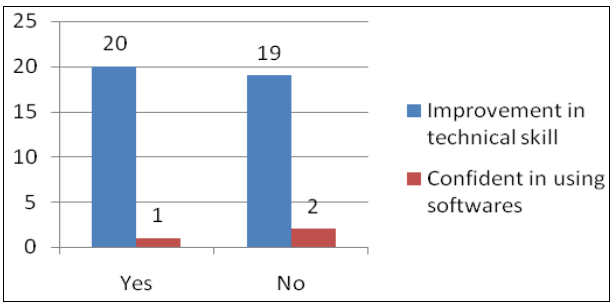

Fig 8: Development of skills in teaching

Figure 8 indicates about the development of skills in teaching through online mode for which 95% of the participants responded saying that teaching through online mode has improved the technical knowledge and skill of teachers and one participant have indicated it is not. 91% participants have indicated that teaching through online has built their confidence in using software and 9% of them have responded in negative for the same.

The current pandemic situation has brought out the best and worst among many people especially the teacher community. They had a huge responsibility on their shoulder of continuing with their jobs of teaching without bringing a gap in learning. Hence, the teachers faced both challenges and opportunities in learning and upgrading themselves during this pandemic. As per the report by Education plus development (2020), the top ten risks and opportunities for education in the face of COVID-19 are as follows:

Risks and Challenges include

1. Difficulty in reinforcing new teaching and learning approaches through distance learning
2. Lack of sufficient support to the educators to do their jobs well
3. School closures have widened the equity gaps as not all children have access to digital devices or internet connectivity.
4. Lack of confidence in using technology based products due to lack of knowledge, training and expertise.

But the pandemic has also created opportunities in learning, which are as follows:

1. Incorporating new approaches like the blended learning approach
2. Parents and others in the society have realised the value and importance of teachers for their non-stop commitment and support
3. Quality teaching and learning materials will be curated and more widely used
4. Increased teacher collaboration.

Conclusion

Adaptability is a unique feature of human being. And it has become very evident in the current COVID-19 situation. Human beings adapted and adjusted themselves according to the requirement. Technology helped the individual in the process. The learning scenario changed drastically and classes went from live to recorded online class. The conclusion drawn was technology has made the teaching learning process easy and reached children even in rural areas. Children could learn by themselves once the concept is taught by teachers. Teachers have developed many creative and alternative skills in teaching during this pandemic. The administration and software developers have supported a lot in this crucial time for education setup. Teachers are upgrading themselves to meet the changing educational needs but the senior teachers who are used to the traditional method and have lack of knowledge in technology are facing difficulty in providing online class. The upcoming young teachers are appreciating the online mode of teaching and they making it creative.The school which has low economic status and children from rural areas are missing the opportunity to learn during the pandemic time.

Hence it could be concluded that role of teacher cannot be totally ignored however support of technology is also essential at this time of crisis. This study has its own delimitations and implications for conducting and are given as follows

1. Administering tools by personally handling over to participants has an impact; the digital tool though useful, cannot ensure full participation from the participants and hence limited number of respondents.
2. Only 10 number of schools were covered as other schools whom the researcher approached didn't respond.
3. The demographic details couldn't be collected as the participants entered it incorrectly

Implications of the Study

1. The current pandemic situation has taught the teachers to be technologically oriented and to be updated
2. Schools should try to upgrade themselves in terms of technology and its training
3. Rural schools should take it as an opportunity to upgrade the school and teacher skills in technology and other softwares
4. Government should make it mandate for the teachers to

undergo training for their upgradation and skill enhancement.
5. The study has also revealed the need for a strong public-private partnership

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