A study on Use of Effective ICT Tools in Secondary Schools to Impart Education Online During the COVID - 19 Outbreak in Aurangabad City & The Way Forward

Anita Pisote [1], Dr. Rajendra Gaikwad [2], Saurabh Kohli [3], Dr. Nalini Chondekar [4]

1. Research Scholar, Department of Management Science, Dr. Babasaheb Ambedkar Marathwada University, Maharashtra, India, e-mail: anitapisote@gmail.com, Mob: 9011034665
2. Principal, Matsyodari Shikshan Sanstha's Arts College, Maharashtra, India, e-mail: rjgaikwad5757@gmail.com, Mob: 9422215425
3. Assistant Professor, Department of Electrical Engineering, Marathwada Institute of Technology, Maharashtra, India, e-mail: saurabh.rwth@gmail.com, Mob:7888243989
4. Assistant Professor, Department of Education, Government College of Education, Maharashtra,   India, e-mail: nalinimuley@outlook.com, Mob: 9822137800

ABSTRACT

World is changing at a faster pace. "An investment in the knowledge is the best investment" as quoted by Benjamin Franklin. Everlasting learning is the game of life. Education is a vital part of human being and its generation but COVID-19 pandemic has halted the learning in schools, institutes, universities etc. The coronavirus pandemic is giving technology great insights at extent as to what human development and learning looks like, allowing it to potentially shift from just delivering content to augmenting relationship.

Teaching and learning process can be made effective by use of these ICT tools which provide an innovation and ease in student teacher interaction. Technologies i.e. radio, television (Swayam Prabha Portal which has lectures on DTH, online and Doordarshan etc.), video, podcasting (audio), computer, smartphone, Learning Management System (LMS-Moodle), Zoom App, Google Classroom etc. are some solutions to foster education in the COVID19 pandemic times. Shifting to these new technologies is something which is a difficult task for the teachers also as a great amount of training will be needed to accomplish this.

This paper discusses use of ICT in secondary schools by teachers during COVID 19 pandemic in Aurangabad District, Maharashtra, India. A total of 134 teachers from 44 public schools and 46 private schools from Aurangabad participated in this study. The online survey was a means for data collection.

Descriptive statistics were used to study and evaluate the data. The results of this study indicated towards the fact that teachers' use of ICT during COVID-19 increased but teaching hours were reduced drastically. Technology tools used for teaching, learning and evaluation are chat application and "Live" audio or video class meetings. Furthermore, the analysis showed that even though teachers have gadgets for teaching but gadgets are not available to most of the students for distance learning during COVID-19 pandemic. Most of the students partially disengaged (stopped participating) from studies during COVID-19.The results provide insights into factors that teachers perceived as benefits, difficulties, challenges to the use of ICT in their teaching.

Keywords: Information and communications technology (ICT), COVID-19 pandemic, Technology tools

1.   INTRODUCTION

nformation and communication technology (ICT) plays a critical role in imparting knowledge and providing information to society .Remote education became an only option owning to closure of primary and secondary schools to stop the spread of virus in the COVID-19 pandemic.

Following are the difficulties to move teaching online completely:

- Unequal access to digital learning portals: Lack of access to technology or lower bandwidth is an obstacle to continued learning, especially for students from rural areas.
- Abstained Learning/ Interrupted learning: The disadvantages are disproportionate for underprivileged learners who tend to have fewer educational opportunities
- Parents unprepared: Parents busy in work from home or actually present for work and unprepared for distance and home learning when schools/universities close.
- Levels of income: Different level of income of the families makes the problem of internet connectivity to aggravate as some families may not be able to provide their children with rich internet connectivity plans [1].

1.1.   Problem Statement

Due to the COVID-19 pandemic, including children and youth – roughly 80% of the world's student population – were barred from going to colleges and schools (UNESCO Report) [1]. In the current COVID – 19 pandemic situation a large number of students suffered educational loss by distancing from schools and colleges. The problem is that students are ready for physical class and since maintaining social distancing is a norm now hence it becomes essential to replace physical class with online live session via Google meet or Zoom and many such means of communication. Looking at the scenario though many schools opened up to the online teaching mode but the preparation of the schools and staff to educate students online was not effective. Moreover poor internet connectivity has further raised the issues.

1.2.   Purpose

The purpose of this paper is to investigate teacher's use of ICT in secondary schools in Aurangabad District, Maharashtra, India during COVID 19 pandemic.

1.3.   Research questions

- How will be the delivery of course by teacher? Synchronous or asynchronous
- How will students participate and engage in an online classroom setup? Self-managed learning, discussion forum, group
- What will be the mode of communication between teacher and student? Email,   WA, Facebook, etc.
- What will be the assessment and evaluation criteria? Online, assignments, take-home exam, etc.

1.4.   Objectives

1. To study teachers' use of ICT before and during COVID-19.
2. To study teachers' technology tools used for teaching, learning and evaluation in secondary schools during COVID-19 pandemic.
3. To study teachers' perceived ICT access, difficulties in using ICT, benefits and challenges of online teaching/learning during COVID-19 pandemic.

2.   RESEARCH METHODOLOGY

A questionnaire was designed after conducting a comprehensive review of the related literature. A survey of the secondary school teachers of Aurangabad district was onducted. A volunteer sample technique i.e. a type of non-probability sampling method is

used for sampling and data collection. Near to 500 questionnaires were provided to the respondents on their email ids as well as on WhatsApp and out of which 134 were returned. Hence, the response rate of the study was 26.8 percent. Survey conducted from 15th May to 15th July 2020. Data were analysed using Excel. Quantitative and qualitative research methodology used. Results were represented with the help of tables and different figures.

3.   LITERATURE REVIEW

(Cubukcuoglu, 2013) **Underlining** on factors enabling the use of technology in subject teaching. Author mentions different factors like school factors, teacher factors and additional enablers.

School factors- pre- and in-service training , training on the use of ICT ,well-designed ICT infrastructure ,teachers have access to computer rooms , principal's positive attitude, governmental ICT policy, educational software, CDs ,DVDs and ready curricula.

Teacher factors: Teachers confidence, positive attitude, and their skills in ICT.

Additional enablers: Lower number of students in the classroom, reward for the frequent and successful use of technology at semester closure, authorities and school administration should encourage use of ICT, providing high quality resources makes it easier to merge the upcoming technologies into education[2] .

(Bingimlas, 2009) has done a meta-analysis of literature to present the barriers faced by teachers to use ICT in science education. According to author lack of confidence , lack of time are teacher level barrier and negligible access to training facilities and other resources are school level barrier and insufficient number of computer or copies of software are material barrier and teacher lack of knowledge, skills ,the problem of integrating ICT in instruction are non-material barrier[3]. But During COVID-19 Lockdown is the factor which enables teacher to use technology tools in teaching, learning and evaluation.

4.   DATA ANALYSIS

4.1.   Respondent's educational organization and Teaching Experience

All the respondents were secondary school teacher. Out of total 134 respondents, 37 (28%) respondents have 6 to 10 years of experience, 31(23%) respondents have 11 to 15 years of experience, 27 (20%) respondents have 16 to 20 years of experience. 26 (19%) respondents have 20 21 years or more experience,13(10%) respondents have less than 5 years of experience. (See Figure 1)

Respondents Teaching Experience

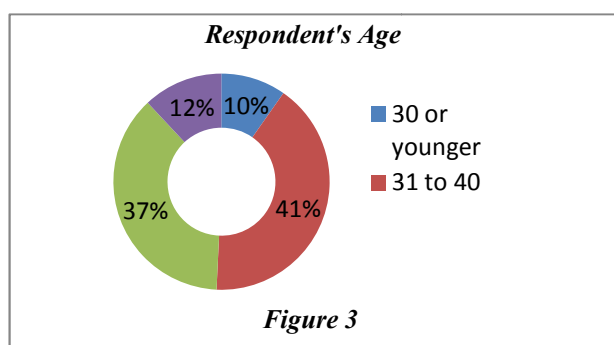*Figure 1*

4.2.   Medium of Education
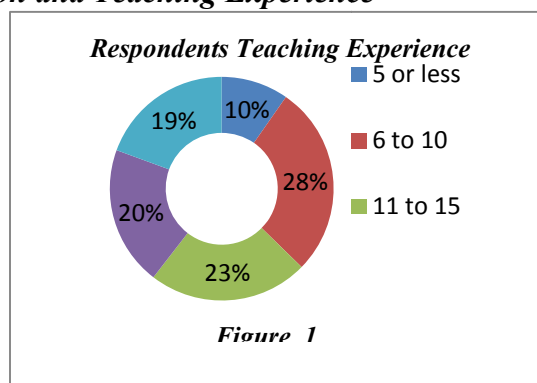

Medium of Education
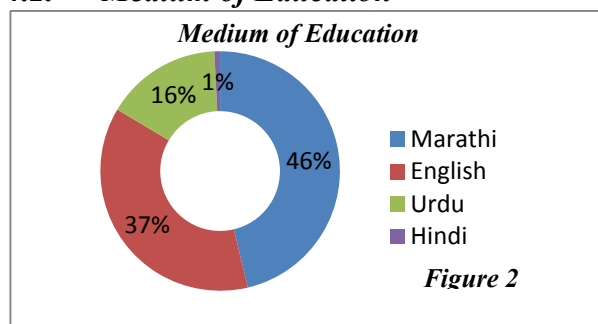
Figure 2

Data shows that 62 (46%) respondents were teaching to Marathi Medium, 50 (37%) were teaching to English Medium,21(16%) respondents were teaching to Urdu Medium and 1 respondent were teaching to Hindi Medium .(See Figure 2)

4.3.   Respondent's Age

Data shows that 55 (41%) respondents were between 31 to 40 years old, 50 (37%) were between 41 to 50 years, 16(12%) were between 51 to 60 years old and 13(10%) respondent were having age 30 or younger.
(See Figure3)

Respondent's Age

Figure 3

### 4.4.   Gender of Respondents

Respondent's Gender
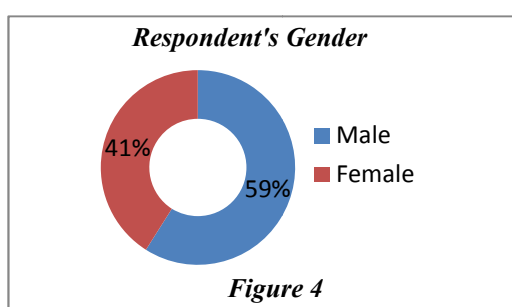
Figure 4

Data shows that from total 134 respondents, 79 (59%) were male and 55 (41%) were female.
(See Figure 4)

4.5.   Use of ICT by Teacher before COVID-19
4.5.1   Students were inquired that whether they were using ICT, before COVID-19. Very few respondents 17(12.68%) and Mean= 0.12 (See Table1) reported that they using ICT in teaching, before COVID-19(See Figure. 5)

Sr.	ICT Use	Mean	Median	Mode	S.D.
Table 1. *Statistical distribution of ICT Use before COVID-19*
1	Using ICT in teaching before COVID-19	0.12	0	0	0.33

Frequecncy distribution of ICT use by Teacher Before COVID-19

Figure 5
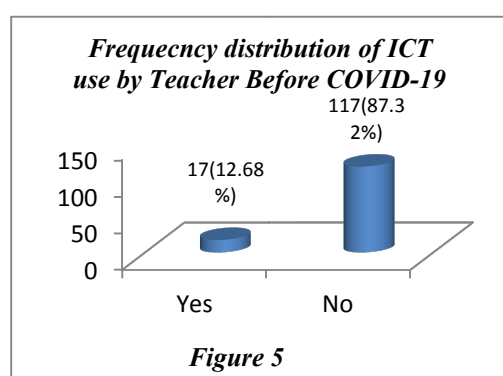
4.5.1.   Respondents were inquired on since how many years have they been using ICT for teaching /learning in their class before COVID-19. 105(78.35%) respondents reported they did not using ICT before COVID-19. 26 (19.40%) teachers reported that they are using ICT in their teaching from last 1 to 5 years. 3(2.24%) teachers reported that they are using ICT in their teaching from last 6 to 10 years. Mean=0.76(See *Table 2*) shows majority respondents did not using ICT for teaching/ learning in class before COVID-19(See Figure 6)

Table 2. *Statistical distribution of* Using ICT for teaching /learning in class before COVID-19(in years)					
Sr.	ICT Use	Mean	Median	Mode	S.D
1	Using ICT for teaching /learning in class before COVID-19(in years)	0.76	0	0	1.61

Frequency distribution of using ICT before COVID-19(in years)

Figure 6
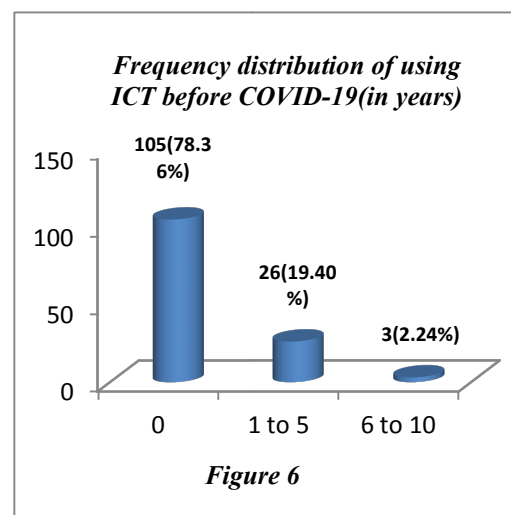
Note: 1=Nil i.e. 0 years   2= 1 to 5 years   3=6 to 10 years

4.6.   Use of ICT by Teachers during COVID-19/lockdown

4.6.1.   Respondent was questioned on whether they were using ICT tools for conducting classes online during COVID-19. Majority respondent 92(68.7%) and mean= 3.43(See Table 3) reported that they are using ICT in teaching, during COVID-19(See Figure 7)

Table 3. *Statistical distribution of Use of ICT tools by teachers during lockdown*					
Sr	ICT Use	Mean	Median	Mode	S.D.
1	Using ICT tools for teaching during lockdown	3.43	5	5	2.32

Frequency distribution of using ICT tools for teaching during lockdown

Figure 7
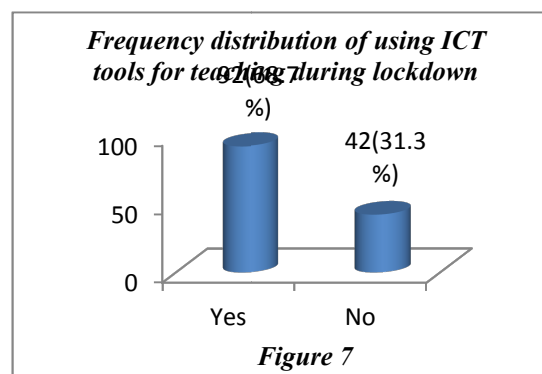
Note: 1= Yes 2=No

4.6.2.   Another question on how many classes were being conducted online in a week (in hours) during COVID-19 was asked to the respondents. Majority respondents 70(52.23%) and mean=3.74(See Table 4) reported that they were conducting 1 to 5 lectures weekly, 30 (22.39) respondents reported that they were conducting 6 to 10 lectures weekly, 4(2.99) respondents reported that they were conducting 11 to 15 lectures weekly, 30(22.39) respondents reported that they were not conducting classes during COVID-19((See Figure 8)

Table 4. *Statistical distribution of conducting classes online in a week (in hours) during COVID-19.*					
Sr.	ICT Use	Mean	Median	Mode	S.D.
1	Conducting classes online in a week (in hours) during COVID-19	3.74	3.14	1.9	3.18

Frequency distribution of conducting classes online in a week (in hours)

Figure 8
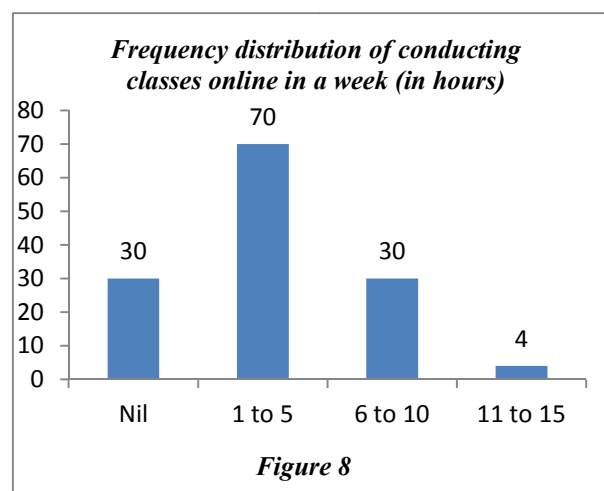
4.7. Professional Development

This question aimed to evaluate the professional development of teachers [4]. Responses showed that majority respondents 87(64.92%) and mean=3.24 have taken training on a course on ICT applications (e.g. MS. Word , Excel , PowerPoint, Internet use), 41(30.59%) respondents have taken subject-specific training on learning applications (tutorials, simulations, etc.), 36(26.86%) respondents have taken training on Course on digital content creation (Video creation etc.), 32(23.88%) respondents have taken training on courses on learning management System /virtual learning environment(e.g. Moodle), 40(29.85%) respondents have taken any other ICT training. Less mean value indicate (See Table 5) need of training in these particular area like learning management system, digital content creation and subject-specific training.

Table 5. *Statistical Distribution of Professional Development*					
Sr.	Professional Development	Mean	Median	Mode	S.D.
1	A course on ICT applications (e.g. MS. Word, Excel, PowerPoint, Internet use)	3.24	5	5	2.39
2	Courses on Learning Management System /Virtual Learning Environment(e.g. Moodle)	1.19	0	0	2.13
3	Course on Digital Content Creation (Video creation etc.)	0.33	0	0	2.22
4	Subject-specific training on learning applications (tutorials, simulations, etc.)	1.52	0	0	2.31
5	Any other ICT training	1.49	0	0	2.29

### 4.8. Gadgets owned by teachers (ICT access during COVID-19)

An attempt was made to estimate gadgets owned by teachers for conducting classes online, During COVID-19[5]. Majority respondent 115(85.8%) and mean= 4.29(See *Table 6*) reported that they have [Laptop/PC/Smartphone with internet], 55 (41.0%) reported that they have [Internet-connected tablet PC/ notebook computer], 11(8.20%) reported that they have [IPod / IPad/PDA], 19(14.17%) reported that they have [other gadgets] for online teaching, during COVID-19. Less mean value indicate (See Table 6) very few respondent have corresponding gadgets.

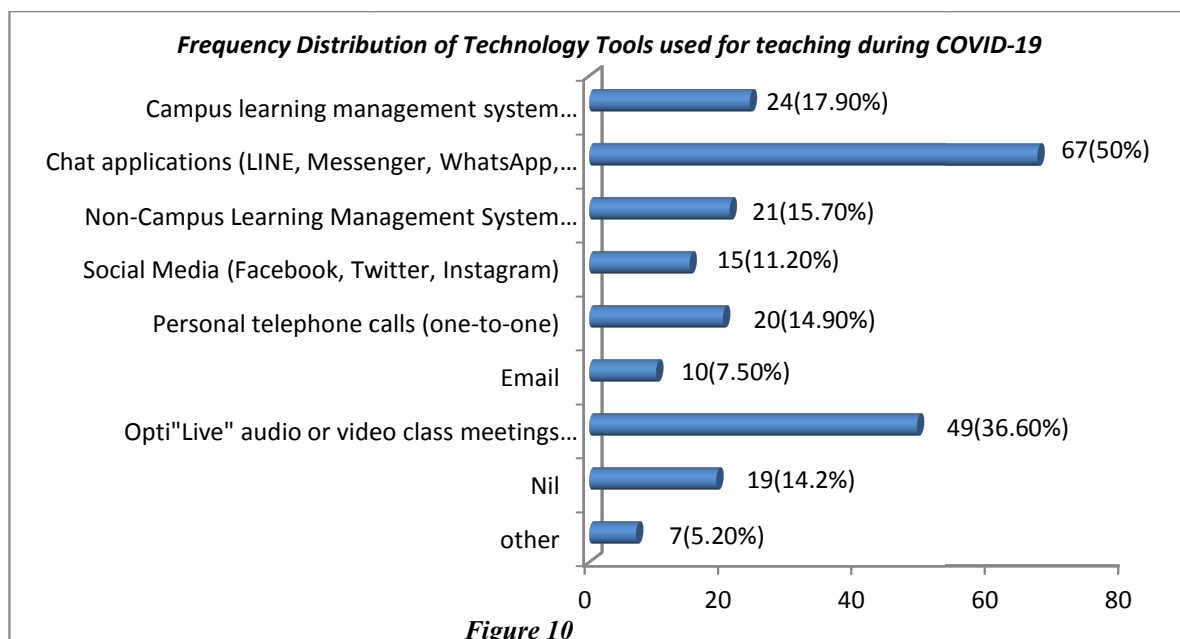| Table 6. *Statistical Distribution of Gadgets Owned by teachers*					
Sr.	**Gadgets own by teachers**	**Mean**	**Median**	**Mode**	**S.D.**
1	Laptop/PC/Smartphone with internet	4.29	5	5	1.76
2	Internet-connected tablet PC/ notebook computer	2.05	0	0	2.46
3	IPod/IPad/PDA	0.41	0	0	1.33
4	other gadgets	0.70	0	0	1.75

4.9. Gadgets owned by students ((ICT access during COVID-19)

An attempt was made to estimate gadgets owned by students for attending classes online during COVID-19[5]. 37(27.6%) respondents reported that their all students have computer/laptop/smartphone and internet access. 32(23.88%) respondents reported that their few students have computer/laptop/smartphone and internet access, 25(18.65%) respondents reported that their all but few students have computer/laptop/smartphone and internet access, 24(17.92%) respondents reported that their 50% students have computer/laptop/smartphone and internet access, 16(11.95) respondents reported that their students do not have computer/laptop/smartphone and internet access for attending classes online, during COVID-19(See Figure 9)

Figure 9
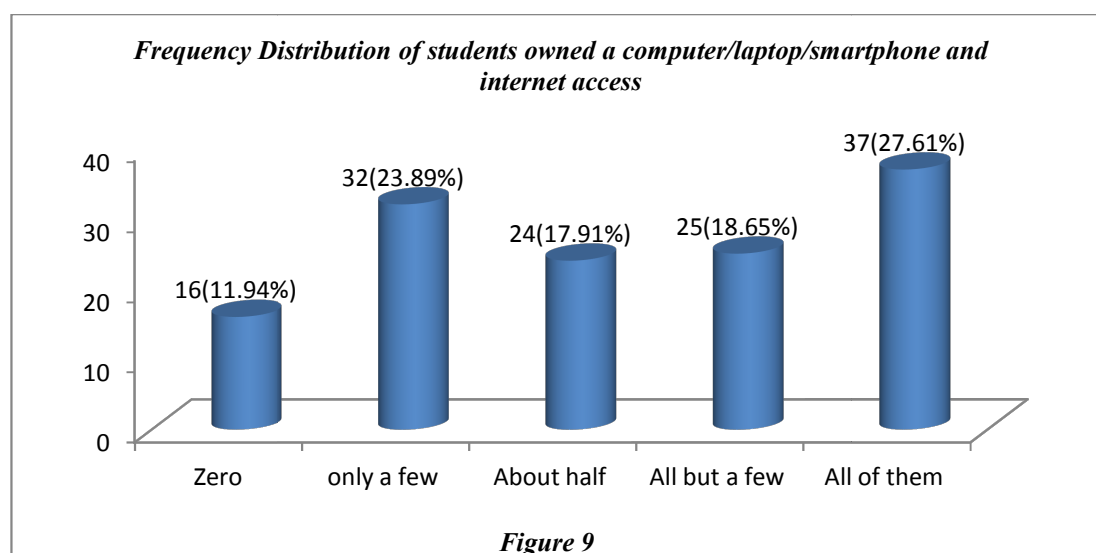
4.10. Technology Tools used for teaching during COVID-19

Respondents were queried on which technology tools were used for teaching during COVID-19. Majority respondents 67(50%) reported that they use chat applications (LINE, Messenger, WhatsApp, WeChat, Telegram, etc.), 49(36.60%) respondents reported that they use "Live" audio or video class meetings (Telephone conference calls, Microsoft Teams, Google Meeting, GoToMeeting, Zoom, Cisco Webex, Skype, Facebook Live etc.),24(17.90%) reported that they use campus learning management system (MOODLE, Canvas, Blackboard, etc.), 21(15.70%) reported that they use non-campus learning management system (Google Classroom, Edmodo, etc.), 15(11.20%) reported that they use social media (Facebook, Twitter, Instagram),20(14.90%) reported that they do personal telephone calls (one-to-one),10(7.50%) reported that they use Email, 19(14.2%) reported that they don't using any ICT tool, 7(5.2%) reported that they using other tools for teaching during COVID-19(See Figure 10)

Frequency Distribution of Technology Tools used for teaching during COVID-19

Campus learning management system…	24(17.90%)
Chat applications (LINE, Messenger, WhatsApp,…	67(50%)
Non-Campus Learning Management System…	21(15.70%)
Social Media (Facebook, Twitter, Instagram)	15(11.20%)
Personal telephone calls (one-to-one)	20(14.90%)
Email	10(7.50%)
Opti"Live" audio or video class meetings…	49(36.60%)
Nil	19(14.2%)
other	7(5.20%)

Figure 10

4.11.   Online Activities by teachers for student learning during lockdown

Student learning is most important though it is offline/online/blended teaching. Respondents were asked what activities they do for student learning. Majority of the respondents 98(73.13%) prepare and post exercises/tasks/ homework/worksheet for students via different means of communication, 79 (58.95%) communicate online with parents, 74 (55.22%) assess student learning, 55 (41.04), clarify doubts via skype, live web chat etc., 53(39.55%) use ICT to provide feedback to the student/ collect feedback from the students, 36 (26.86%) communicate with student via discussion Forum/Blog, 30(22.38) reported that they do other activities for student learning. Less mean value indicate respondent using corresponding tools less frequently for student learning during COVID-19. (See Table 7)

Sr.	Online Activities	Mean	Median	Mode	S.D.
	Table 7. Statistical Distribution of Activities for student learning during COVID 19				
1	Prepare and post exercises/tasks/ homework/worksheet for students via different means of communication	3.65	5	5	2.22
2	Use ICT to provide feedback to the student/ collect feedback from the students	1.97	0	0	2.45
3	Communicate online with parents	2.94	5	5	2.46
4	Assess student learning	2.76	5	5	2.49
5	Clarify doubts via Skype, live web chat etc.	2.05	0	0	2.46
6	Communicate with student via Discussion Forum/Blog	1.34	0	0	2.24
7	Other	1.11	0	0	2.37

4.12. Student Engagement

On the question of how respondent ensure student attention/engagement during online teaching majority of the respondents 59(44%) reported that they do so by taking some activity. 55(41%) making videos interactive by embedding quizzes within them, 25(18.70%) using Learner Experience Interaction (LXI),22(16.40%) include Reflection Quiz,19(14.20%) using poll feature to collect participant responses about a specific issue or topic during live interaction during online class to ensure student attention(See Figure 11)
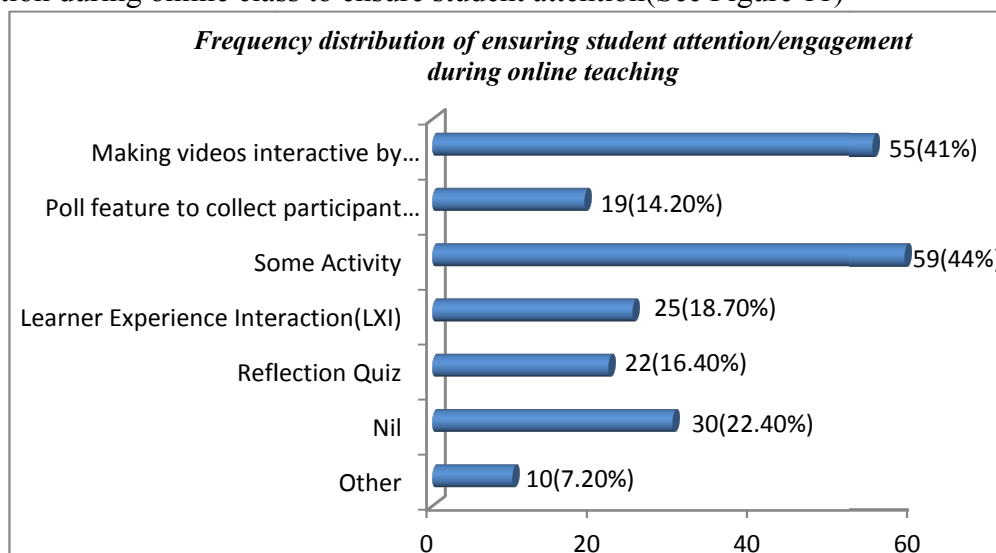

Frequency distribution of ensuring student attention/engagement during online teaching

- Making videos interactive by… 55(41%)
- Poll feature to collect participant… 19(14.20%)
- Some Activity 59(44%)
- Learner Experience Interaction(LXI) 25(18.70%)
- Reflection Quiz 22(16.40%)
- Nil 30(22.40%)
- Other 10(7.20%)

Figure 11

4.13. Students participated or disengaged (stopped participating)

An attempt was made to estimate if students participated or disengaged (stopped participating) during COVID-19. 34(25.4%) respondent reported that their students partially disengaged, 34(25.4%) reported that their student participated somewhat more, 28 (20.9%) reported that their students participated a lot more. 19(14.2%) reported that their students disengaged completely. 19(14.2%) reported that their students partially disengaged (See Figure 12)
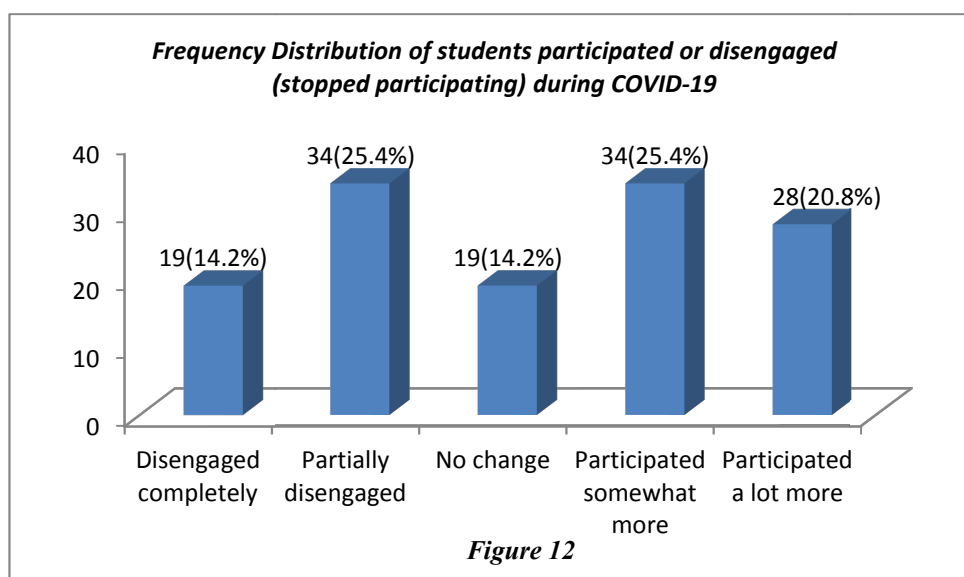

Frequency Distribution of students participated or disengaged (stopped participating) during COVID-19

- Disengaged completely 19(14.2%)
- Partially disengaged 34(25.4%)
- No change 19(14.2%)
- Participated somewhat more 34(25.4%)
- Participated a lot more 28(20.8%)

Figure 12

4.14.   *Main hindrance for integration of ICT in teaching-learning process*

A crucial question on the main hindrance in integrating of ICT in teaching-learning process was put forth in front of the respondents. 77(57.50%) respondent reported that lack of internet facility, 66(49.30%) reported that lack of technical support, 40(29.90%) respondent reported lower bandwidth, 19 (14.20%) reported that lack of confidence, 26(19.40%) reported all of the above are hindrance for integration of ICT in teaching-learning process (See Figure 13)
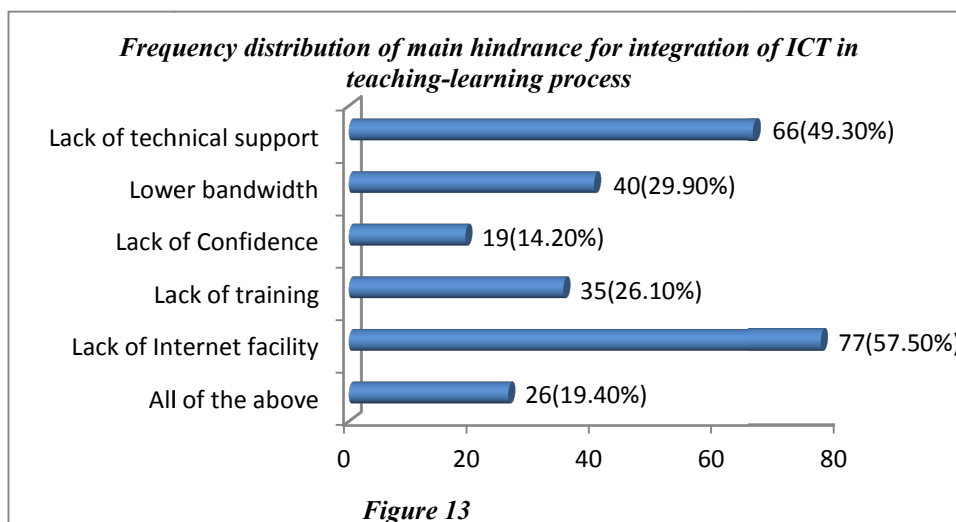
Figure 13

4.15.   *Difficulties in using ICT*

To the question on difficulties faced while using ICT tool, 67(50%) respondent reported that they feel difficulties in execution. 79(58.95%) feel the difficulty in conducting practical subject using ICT, 72(53.73%) face difficulty in reading like mobile/laptop/computer screen as compare to whiteboard/blackboard, 72(53.73%) feel that they face problem in attendance management(See Figure 14)
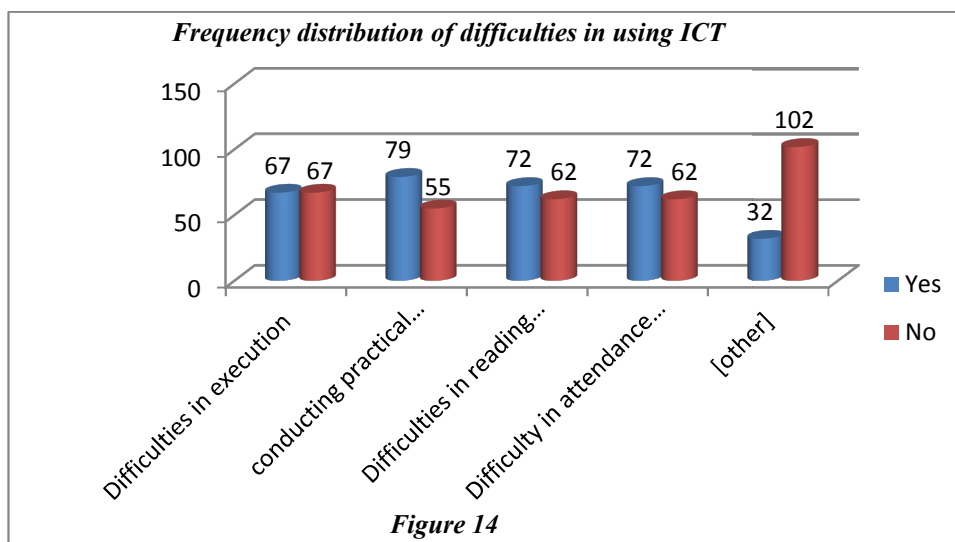
Figure 14

4.16.   *Benefits of online teaching/learning (Open ended Question)*

Whether there are benefits of online teaching/learning model, for this question each comment was rated on 5-point Likert scale (-2=very negative,-1=negative, 0=neutral, 1=positive, 2=very positive). Majority of respondent agree that there has been benefits of online teaching (See Table 8)

Table 8. Coding scheme to categorise teachers comment about benefits			
Category	**n**	**%**	**Sample Comment**
Very Negative	5	3.73	"Not at all" "Online teaching is not effective"
Negative	13	9.71	"It is useless to those who haven't facility in rural areas." "Not that much"
Neutral	31	23.13	"Many benefits", "convenient", "Partially better"
Positive	55	41.04	"Fun way of teaching learning " "Children's are learning.... teaching continues to keep them engaged in this pandemic situation."
Very Positive	30	22.39	"Visual learning is effective to learn new or difficult concept." "Excitement in learning/ teaching"

4.17. Challenges of online teaching/learning (Open ended Question)

Respondents were asked to give their opinion on challenges of online teaching/learning. Each Comment categorised as internet issues, financial problem and lack of instrument, challenges faced by teacher, challenges faced by student, lack of training, neutral (See Table 9)

Table 9. Coding scheme to categorise teachers comment about challenges			
Category	**n**	**%**	**Sample Comment**
Internet issue	42	31.34	"bad network" "Lack of internet facility" "NET ISSUE"
Financial problem and lack of Instrument	16	11.94	"poor people get problems of Internet , electricity and gadgets" "finance and facility" "Availability of devices"
Challenges faced by teacher	26	19.4	"Demerits of non-face to face teaching For e.g. science experiment" "It is difficult for explanation." "We cannot analyse the students whether they have understood the topic." "Proper evaluation of each student is not possible through online monitoring." "The teachers who have been teaching via the traditional method face hindrances, especially in handling internet equipment"
Challenges faced by student	8	5.97	"May increase use of mobile result in eye pain and headache" "More stress feeling." "All age groups students are not likely to participate in online teaching"
Lack of training	10	7.47	"Lack of training at school" "Technical training for all teachers"
Neutral	32	23.88	"Yes it's a challenge" "Yes, many challenges of online teaching."

5. MAJOR FINDINGS OF THE STUDY

1. The study found that majority respondents were male and majority of them were between 31 to 40 years old.

2. Very few respondents reported that they were using ICT in teaching before COVID-19.

3. A large number of respondents reported that they are using ICT in teaching, learning and evaluation during COVID-19.

4. Majority respondents reported that they are conducting 1 to 5 lectures weekly, which points out that teaching hour have reduced drastically during COVID-19.

5. There is need to give training to teachers like Subject-specific training on learning applications (tutorials, simulations, etc.), Digital Content Creation (Video creation etc.), Learning Management System /Virtual Learning Environment (e.g. Moodle)

6. Majority of respondents at least have laptop/smartphone with internet but very few respondents have expensive gadgets like tablet, Internet-connected tablet PC/ notebook computer, IPod /IPad /PDA.

7. Very few respondents reported that their all students have computers/laptop/smartphone and internet access. It means gadgets are not available to students for distance learning during COVID-19 pandemic .Due to that most of the student partially disengaged /completely disengaged from the studies during COVID-19.

8. Significant number of the respondents mentioned that they use chat application and "Live" audio or video class meetings (Telephone conference calls, Microsoft Teams, Google Meeting, GoToMeeting, Zoom, Cisco Webex , Skype and Facebook Live etc.)

9. Majority respondents do various online activities for student learning like prepare and post exercises/tasks/ homework/worksheet for students via different means of communication ,Communicate online with parents and assess student learning,

10. Majority respondents ensure to engage student by taking some activity during online teaching and make video interactive by embedding quiz within them.

11. Most of the students partially disengaged(stopped participating) from studies during COVID-19

12. Lack of internet facility and lack of technical support are the two main hindrances for integration of ICT in teaching /learning.

13. Majority respondent feel the difficulty in conducting practical subject, difficulty in reading on mobile/laptop screen, difficulty in execution, difficulty in attendance management.

14. Majority respondents think that this mode helps students to learn far away from schools without a break in the curriculum. In the COVID-19 times since social distancing is the need of the hour this online teaching mode proves to be effective. Some respondents have reported that students become technologically stronger through this medium. Minimal studies can still be carried out through online mode, in a situation where it seemed impossible to continue studies. Few respondents reported that visual teaching may become a norm in future and hence it's beneficial to carry on online teaching.

15. Majority of respondents have reported issues with internet connectivity as bandwidth needed for certain tools could not be provided in remote areas. Some respondents with lower income levels could not afford rich internet plans or even smart phones without which online teaching is a dream. A few respondents reported that in absence of face to face interaction it's difficult to monitor students as well as keeping students involved over the time of lecture. Need of adequate training to teachers on the online tools also remains as one of the challenges of this online teaching mode during COVID-19.

6.   *CONCLUSION AND RECOMMENDATIONS*

The aim of every education system is to build wise heads on the young shoulders. Lockdown is shock for entire education fraternity because not prepared for such situation ever arise.COVID-19 has forced stakeholders to accept the reality of effectiveness and intent of pre-covid pedagogy. Only advanced learners are comfortable, slow learners and who require active support are lagging behind. However, today's impersonal classrooms with faceless or with tensed face peeping through a small square window are creating new challenges for teachers. All teachers must have realized, how important is to see facial expression of students during classroom interaction. This is differentiating factor from online education to physical education in-person classroom teaching. Learning environment is completely different from face-to-face live classes. If the expectation of this is same then it doesn't work.

Student must have to be engaged. Its university business to check learning outcome. No gadget, no technology can engage students. Teacher should have innovative method to keep student engage. Delivering lectures in Zoom, Google meet is not a replacement of in person classroom and expectation from the students to continuously watch live lectures throughout the day, not feasible. Otherwise all have to face health issues may increase use of mobile result in eye pain and headache.

Even if the same technology is given to all students, different background people will use it differently. Need to accept challenges. It's really important to realise that which of the changes appearing as momentary but are irreversible. For students from the underprivileged sections of the society, getting a smart phone or computer with internet connection is not possible. Student and teacher should be empowered with new technologies knowledge quotient is not so important. We should understand the psychological issues of the students. Psychological Quotient, Intelligent Quotient, Emotional Quotient is needed to prepare student for life long learner, good citizen, enabler in their field and getting the best job in market. Peer learning will be challenge in online learning.

Curriculum and delivery should be empowered. That's why 5G is required. All we know the online teaching is a time being solution but the technology and blended learning will be the way forward for active and effective learning. Best time to have National Educational Policy 2020. Though there are lots of challenges of online teaching/learning but teachers have found out different ways to different problem by their innovative mind.

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