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About the Journal

CIET, NCERT has been a premier institution for development and dissemination of resources and techniques related to Educational Technology (ET) for better understanding of teaching-learning at school level. With renewed thrust on educational technology using digital platforms, the need for a quality journal on educational technology in India is felt more than ever. Keeping this in regard, Indian Journal of Educational Technology will be a medium for scholarly presentation and exchange of information between researchers, professionals and practitioners of technology related fields of education. The journal aims at covering disciplinary areas of educational technology (ET) for school education and teacher education. The specific objectives of this journal are: i) to provide an open access journal for sharing updated and peer reviewed research on Educational Technology for easy access and ii) to promote research on the integration of technology in school and teacher education, promote innovative practice, and inform policy debates on educational technology. This bi-annual open access online peer reviewed journal will be a platform for exchange of ideas and would also become a basis for further innovation in ET in school and teachers' education.

Notes to Contributors

Indian Journal of Educational Technology is a UGC listed (UGC CARE list, List-1) peer reviewed bi-annual journal especially designed for scholarly discourse of use of various forms of technology in education. Some of the themes encompassed under its broad purview are: Education Technology (ET), Information and Communication Technology (ICT) in education, Distance education and technology, Technological integration into pedagogy and content, Open Educational Repositories (OER) and FOSS, Innovation in educational system, Computer-based learning, Audio-video and multimedia in education and issues thereof, Technology cognition and curriculum, Impact of technology in education, Nature of technology and learning, Mobile learning, Learning through social media, Technology assisted evaluation systems, Technology support for differently abled population, Flipped classroom, Virtual and Augmented Reality, Artificial Intelligence, robotics and education, Impact of technology on learning, Social media and children, Economics of technology and its impact on education system, Educational planning administration and technology and Online courses for school education and teacher education. We look forward to your contributions in the coming issues. Your feedback and suggestions are also welcome on the following address:

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Editorial

"Freedom....It must be pursued constantly and responsibly. Freedom is not an ideal located outside of man; nor is it an idea that becomes myth. It is rather the indispensable condition for the quest for human completion".....Paulo Freire in Pedagogy of the Oppressed.

Last year, on 19 September 2021, the world celebrated the birth anniversary of Paulo Freire. Paulo Freire is known for his seminal work, Pedagogy of the Oppressed, which he wrote in the Portuguese language in 1968. Its English translation was first published in 1970.

Pedagogy of the Oppressed is a treatise on human freedom and liberation from exploitations. Through this book, Paulo Freire expounds on the science, the art, and the philosophy of human emancipation through a pedagogy that gives importance to the people who have been at a receiving end of history. Their views, their opinion, their activities, and their reflection provide the force for change. Pedagogy of the oppressed is not only a conscious reflection of the conditions that fetters men and women in the bondage of all kinds but also a praxis for the own emancipation of the people. It is this critical pedagogy that Paulo Freire believed should be the hallmark of any educational system.

A Brazilian by birth, Paulo Freire begins this book by establishing the absolute necessity of making people free from the clutches of exploitation. Such an act will not only be humanising for the exploited but for the exploiters as well. He then goes on to espouse the philosophical and educational contours of the critical pedagogy which will lead to human emancipation. He comes down heavily on what he described as the "banking model of education" which considered people as an empty account where teacher, acting as depositor, deposited the knowledge in the account. He called such a model of education as suffering from narration sickness. The banking model of education is slavery, he thought. Instead, he vouched for an education system where students and teachers traversed together as collaborators in the pursuit of knowledge. Trusting each other was the precondition for such pursuit of knowledge. Establishing dialogues and communication between people with a problem-solving approach were the ways of such a pedagogy.

Even after more than five decades of the first publication of this book, the theory and analysis propounded in this book remain relevant. Today, when technology is mediating how we learn and what we learn and there is a deluge of options that technology offers to the cultivators of education then Freire comes to the rescue in terms of what is to be learnt. When one is in a maze of EdTech choices and can't decide the best option then the only criterion to choose a technology is whether it frees the learners or enslaves the learners. In the case of the former, accept it. In case of the latter, reject it.

The January 2022 issue of the journal delves into the zone of the use of EdTech. It has twenty-one manuscripts under various categories: seventeen research articles, one review article and two general articles along with a book review. These manuscripts relate to use of EdTech during the COVID-19 pandemic, in pedagogy and analysing competency, for MOOC and for CWSN.

I would like to thank all the authors and reviewers for their contribution in taking out this issue. The guidance provided by the editorial board members on various occasions has been honourable. The seventh issue of the journal is considered to contribute positively to the area of research and academic discourse.

(ABHAY KUMAR)
Editor

PMeVidya

A comprehensive initiative which unifies all efforts related to digital/ on-air education to enable multi-modal & synchronous access to education.

DIKSHA (Digital Infrastructure for School Education)

DIKSHA is developed on the core principles of open architecture, open access, open licensing, diversity in choice and autonomy. The platform is built on open source technology, made in India and made for India promoting the spirit of Atma Nirbhar Bharat, which incorporates internet scale technologies and enables several use-cases and solutions for teaching and learning.

One Class One Channel initiative of PM eVIDYA 12 DTH TV Channels

One Class One Channel initiative of PM eVIDYA 12 DTH TV Channels offer the best curriculum-based eContents by experienced teachers to the doorsteps of the students of grade 1-12 on 24x7 hours basis. For the convenience of the children, these channels transmit two and half hours of fresh content for class 1 to 10 with approximately nine times repeat telecast while for class 11 and 12, the duration of the programmes is three hours with approximately seven times repeat telecast. The medium of the programmes on telecast is Hindi, English and Indian Sign Language. The programme telecast is scheduled in alignment with the academic calendar of school. Besides the telecast of the regular programmes, these channels also telecast Live Interactive Sessions facilitating the students in clarification of their doubts. The curriculum-based programmes of PM eVIDYA are enabled for coherent access on DIKSHA. This feature allows the students to access the eContents anywhere-anytime using DIKSHA. PM eVIDYA 12 DTH TV Channels are available through DD Free Dish, Dish TV, and Jio TV App. PM eVIDYA initiative also includes the broadcast and podcast of audio programmes through 230 radio stations and iRadio.

SWAYAM (Study Webs of Active learning for Young Aspiring Minds) for School Education & Teacher Education

SWAYAM focusses on the three cardinal principles of educational policy viz. Access, Equity and Quality. SWAYAM - MOOCs seek to enrich students' knowledge and connect teachers and teacher-educators through online mode to facilitate their Continuous Professional Development. The portal is offering various Massive Open Online Courses (MOOCs) for school education for Classes XI-XII and for teachers. There are around 34 courses run by NCERT. Nearly 2.5 lakh participants have already been enrolled in 7 cycles.

National Initiative for School Heads' and Teachers' Holistic Advancement

NISHTHA a capacity building programme aims to build competencies among all the school teachers and principals focusing on major areas like strategies for improving classroom processes, generic concerns, subject - specific pedagogies and systemic concerns. Under NISHTHA online on DIKSHA, there are 18 courses in 10 Indian languages with over 24 lakh participants from 34 States/UTs and 7 autonomous bodies so far.

Research Article

The Transition from Traditional to Digital Teaching-Learning due to COVID-19: A Comparative Study

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Abstract

The transition in the teaching-learning process came with an untimely pandemic. Whilst schools and colleges were closed due to nationwide lockdown, the Indian education system had to shift from traditional to digital education. This study aims to collect data from students and educators of both schools and colleges from rural and urban regions to identify the digital technologies widely used, the practical challenges they encountered, the strengths and weaknesses of this method, to discover the effectiveness of teaching-learning in digital mode, to know the preferences of students and educators on teaching-learning methods and to comprehend the potential of digital teaching-learning to be used in the future from their experiences of teaching-learning during the COVID 19 era. For this, the data was collected twice with a time interval of 10 months, the first survey was conducted in August 2020 and the second was conducted in June 2021. It also seeks the opportunities created and its potential in the future. This study also reflects how the students and educators adapted to digital teaching-learning and the change in percentage of the practical challenges they faced.

Keywords: COVID-19, Digital Education, Online Teaching, Traditional Teaching, Digital Teaching

Introduction

With the sudden occurrence of the coronavirus (COVID 19) pandemic, many governments implemented the lockdown as a strategy to sojourn the virus from spreading. As per the fourth annual UNESCO Global Education Monitoring (GEM) Report 2020, more than 258 million children and youth across 209 countries were entirely excluded from education with poverty and the closure of educational institutes as the main obstacle due to the coronavirus pandemic. The Indian Government imposed the lockdown in four phases. The first phase of lockdown was a nationwide lockdown (i.e., Lockdown 1.0) which was imposed from 25th March 2020 to 14th April 2020. Consecutively, the second phase was from 15th April to 3rd May 2020, the third phase from 4th May to 17th May 2020, and the fourth phase from 18th May to 31st May 2020. The lockdown resulted in schools and colleges being closed across the country. As India has the largest student population in the world in the age bracket of 3-22 years, it affected over 495 million students in India (India | UNESCO UIS, 2020). The academic years 2019-20 and 2020-21 were disrupted by the coronavirus pandemic. As a result, the Indian education system caught up in the vortex and was not able to

continue with the Traditional Teaching Methods (TTM). So, they had to shift to the Digital Teaching Methods (DTM) to continue the teaching-learning process while ensuring the safety of students and faculty.

Digital education is redefining the way students in schools and universities study various concepts and theories. It is a form of learning that is assisted by digital technology or instructional practices that make good use of digital technology. This is a flexible and alternative choice that allows people to learn at their own speed and time. The teaching and learning become a more enjoyable experience as it incorporates animations, gamification, and audio-visual elements. Students are more likely to participate in digital learning as they are well-versed in the use of technology (Dua et al., 2016).
After the United States, India has supplanted as the world's second-largest market for digital education. However, there is still enormous potential for the future in the realm of digital education (Dua et al., 2016). There have been significant investments and initiatives to encourage digital education in India by the government (i.e., SWAYAM, DIKSHA, NDL, Virtual Labs, e-PG Pathshala, etc.) and various private organizations (i.e., BYJU's, TCS iON, Udemy, Coursera, Khan Academy, etc.).

Literature Review

Intending to improve Rural India, Prime Minister Narendra Modi's administration has begun the Digital India initiative even before COVID-19 as part of the digital era. Among the goals of this programme are to provide broadband access to a quarter-million rural communities by 2019 and to make wi-fi connections available in schools according to Dua et al. (2016). These Digital India initiatives played a magnanimous role in maintaining the teaching-learning through digital modes during the pandemic. Some of the main Digital Teaching aids discussed in research from Dua et al. (2016) include video-based learning, game-based learning, Massive Open Online Courses, digitized classrooms, and distance learning programme.

There are other aspects of digital education as well, once adapted to digital education your knowledge of computers and smart technological devices increases and the maintenance of records becomes very convenient. The use of audio-visuals and games to teach also increases the understanding and memorizing capabilities of students. The audio-visuals also improve the imagination and creativity of learners. There are numerous other advantages of digital education but the situation in India is different from other developed countries. As the basic needs for digital teaching are not available to everyone in India which made it is difficult for the Indian education system to directly switch from the traditional chalk and board teaching-learning to complete digital teaching using different digital tools available in the market (Dua et al., 2016).

According to new research, some common problems were found that arise during the online teaching-learning in which issues related to the internet, attentiveness, motivation, time-management, interaction, and adaptability were included (Pandey & Kiran, 2021). In research from Gond and Gupta (2017), some limitations of digital education such as lack of resources, trained educators, funds, maintenance, and up-gradation of digital equipment were listed out.

Another research from Rana and Kumari (2021) Stated some challenges faced by the educators while online teaching that includes lack of devices and internet speed, the cost of internet, lack of parental support, non-responsiveness

of students, lack of hands-on experience, disturbance, and feeling of isolation. In research from Harini and Varghese (2021) access to gadgets, connectivity issues, technophobia, misuse/ online abuse, distraction, physical & psychological issues, electricity access, dropouts, and practical learning were listed out as major challenges in online learning.

Objectives of the study

This study aimed to collect various kinds of information on digital teaching-learning from students and educators of both schools and colleges of rural and urban regions. The following are the main objectives of this study:

1. To identify the digital technologies widely used by educators for teaching and learning during the pandemic.
2. To identify the practical challenges encountered during digital teaching-learning.
3. To identify the strengths and weaknesses of the digital teaching-learning methods.
4. To study the opinions of the respondents on the effectiveness of teaching-learning in digital mode during the pandemic.
5. To learn about students' and educators' preferences for teaching and learning methods.
6. To comprehend the potential of digital teaching-learning in the future.

Scope and Limitations

The primary goal of this research is to gather information from students and educators indulged in the digital teaching-learning process to assess the advantages and shortcomings of this precipitous shift from traditional to digital teaching methods. It contributes to making an initiative to reach out to students and educators of schools and colleges in both rural and urban regions to gather information for the research's objectives. This study cannot be extrapolated to the entire country, but it does provide an overview of how students and educators are coping with digital teaching and learning in the 'COVID Era'. Future research using a larger data set would be necessary to establish the generalisability of the findings of this study.

Methodology

The methodology used is survey-based causal research intended to elicit and accumulate data from educators and students of rural and urban regions for gaining insight into the impact of the coronavirus pandemic on teaching-learning. The survey model used in this study was a self-administered online survey created using Google Forms and distributed to educators and students via online digital platforms at two different time intervals to meet the study's objectives. The questionnaire was developed through focus group discussion, qualitative item analysis, and validation through five external experts. The first survey was conducted in August 2020, while the second survey was conducted in June 2021 having a time difference of 10 months to obtain developmental results of the impact of the coronavirus pandemic on teaching-learning. The accumulated data was analyzed using Pareto analysis and presented in Graphical and Tabular form.

Participation

This research aimed to reach out to the students and educators from preparatory to a higher educational level. The participants of the survey are broadly categorized by the region they live in such as rural or urban. They are

further categorized by their professions like college teacher, school teacher, college student, or school student. The number of categorized participants can be seen in table 1. A total of 158 responses were received, with 68 from the first survey and 90 from the second. In the first survey, there were 27 teachers and 41 students from different schools and colleges nationwide. Of 27 teachers, 5 were from a rural region and 22 were from an urban region in which 8 were college teachers and 19 were school teachers. Of 41 students, 19 were from a rural region and 22 were from an urban region of which 27 were college students and 14 were school students, whereas, in the second survey, there were 24 teachers and 66 students from different schools and colleges nationwide. Of 24 teachers, 8 were from a rural region and 16 were from an urban region of which 3 were college teachers and 5 were school educators. Of 66 students, 14 were from a rural region and 52 were from an urban region of which 47 were college students and 5 were school students.

Table-1: Sample Distribution (N=158)

Region	College student	College Teacher	School student	School Teacher	Total
Rural	26	4	7	9	46
Urban	61	9	13	29	112
Grand Total	87	13	20	38	158
Source: Survey responses					

Result and Analysis

The digital technologies widely used by educators for teaching and learning during the pandemic include various tools as can be seen in table 2.

Table-2: Digital Tools Used

Tools	Survey 1	Survey 2	Variance
Google Meet	25.00%	34.44%	9.44%
Zoom	42.65%	28.89%	-13.76%
Google Classroom	2.94%	14.44%	11.50%
Microsoft Teams	2.94%	7.78%	4.84%
YouTube	14.71%	6.67%	-8.04%
WhatsApp	8.82%	3.33%	-5.49%
Cisco WebEx	1.47%	2.22%	0.75%
Other	1.47%	2.22%	0.75%
Source: Survey responses (N=158)			

From table 2, it can be seen that 70.59 percent of educators used either Google Meet, Zoom, or Google Classroom applications as a teaching aid to interact with students before August 2020, whereas, this number increased by 7.19 percent till June 2021 and reached 77.78 percent. The variance column of table 2

indicates the change in the percentage of digital tools used whether increased or decreased.

Table-3: Advantages of Digital Teaching Learning

Advantages	Survey 1	Survey 2	Variance
Can Accessible from everywhere	67.65%	62.22%	-5.42%
Easier Study material distribution	39.71%	46.67%	6.96%
Improves Visualization	8.82%	22.22%	13.40%
Improves Time Management	20.59%	22.22%	1.63%
Increases Creativity	14.71%	24.44%	9.74%
Record Classes for future use	20.59%	50.00%	29.41%
Other	13.24%	3.33%	-9.90%
Source: Survey responses (N=158)			

Among numerous advantages of digital teaching-learning, a few can be seen in table 3. The average voting percentage for the listed advantages can also be observed from the table. 64.93 percent, 43.19 percent, 35.29 percent, 21.41 percent, 19.58 percent, 15.52 percent of educators/students experienced the advantages of digital teaching-learning such as it is accessible from everywhere, it provides easier study material distribution, classes can be recorded for future use, improves time management, creativity and visualization respectively.

Table-4: Challenges Faced by Educators & Students

Practical Challenges	Survey 1	Survey 2	Variance	Total	Cumulative value
Internet/Network Issue	70.59%	73.33%	2.75%	36.86%	36.86%
Lack of Interaction	25.00%	46.67%	21.67%	18.35%	55.21%
Lack of Infrastructure	36.76%	14.44%	-22.32%	13.11%	68.32%
Lack of Adaptability	11.76%	36.67%	24.90%	12.40%	80.73%
Lack of Self-Motivation	13.24%	26.67%	13.43%	10.22%	90.94%
Lack of Computer Knowledge	10.29%	7.78%	-2.52%	4.63%	95.57%
Lack of Discipline	16.18%	1.11%	-15.07%	4.43%	100.00%
Source: Survey responses (N=158)					

The practical challenges encountered during digital teaching-learning by students and educators are shown in table 4. Where, it can be observed that most educators/students faced Internet/Network issues and an increase of 2.75 percent on internet/ network issues was observed in the lateral survey, followed by the lack of interaction, adaptability, and self-motivation which increased by 21.67 percent, 24.90 percent, 13.43 percent

respectively. While on the contrary a decrease in lack of infrastructure, discipline, and computer knowledge by 22.32 percent, 15.07 percent, and 2.52 percent respectively was observed from August 2020 to June 2021.

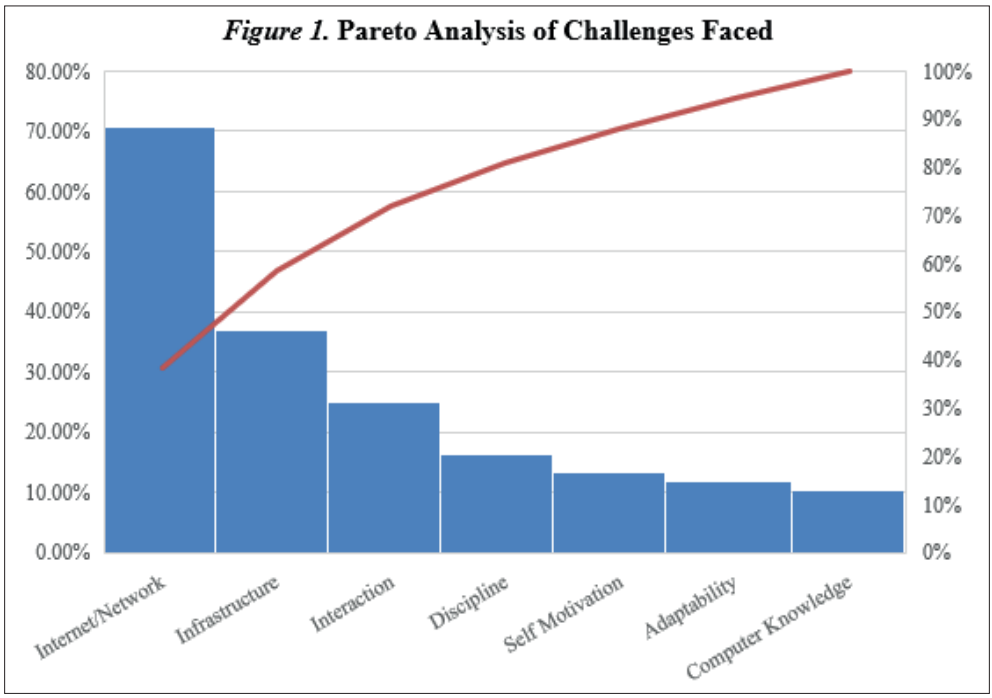


Figure 1. **Pareto Analysis of Challenges Faced**

As can be seen through figure 1, a total of 36.86 percent of challenges can be overcome just by resolving Internet/ Network issues only, furthermore, a reduction of 55.21 percent can be observed by resolving both the lack of interaction and internet/network issues combined. 80.73 percent reduction can be observed just by resolving only four issues that are internet/network issues, lack of interaction, infrastructure, and adaptability. Further reduction can be observed by overcoming the lack of self-motivation, computer knowledge, and discipline.

Table-5: Shortcomings of Digital Teaching-Learning

Shortcomings	Survey 1	Survey 2	Average
Lack of Interaction	61.76%	65.56%	63.66%
Reduces Practical Skills/Knowledge	14.71%	62.22%	38.46%
Hard to Identify if Students are attentive	13.24%	62.22%	37.73%
Harmful to Health (i.e., Eyes)	4.41%	63.33%	33.87%
Insufficient Digital Teaching Methodologies	25.00%	35.56%	30.28%
Dependency on Financial Status	10.29%	30.00%	20.15%
Source: Survey responses (N=158)			

Among various shortcomings of digital teaching-learning, a few are listed in table 5. The average voting percentage for the listed shortcomings can be observed from the table. 63.66 percent, 38.46 percent, 37.73 percent, 33.87 percent, 30.28 percent, 20.15 percent of educators/students experienced the shortcomings of digital teaching-learning such as lack of interaction, reduces practical skills/knowledge, hard to identify if students are attentive, harmful to health (i.e., eyes), insufficient digital teaching methodologies and dependency on financial status respectively.

Table-6: Opinions on Effectiveness of Digital Teaching-Learning

Categories	Survey 1	Survey 2	Variance	Average
Status				
Effective	69.12%	63.33%	-5.78%	66.23%
Highly Effective	2.94%	3.33%	0.39%	3.14%
Ineffective	27.94%	33.33%	5.39%	30.64%
Benefits				
Non-Beneficial	33.82%	36.67%	2.84%	35.25%
Beneficial	66.18%	63.33%	-2.84%	64.75%
Ratings				
1 to 3	16.18%	17.78%	1.60%	16.98%
4 to 7	51.47%	60.00%	8.53%	55.74%
8 to 10	32.35%	22.22%	-10.13%	27.29%
Source: Survey responses (N=158)				

For this study, the effectiveness of teaching-learning in digital mode during the pandemic was broadly categorized as effective, highly effective, and ineffective amid this pandemic that can be seen in table 6. The recorded results of the survey showcased that on an average 66.23 percent, 3.14 percent, 30.64 percent voted digital mode of teaching-learning as effective, highly effective, and ineffective respectively. 35.25 percent believed this mode to be beneficial whereas 64.75 percent believed it to be non-beneficial. On a scale of one to ten, the average rating for effectiveness of digital mode of teaching-learning during the pandemic for the range between 1 and 3 was 16.98 percent, 4-7 was 55.74 percent and 8-10 was 27.29 percent respectively. A reduction of 10.13 percent of votes for the range 8-10 of effectiveness was observed from August 2020 till June 2021, whereas a rise of 1.60 percent and 8.53 percent votes was observed for the range of 1-3 and 4-7 respectively.

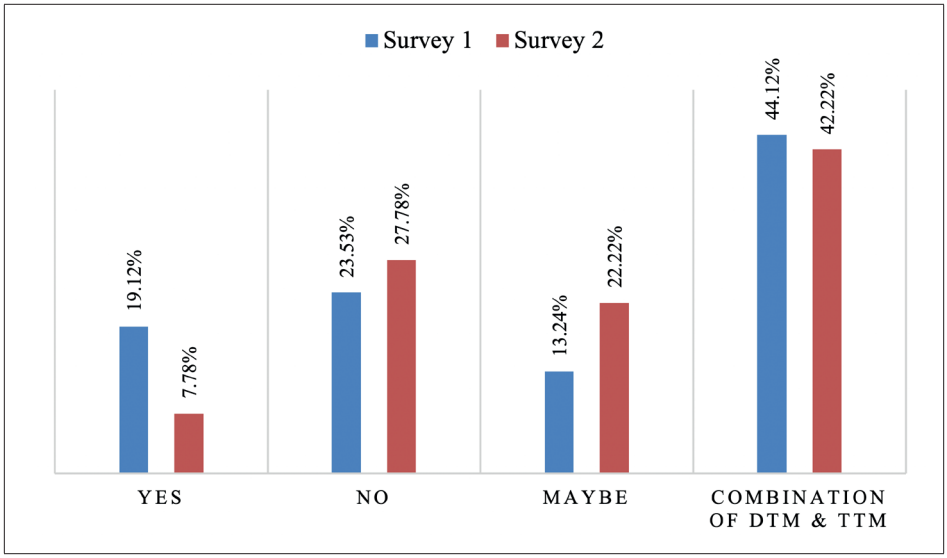
Table-7: Region-based Preferences

Categories	Survey 1		Survey 2	
Methods of Teaching	Rural	Urban	Rural	Urban

Digital Teaching Method	20.83%	36.36%	13.64%	16.18%
Traditional Teaching Method	79.17%	63.64%	86.36%	83.82%
Source: Survey responses (N=158)				

The region-based preferences of students and educators on teaching-learning methods can be seen in table 7. 20.83 percent in the rural region preferred digital teaching method before August 2020 that decreased by 7.20 percent till June 2021 making it 13.64 percent and 79.17 percent preferred traditional teaching method before August 2020 that increased by 7.20 percent till June 2021 making it 86.36 percent. Whereas, 36.36 percent in the urban region preferred digital teaching method before August 2020 that decreased by 20.19 percent till June 2021 making it 16.18 percent and 63.64 percent preferred traditional teaching method before August 2020 that increased by 20.19 percent till June 2021 making it 83.82 percent.

Figure-2: Future Scope for DTM



The potential of digital teaching-learning to be used in the future as per educators' and students' preference is presented in figure 2. About 19.12 percent preferred to opt for DTM before August 2020 that decreased by 11.34 percent till June 2021 making it 7.78 percent. Likewise, 23.53 percent preferred to opt for TTM before August 2020 that increased by 4.25 percent till June 2021 making it 27.78 percent, whereas, 44.12 percent preferred to opt for a combination of both digital teaching methods and traditional teaching methods before August 2020 that decreased by 1.90 percent till June 2021 making it 42.22 percent. 13.24 percent were not sure whether to use digital teaching methods, traditional teaching methods, or a combination of both before August 2020 that increased by 8.99 percent making it 22.22 percent till June 2021.

Discussion

Based on the findings, digital teaching-learning is now a challenge and an opportunity in the education sector

following the pandemic. Around 78 percent of the population uses freeware tools for online learning and this number is steadily rising. Over 70 percent of educators and students have trouble connecting to the internet and the development of digital infrastructure in schools and colleges is also a concern. When there is a transition, people confront various challenges in adapting. This transition from traditional to digital education has its pros and cons, but it can be effective in the long run when properly executed.

During this pandemic situation, digital education rose as a saviour to cater the knowledge of educators to students who were far apart from each other. Digital education has no boundary restrictions and hence students can learn from their educators while staying at home and keeping themselves and their families safe during this pandemic. And the sessions can be recorded and can be revisited at the time of their convenience. Our study will be helpful to make a futuristic plan by the government. Dua et al., (2016) in their study also agree that these fewer time restrictions help students and educators to improve their time management as they can conveniently record or watch the sessions at their own convenient time, hence, they can manage to utilize the remaining time to perform other tasks. Similarly, the challenges shown in research from Rana and Kumari (2021) and Harini and Varghese (2021) are in common with this study.

Digital education has the potential to be a paradigm for resource-strapped nations like India and we should embrace innovative teaching-learning methods. With everything going digital, we need to ensure that pedagogies are as efficient as possible. Effective educators will be able to grasp those digital teachings that will enhance self-development. The beneficial prospects, on the other hand, exceed the negative consequences and we should be prepared to adapt to the changes (Gupta & Tiwari, 2020).

Conclusion

From the results of this research, the perspective of educators and students regarding the impact of COVID 19 on their education can be observed. In this research, the major challenges faced during this sudden enforcement of digitalisation were captured from educators' and students' perspectives in which lack of interaction, adaptability, and self-motivation was listed which increased by 21.67 percent, 24.90 percent, 13.43 percent respectively from August 2020 to June 2021. On the other hand, a decrease in the percentage of lack of infrastructure, discipline, and computer knowledge was observed. The advantages of digital teaching-learning include accessibility, easier distribution of study materials, recording facility, and enhanced time management, creativity, and visualization. It also came to light that the majority of educators and students favour the use of a combined teaching-learning method of digital and traditional. According to the findings, tackling only four challenges (internet/ network issue, lack of engagement, infrastructure and adaptability) can result in an 80.73 percent reduction of overall practical challenges.

From the study, we can conclude that this enforcement of digitalisation in the educational field will yield a fruitful future if the practical challenges are reduced. This will help students and educators to be prepared for the future when the majority of the task will be based on new technological models. It will promote the adaptability of students to always be ready for changes. For now, when this pandemic situation will settle down then the best course of action for educational entities will be to continue with the digital teaching methods along with the traditional teaching. These methods can be used as a combination

to yield greater benefits in every field.

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Research Article

Post COVID-19 challenges of online teaching in higher education institutes: Teacher's experiences and satisfaction

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Abstract

The study examined factors related to teachers' satisfaction and their perspectives of the benefits and challenges of the online mode of teaching in colleges and universities during the time of the pandemic. The cross-sectional study utilized a Google form that was delivered to college and university teachers through social media platforms and the snowball sampling technique was used. The questionnaire elicited basic demographic and teaching experience information, views regarding online teaching experience, satisfaction with the same, online platform used, limitations, and advantages. The main outcome measure was the level of satisfaction with online teaching. The study was cleared by the ethical committee of the institute. The participants included 422 teachers (58.1 percent males). Overall, 36.9 percent reported being satisfied with their online teaching experience. Satisfaction was related to the educational stream taught, and medical and science faculty reported a significantly lower level of satisfaction with the online platform (χ^2=13.41, P=.037). Only 11.8 percent of the teachers concurred that online teaching led to superior learning among students and nearly half (49.8 percent) opined that it led to inferior learning. Collaborative efforts of the government and academic teaching institutions are needed to facilitate the adoption of a meaningful alternative to the conventional mode of teaching and learning.

Keywords: online teaching, teachers' satisfaction, higher education, COVID-19, distance learning

Introduction

In the post-COVID era, the educational landscape changed rapidly and almost all educational institutes across the world closed and face-to-face classes were suspended to contain the novel virus. It is estimated that nearly 1.5 billion students around the world are currently affected by the closure of educational institutions due to the pandemic and perforce engaged in online remote learning platforms (UNESCO, 2020). There was an abrupt demand that teachers change their teaching style and rapidly shift and adapt to the technology-enabled virtual education format so that students could continue learning with minimal disruption from the comforts of their homes. In western countries, advances in information and communication technology have made web-based learning a viable and popular choice in higher education both for learners and educators (Cojocariu, Lazar, Nedeff,

& Lazar, 2014; Wu, 2016). Some of the advantages of online teaching include increased accessibility and affordable options. Most educational institutions have adopted the synchronous learning mode wherein the students attend live lectures and engage in real-time interactions with their teachers (McBrien, Cheng, & Jones, 2009).

The transition was sudden and caught the college and university faculty by surprise as few were prepared or had any experience in the virtual delivery of academic curriculum in India (Mishra, Gupta, & Shree, 2020). Since India has marked regional and household digital inequalities in access to technology, this shift led to a major disruption in education for many students and teachers alike (Government of India, 2020). Moreover, the move increased the demands on teachers who were struggling to balance the stress of coping with the novel contagion and at the same time respond to the new challenges of service obligations of providing education remotely, especially in developing countries (Fernandez & Shaw, 2020; Oyedotun 2020; Rapanta, Botturi, Goodyear, Guardia, & Koole, 2020; Tuma, Nassar, Kamel, Knowlton, & Jawad, 2021). For example, a study from Jordan reported that a little more than half of the teachers reported increased difficulties with remote teaching due to intermittent internet connectivity and online fatigue (Tuma et al., 2021). Oyedotun (2020) suggested that the rapid change to online pedagogy due to the pandemic in developing countries has brought to the fore the inequities in the education sector of the developing nations including lack of devices and internet access in the rural areas, limited training among teachers to impart teaching on the online platform. In this paper, we address the gap in the research by examining teacher satisfaction of teaching a fully-online under and postgraduate academic courses. The main aims of the current research are to examine teachers' satisfaction with remote teaching and to understand their perspectives regarding the benefits and challenges of the online mode of teaching in colleges and universities during times of the pandemic. The possible limitations, challenges, and experiences of instructors of an implemented distance education curriculum are examined to share the findings and provide recommendations. Indeed, understanding teacher barriers is vital for the optimal implementation of remote learning in higher education.

Methodology

The study utilized a cross-sectional design and the findings are based on a Google form that was designed and delivered to college and university teachers through email, WhatsApp, and social media platforms. Emails were sent to a few faculty members from premier Indian institutes with a request to circulate the survey link to their colleagues and the snowball sampling technique was used. The institutes surveyed included the Indian Institute of Technology (IITs), Indian Institute of Management (IIMs), All India Institute of Medical Sciences (AIIMS), National Institute of Technology (NITs), and Central Universities. An effort was made to ensure that all the main streams of education and the Indian States were represented. The data were collected between January to February 2021. A total of 422 higher education teachers, residing in 27 States and two union territories of the country, responded to the survey.

The questionnaire elicited basic demographic (age and sex), and teaching experience information (basic degree, designation, number of years of teaching experience, the average size of the class taught, working in government or private sector, the education

stream). The questionnaire also elicited specific information regarding online teaching experience, satisfaction with the same, the type of online platform used, main limitations and advantages, and perception of students' learning outcome. The main outcome measure was the level of satisfaction with the online teaching and this was measured on a 5-point Likert ranging from very dissatisfied (1) to neutral (3) to very satisfied (5). This was converted to a 3-point scale while conducting the analysis.

The questionnaire was pilot tested and modified and it was ensured that it did not take more than 10 minutes to complete. Participation in the study was voluntary and confidentiality was assured. Providing identification information such as email addresses was voluntary. Only those respondents who consented to participate in the research study were included. Ethical approval was granted by the Ethics Committee of the institute vide letter INT/IEC/2021/591-126, dated 22.1.2021.

Results

The participants included 422 teachers (mean age= 42.18 years, SD= 9.04; 58.1 percent males), mostly from government institutes (82.2 percent), teaching undergraduate (19.7 percent) postgraduate (17.5 percent), and both under- and postgraduate courses (62.8 percent). On an average, the faculty had 12 years (SD=8.05) of teaching experience, however, the majority reported that they had little experience of online teaching before the pandemic and the majority lacked the technical knowledge and only 21 percent had previously taught an online course/s. A little more than half (51.7 percent) reported that they had received some training from their institutes and an additional 8.1 percent reported that they had taken some course to update themselves regarding virtual teaching. Most teachers had some technical support from their educational institutes and 61.8 percent reported that they were provided with computers and infrastructure to support e-teaching during the pandemic. Despite the support, more than half (55 percent) reported an increase in expenditure related to web-based teaching. The most popular online platforms used were Google Meet (61.1 percent), Zoom (32 percent), Google Classroom (30.1 percent), Microsoft teams (23 percent), WhatsApp group chats (23.5 percent), and WebEx (21.1 percent). Most of the faculty reported that these platforms were user-friendly and posed no major user difficulty. However, nearly half (48.6 percent) of the respondents had cyber security concerns with the use of these platforms. The major modality of teaching was through the use of synchronous live streaming tutoring sessions. More than half (55 percent) of the participants reported taking online classes both from the office and home and only 18.5 percent reported taking classes exclusively from home.

To identify the salient characteristics of effective online instructors, the participants were asked to identify the most important features of online educators. Results indicated that teachers ranked passion for teaching, good subject knowledge, passion regarding the subject being taught and facilitating student engagement in the classroom as some of the distinctive characteristics (Table 1). Thirty-six (8.5 percent) respondents reported being 'very satisfied' and an additional 28.4 percent reported that they were 'satisfied' with their fully online teaching experience. Four percent of the participants reported being 'very dissatisfied' and 17.3 percent were 'dissatisfied' and 41.7 percent responded with 'neutral'.

Table-1: Percent reporting on the important characteristics of effective online teachers

Categories	Not important Percent (n)	Somewhat important Percent (n)	Very Important Percent (n)
Passion of teaching	0.9 (4)	11.4 (48)	87.7 (370)
Good subject knowledge	0.9 (4)	13.7 (58)	85.3 (360)
Passion about the subject	0.5 (2)	16.4 (69)	83.2 (351)
Facilitates classroom engagement	2.6 (11)	24.2 (102)	73.2 (309)
Flexible and open to feedback	4.0 (17)	24.4 (103)	71.6 (302)
Good time manager	2.6 (11)	34.8 (147)	62.6 (264)
Trained in online teaching	13.3 (56)	39.8 (168)	46.9 (198)

Table 2 presents the percentage of satisfaction or dissatisfaction with online teaching by the background characteristics. Results indicated that there were no differences among educators on satisfaction by gender, designation, type of institute, number of students in the class, and number of classes taught per week. Satisfaction was related to the educational stream taught and medical and science faculty reported a significantly lower level of satisfaction with the online teaching platform (χ^2=13.41, P=.037). Higher satisfaction was reported by teachers who had some prior online teaching experience (χ^2=10.47, P=.005) and by those who had greater teaching experience (χ^2=12.60, P=.05).

Table-2: Background characteristics and percent satisfied/dissatisfied with online teaching

Characteristics	Percent satisfied Percent (n)	Percent dissatisfied Percent (n)	χ^2	P value
Gender				
Male (245)	37.6 (92)	23.3 (57)	1.97	.373
Female (177)	36.2 (64)	18.6 (33)		
Designation				
Assistant Prof (244)	34.0 (83)	21.3 (52)	3.17	.530
Assoc/Additional (97)	39.2 (38)	20.6 (20)		
Professor (81)	43.2 (35)	22.2 (18)		
Type of Institute				
Government (347)	37.6 (92)	22.5 (78)	2.62	.270
Private/aided (75)	37.5 (130)	16.0 (12)		
Stream taught				
Engineering (162)	42.6 (69)	24.7 (40)	13.41	.037
Humanities (125)	40.0 (50)	16.0 (20)		
Medical (61)	27.9 (17)	23.0 (14)		
Science (74)	27.0 (14)	21.6 (16)		

Teaching experience (yrs.) <5 (97) 5-10 (111) 11-20 (128) >20 (86)	 16.0 (25) 24.4 (38) 34.0 (53) 25.6 (40)	 30.0 (27) 24.4 (22) 24.4 (22) 21.1 (19)	12.60	.050
No. of students (class) <40 (141) 40-80 (181) >80 (100)	 36.9 (52) 39.8 (72) 32.0 (32)	 23.4 (33) 20.4 (37) 20.0 (20)	2.73	.603
No. of classes taught (week) Less than 5(151) 6-15(210) >15(61)	 39.1 (59) 34.8 (73) 39.3 (24)	 24.5 (37) 19.0 (40) 21.3 (13)	3.88	.422
Previous online experience No (333) Yes (89)	 33.3 (111) 50.6 (45)	 23.7 (79) 12.4 (11)	10.47	.005

Table 3 presents the percentage of teachers who agreed with online teaching pros and cons by level of satisfaction. Results indicated that educators who were more satisfied with online teaching relative to those who reported being dissatisfied were more likely to agree with the myriad advantages of web-based teaching such as increased interaction (χ^2=51.44, P=.0001), greater flexibility (χ^2=59.8, P=.0001), recording of lectures and replaying them at a convenient time (χ^2=24.53, P=.0001), active participation of students (χ^2=59.8, P=.0001), and increased creativity (χ^2=17.02, P=.002). On the other hand, no differences were found among satisfied and dissatisfied faculty on some of the cons of online teaching such as increased workload associated with virtual delivery of classes, limited face-to-face contact and longer preparation time associated with online teaching.

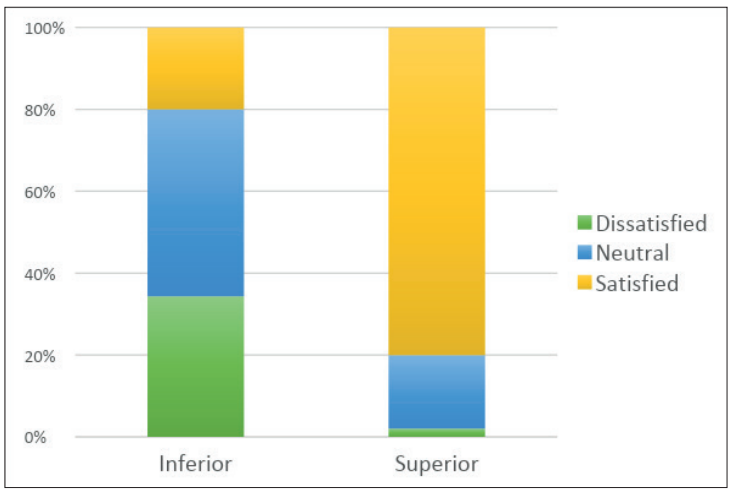
Table 3: Percent agreement with online pros and cons by satisfaction with online teaching

Statements	**Satisfied (n=156)** **Percent (n)**	**Not Satisfied (n=90)** **Percent (n)**	χ^2	**P value**
Interaction is higher in online than traditional class	19.9 (31)	1.1 (1)	51.44	.0001
Greater flexibility in online teaching	64.7 (101)	24.4 (22)	59.8	.0001
Lectures can be recorded and replayed	78.8 (123)	50.0 (45)	24.53	.0001
Students are actively involved	30.1 (47)	1.1 (1)	92.67	.0001
Increased workload in online teaching	60.9 (95)	68.9 (62)	2.13	.713

Face to face contact with students is missing	85.3 (133)	93.3 (84)	4.94	.293
Online teaching requires being creative	86.5 (135)	66.7 (60)	17.02	.002
Technical issues make online teaching frustrating	31.4 (49)	61.1 (55)	28.96	.0001
Longer preparation time for an online class	55.8 (87)	57.8 (52)	0.44	.979
Passive and lower participation of students	58.3 (91)	91.1 (82)	42.78	.0001
Difficulty in motivating students in online mode	57.7 (90)	86.7 (78)	27.57	.0001

Teachers were also asked to report whether they felt that online teaching was associated with superior learning as compared to face-to-face teaching. Only 11.8 percent of the teaching faculty concurred that online teaching led to superior learning among students and nearly half (49.8 percent) opined that it led to inferior learning. Interestingly, teachers who felt that online teaching was associated with a superior outcome were more likely to report being satisfied with the web-based platform as compared to the faculty who felt it was associated with inferior learning (Fig 1). A little less than two-thirds (63 percent) of the teachers preferred a hybrid mode of teaching in the future and only 35.1 percent wanted to continue with the traditional classroom teaching. It seems that the e-learning platforms cannot completely replace the traditional classrooms as most preferred a blended mode after the pandemic.

Figure-1: Percent teachers satisfied with online teaching by student learning outcome



Discussion

The study examined teachers' satisfaction with their web-based teaching experiences post the lockdown. Satisfaction with this novel mode of teaching was generally low as the faculty struggled with several

challenges including lack of adequate training for using the online platform, increased expenses, limited teacher-student engagement, and doubts about whether students were learning from the e-learning platform. In addition, other issues cited by some participants included the adequate provision of basic online teaching facilities, unlimited internet connection plans and a stable power supply.

Some of the distinctive characteristics for effective online teaching affirmed by the faculty included passion for teaching and the subject, expert knowledge of the subject and teacher's ability to facilitate student engagement in the classroom. Indeed, evidence indicates that passion is a salient feature and has a positive effect on the academic achievement, commitment, and motivation of the students (Carbonneau, Vallerand, Fernet & Guay, 2008; Ruiz-Alfonso, Vega, & Beltran, 2018; Serin, 2017). Interestingly, besides subject matter knowledge and passion, respondents also opined that educators need a wide range of different skills and these include instructors' ability to create effective learning environments by student engagement, being open to feedback and exercising flexibility. Indeed, identification of characteristics that contribute towards involvement in online teaching can help in preventing burnout and increasing the involvement of the faculty in their profession (Green, Alejandro, & Brown, 2009).

Instructors also struggled with a lack of skills to create an engaging online learning environment for their students. Satisfaction was particularly low among medical and science faculty as they lacked resources and support for content development. Previous studies have found that academic subjects like medicine and sciences that depend on lab skills and hands-on experiences require educational resources of excellent quality to impart adequate training (Al-Balas et al., 2020; O'Doherty et al., 2018; Sindiani, Obeidat, Alshdaifat, 2020). Previous studies have documented that the distance education format is perceived as less effective and satisfying by students and teachers alike (Khalili 2020; Tuma et al., 2021). Most of the educators surveyed preferred to shift to a hybrid mode of instruction as they felt that traditional face-to-face teaching was superior for coaching skills and a clinical-driven curriculum.

Although previous research indicates that educators are more likely to be satisfied when they have flexibility in 'what, how, when, and where they teach rather than follow strict and rigid curricula and guidelines (Archambault & Crippen, 2009; Bolliger & Wasilik, 2009; Hawkins, Barbour, & Graham, 2012; Murphy & Rodríguez-Manzanares, 2008; Velasquez, Graham, & Osguthorpe, 2013), however, when teachers have with little or no training in online pedagogy the challenges can be considerable (O'Doherty et al., 2018; Khalili 2020). Our results indicated that greater satisfaction was reported by respondents when they had some prior online tutoring experience. There is a need to provide higher education teaching faculty some training to enhance their professional skills regarding remote instruction. Since a significant proportion of respondents were dissatisfied with the online platform and virtual delivery of instruction this can lower the quality of the course and lead to inferior learning outcomes. There are several technology online tools such as multimodality, live cloud recordings of lectures, instant feedback, chatting and posting questions that need to be exploited by the educators to provide enhanced and personalized learning experiences for the technology-driven generation of students. Unless higher education tutors are trained in online pedagogy the

benefits to students and professional satisfaction will remain elusive. Indeed, online instruction requires pedagogical content knowledge that is linked to digital technology tools to enhance students' learning experiences (Rapanta et al., 2020). Several studies have documented that trainer's satisfaction is central to optimal and quality learning of the students (Bolliger & Wasilik, 2009; Stickney, Bento, & Aggarwal, 2019).

Results indicated that satisfaction with online instruction was related to the perceptions of the faculty about the advantages that the web-based platform provided them including interactive technologies and web features like chatting that encourage active participation of learners, use of creative tools like mentimeters, and short quizzes to enhance and test learning. It is anticipated that newer instructional strategies would further enhance student participation and student-teacher interaction and promote collaborative learning (Bao, 2020; Evans, Ward, & Reeves, 2019; Kebritchi, Lipschuetz, & Santiague, 2017). Regardless of the challenges, online instruction is here to stay and can greatly facilitate and enhance the standards of education (Ayebi-Arthur, 2017).

The demand for quality online educators who provide personalized learning experiences to learners is indeed going to increase over time with technological advancement ((Donahoe, Rickard, Holden, Blackwell, & Caukin, 2019; Mishra et al., 2020). It is envisaged that use of technology will become an integral part of academic learning in the coming years and gradually replace the traditional and teacher-driven classroom. Unfortunately, in resource-poor countries, the digital learning platform is limited to students who are tech-savvy and can afford smartphones, computers, and a fast internet connection (Altbach & De Wit 2020). Keeping this in mind, the government of India has initiated the SWAYAM, an educational portal to provide quality online learning for all and bridge the digital divide gap in the country. The portal provides several free distance learning courses at the school, undergraduate and postgraduate levels. The Ministry of Human and Resource Development (MHRD) and University Grants Commission (UGC) have made available several e-books, e-journals, online depositories, web-based TV channels, and virtual labs such as the National Digital Library of India, e-ShodhSindhu, e-GyanKosh and Gyandarshan. Information about these vital resources needs to be widely disseminated to educational institutions so that these resources can be adequately utilized and educational institutes can adapt to the novel educational reality.

The main drawback of the study is the use of a convenience sampling technique that limits the generalizability of the findings. It also remains possible that those who were more satisfied with the digital platform were more likely to respond and this may have overestimated the satisfaction rates. Nevertheless, the study has several strengths including a large sample size and the pan-India representation of teachers from all the educational streams. It is anticipated that the growing pains of remote-based learning will be overcome soon and the forum would provide increased, equitable and affordable opportunities for all students. Future studies need to compare online and traditional classroom teaching to student engagement and learning outcomes.

Conclusions

In sum, collaborative efforts of the government and academic teaching institutions are needed to facilitate the adoption of meaningful alternatives to

the conventional mode of teaching and learning. There are myriad opportunities for transforming instructional practices and expanding the remote learning platform by collaborating with other national and international academic institutes. Indeed, the e-learning platform can unlock immense opportunities for strengthening education in resource- and experience-poor countries.

Key findings and implications for stakeholders:

1. Teachers need the training to enhance their skills to create an engaging online learning environment for their students.
2. It is anticipated that remote learning would provide increased, equitable, and affordable opportunities for all students.
3. Collaborative efforts of the government and academic teaching institutions are needed to facilitate the adoption of meaningful alternatives to the conventional mode of teaching and learning.

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Research Article

Designing and Validating Technological Pedagogical Content Knowledge Strategies for Teaching Mathematics

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Abstract

The ultimatum of the twenty-first century for preparing teachers in technology-rich mathematics classrooms emphasizes an approach in mathematics teaching that makes use of effective choices in teachers' use of technology when teaching a particular content. Technological Pedagogical Content Knowledge (TPCK) is a theoretical knowledge construct enlightening a way to integrate content-specific knowledge and pedagogical strategies while teaching with technology. The major goal of the research was to understand and describe how Technological Pedagogical Content Knowledge Strategies can be designed and validated for guiding mathematics teaching. Technological Pedagogical Content Knowledge Strategies were designed by adopting the methodology of design-based research. These strategies include Technological Pedagogical Content Knowledge Strategies Framework that covers intervention in nine phases for framing the TPCK-based lesson transcript (TPCK Script). The TPCK Strategies were evaluated using the TPCK strategies framework evaluation Proforma. The central theme of this instructional strategy is that it emphasizes the establishment of knowledge–building community learning environments. Considering and applying new instructional strategies can help instructors to understand the uses of pedagogical content knowledge, as well as to reflect the role of technological content knowledge and technological pedagogical knowledge that can be adapted in mathematics teaching in all educational levels and environments.

Keywords: Technological Pedagogical Content Knowledge Strategies, Instructional Strategies, Technological Pedagogical Content Knowledge, Teaching Mathematics, Mathematics Education

Introduction

Significant shifts in the views on teachers' knowledge required for effective teaching have transcended from PCK (Pedagogical Content Knowledge) to a more technically specialized TPCK (Technological Pedagogical Content Knowledge) in the 21st century. Teachers of the 21st century are confronted with expanding their knowledge for teaching with the multitude of recent and emerging technologies, technologies which they have inadequate experience with, much less for integrating them as learning tools in their classrooms. To address this intricacy in the blending of knowledge and experience, they actively search for experiences to assist in reframing their knowledge for teaching with technologies. This knowledge was described as Technological Pedagogical Content Knowledge (TPCK), a dynamic, theoretical construct for designing, implementing, and evaluating curriculum and instruction with technology.

Mathematization of one's thinking is promising by imparting mathematics education. Mathematics Education nurtures cognitive abilities and attitudes

to make life more meaningful. It is a process of human enlightenment and empowerment aiming at achieving a better and higher quality of life. In this era of science and technology, there is a need for more and more mathematical knowledge to confront the challenges of modern technological society. Mathematics has its language with signs, symbols, terms, operations, etc. It helps in drawing conclusions and interpreting various ideas and themes. Mathematics has its tools lay intuition, logic, reasoning, analysis, individuality, generality, and construction, etc.

The teaching of everyday mathematics has become an indispensable part of general education. With the recent emphasis on using technologies in education, particularly in mathematics instruction, the need has emerged to prepare mathematics teachers with effective classroom technology integration skills. The challenge is to design an appropriate strategy for teachers of mathematics by which they can relearn, rethink and redefine teaching and learning as they confront their current conceptions of teaching.

New technologies are advancing into many aspects of our lives, and this progression is evident in the development of technologies to support the teaching and learning of mathematics. A teacher who teaches mathematics should possess the knowledge for integrating different pedagogies and technologies into the content areas. The notion of teachers orchestrating their students' collaboration in mathematics affords new ways to conceptualize teacher pedagogy. Teacher knowledge is never stable, but always changing based on the technologies of the discipline. Therefore, designing strategies grounded in the TPCK framework which promotes teaching with technology as a process of developing knowledge that becomes teacher actions in practice supports the development of content-centric pedagogies for teaching with technology.

Background

Determining an appropriate design for a teaching-learning progression that blends both theoretical and practical experiences in TPCK must draw from multiple research results. Technological Pedagogical Content Knowledge (TPCK) is a supportive knowledge framework for the design of Technological Pedagogical Content Knowledge (TPCK) Strategies. TPCK promotes teachers' teaching content as a complex interaction among content knowledge, pedagogical knowledge and technological knowledge, guiding them in the strategic thinking of when, where, and how to guide students' learning with technologies. TPCK frames teachers' knowledge as the intersection of these three knowledge bases, promoting the intersection as the desirable knowledge upon which teachers rely when designing and implementing curriculum and instruction while guiding students' thinking and learning with technologies in specific content areas.

Technological Pedagogical Content Knowledge (TPCK)

Mishra and Koehler (2006) describe the TPCK as an amalgam of three knowledge bases: content knowledge (CK), pedagogical knowledge (PK) and technological knowledge (TK), in essence indicating the importance of content-specific instructional design. Their model is built upon Shulman's (1986) well-established construct of pedagogical content knowledge (PCK). Koehler and Mishra (2008) conceptualized the TPCK framework as an integration of seven domains of knowledge, which is unique from the other existing individual knowledge forms. They are-

1) Content Knowledge,

2) Pedagogical Knowledge,

3) Technological Knowledge,

4) Pedagogical Content Knowledge,

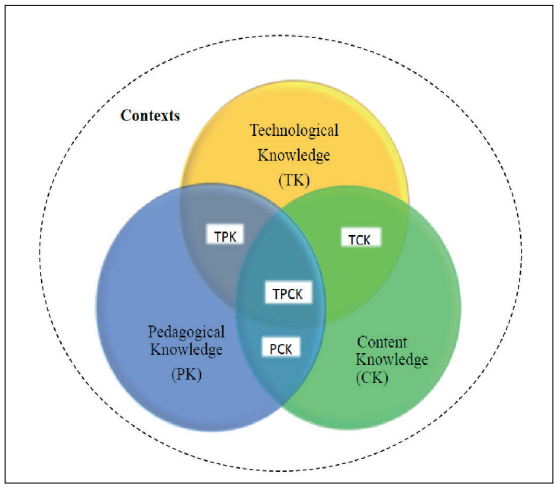
5) Technological Content Knowledge,

6) Technological Pedagogical Knowledge

7) Technological Pedagogical Content Knowledge

Technological Pedagogical Content Knowledge Framework as depicted by Koehler and Mishra (2008) is shown in figure1.

Figure-1: Technological Pedagogical Content Knowledge Framework as depicted by Koehler & Mishra, 2008



The Knowledge Components of TPCK

The seven knowledge components of TPCK are described by Koehler and Mishra (2008) as follows.

1) **Content Knowledge (CK):** Content Knowledge represents the knowledge of the disciplines proposed to be taught or learned. The level of content knowledge varies according to different instructional situations like the differences between the content of mathematics at the school level and graduation level. Content knowledge signifies knowledge of the content area they teach. For example, Knowledge about the content of 8th grade Mathematics.

2) **Pedagogical Knowledge (PK):** Pedagogical Knowledge deals with the knowledge of the methods, strategies, activities, processes, and practices that encourage learning**.** For example, Knowledge about how to use brainstorming in teaching.

3) **Technological Knowledge (TK):** Technological Knowledge refers to the knowledge of affordances of technologies that help in learning. According to Koehler and Mishra (2008), educational technology is all of the tools, techniques, and collective knowledge applicable to education including analog technologies like chalkboard, pencil, and microscope, etc., and digital technologies like the computer, blogging, and internet. For example, Knowledge about how to use the web 2.O tools like wikis, blogs, podcasts, etc.

4) **Pedagogical Content Knowledge (PCK)**: It is the intersection of Pedagogical Knowledge (PK) and Content Knowledge (CK). Some contents cannot be taught to the students using merely an individual pedagogy alone. It emphasizes the importance of the particular type of pedagogies for teaching particular content areas. Pedagogical content knowledge is a term coined by Shulman (1986), which refers to the transformation of content into pedagogically sound forms and to the elucidation of subject matter to be grasped by students in new ways. For example, Knowledge of using discussion methods when teaching a social issue.

5) **Technological Content Knowledge (TCK**): Technological Content Knowledge refers to the combination of Technological Knowledge (TK) with Content Knowledge (CK). Technological Content Knowledge is the technological depiction of content knowledge without any account to teaching (Cox & Graham, 2009). TCK conceptualizes teachers' understanding of how technology can facilitate student skill development in a given subject. That is, teachers must be intimately familiar with the content as well as have the capacity to effectively choose and appropriately leverage technology to support their students' learning. Technology provides extensive representational opportunities for teachers to display content to their students. These representations exist independent of the teacher's knowledge about their use in a pedagogical context. For example, Knowledge about using online dictionaries.

6) **Technological Pedagogical Knowledge (TPK):** It is the interaction of Technological Knowledge (TK) and Pedagogical Knowledge (PK).TPK is the knowledge of using technologies for pedagogical purposes with no reference towards a specific content area. TPK conceptualizes knowledge about how technologies may be used to meet pedagogical aims in the classroom (Koehler & Mishra, 2008).In other words, teachers deeply consider how technologies influence or are influenced, by their pedagogical style and their students' learning styles. TPK is considered to be independent of specific content or topic. It means, TPK can be applied in any content domain. Further, Niess (2008) asserted that teachers with TPK should consider students' learning styles when choosing a particular technology. For example, Knowledge about how to use wikis for collaborative learning.

7) **Technological Pedagogical Content Knowledge (TPCK or TPACK)**: Technological Pedagogical Content Knowledge is the interaction of PCK and TCK and TPK.TPCK is the knowledge required by teachers for using pedagogical techniques that constructively incorporate technologies to teach content. TPCK illustrates teachers' ability to engage in a transactional negotiation among their content, pedagogy, and technology knowledge domains (Mishra & Koehler, 2006). Teachers implement new skills and understandings when they combine these knowledge domains while teaching with technology. Thus, the TPCK construct includes using pedagogical techniques that constructively and continuously incorporate technologies to teach content. For example, Knowledge about how to use YouTube facilitates collaborative learning in teaching the application of physics laws.

Context

Knowledge of the surrounding educational context includes knowledge about the school, the school social networks, students, parental concerns, the available infrastructure, etc. For example, Teachers may be limited to integrating technology into their teaching due to a shortage of technological accessibility.

The researchers identified and proposed Technological Pedagogical Content Knowledge (TPCK) as a path that can be applied in designing Technological Pedagogical Content Knowledge (TPCK) strategies for teaching mathematics with technologies.

Definition of Key Terms

The key terms expressed in the Statement of the problem are defined further.

Technological Pedagogical Content Knowledge (TPCK)

Technological Pedagogical Content Knowledge (TPCK) entails an emergent body of knowledge consisting of three knowledge components of content, pedagogy, and technology and is also supplemented by the interactions among these domains.

Technological Pedagogical Content Knowledge (TPCK) Strategies

Operationally, Technological Pedagogical Content Knowledge Strategies are the instructional strategies involving the integration of three different domains of knowledge of Technological knowledge, Pedagogical Knowledge and Content Knowledge on mutual integration of two it becomes Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), and Technological Pedagogical Knowledge (TPK) and finally, all the three mutually integrates to form Technological Pedagogical Content Knowledge (TPCK).

In the present study, Technological Pedagogical Content Knowledge Strategies include Technological Pedagogical Content Knowledge Strategies Framework and TPCK Script. The researcher benefited from the nine phased Technological Pedagogical Content Knowledge Strategies Framework-based lesson planning for framing lesson transcripts (TPCK Script).

Objectives

1. To design Technological Pedagogical Content Knowledge Strategies (TPCK Strategies) for teaching mathematics
2. To validate the Technological Pedagogical Content Knowledge Strategies (TPCK Strategies) for teaching mathematics

Methodology

The researcher used the design-based research methodology over the three years (2016-2019).In design-based research (DBR), development and research take place through iterative cycles of design, enactment, analysis, and redesign. Edelson (2002) Stated that DBR is conducted "through a parallel and retrospective process of reflection upon the design and its outcomes; the design researchers elaborate upon their initial hypotheses and principles, refining, adding, and discarding-gradually knitting together a coherent theory that reflects their understanding of the design experience".

In DBR, the content, structure, and instructional approaches of intervention are first identified in the analysis and exploration phase of a design project through a literature review and the input of experts and practitioners. This information is then used to design the first iteration of the intervention.

A preliminary literature review is conducted to identify draft design principles that have the potential to address the problem the intervention is being designed to solve.

TPCK Strategies for teaching Mathematics were designed according to three core processes of DBR outlined by McKenny and Reeves (2012) as (a) analysis and exploration, (b) design and construction, and (c) evaluation and reflection and adopted a qualitative approach in DBR. Through design-based research iterative cycles, system prototypes were created with enhanced design features, more sophisticated functionality, and less complexity.

Tools and Materials Designed for the Study

The following tools and materials were designed for the present study.

1. Technological Pedagogical Content Knowledge (TPCK) Strategies Framework (Vrinda Vijayan & Joshith V. P., 2018)
2. TPCK-based lesson transcript (TPCK Script) (Vrinda Vijayan & Joshith V. P.,2018)
3. TPCK Strategies Framework Evaluation Proforma (Vrinda Vijayan & Joshith V. P., 2018)

Description of the Tools and Materials Used

The following tools and materials were very carefully selected for conducting the present study after having a deep study regarding the suitability and appropriateness of the tools. A detailed discussion of every tool used in the present study is given below:

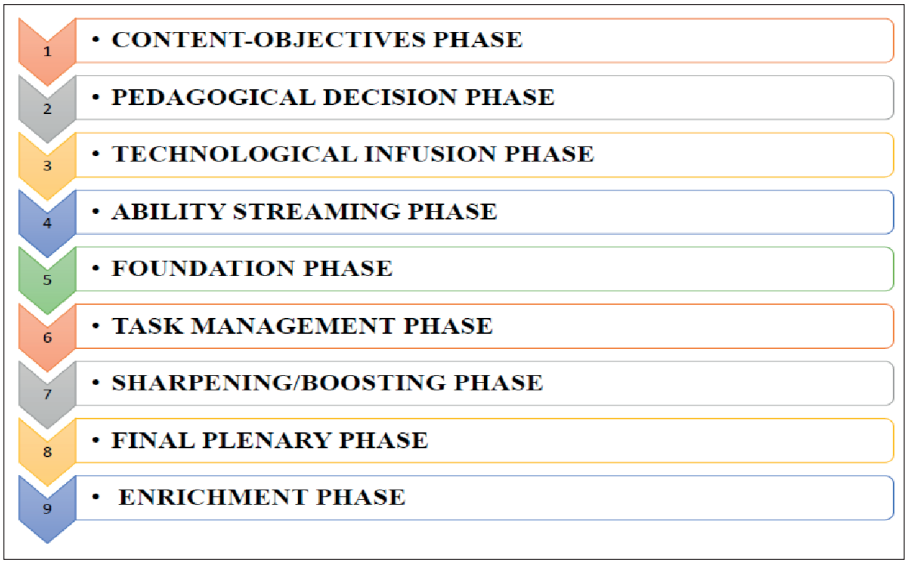
1. **Technological Pedagogical Content Knowledge (TPCK) Strategies Framework**
   Technological Pedagogical Content Knowledge (TPCK) Strategies Framework was designed by the researcher with the guidance of the research supervisor. TPCK Strategies Framework was developed for higher secondary school students of Mathematics. The major aim of preparing the TPCK Strategies Framework was to enhance the mathematical ability of students at higher secondary school in the science stream. It was developed based on the theoretical notions of Punya Mishra and Matthew J. Koehler on Technological Pedagogical Content Knowledge (Koehler & Mishra, 2008). It involves the integration of content, pedagogy, and technology systematically as in five-step curricular-based teaching (Harris & Hofer, 2009).
   The Framework included 33 learning points following certain tasks, which cover a range of topics from Conic Sections, Introduction to Three-dimensional Geometry, Limits, and Derivatives. During the conduct of the experiment, a scheduled amount of forty periods was uniformly fixed to complete the material. It was prepared following ten distinct types of exercises for each learning point: 1) Content 2) Pedagogy 3) Technology 4) Learning Objectives 5) Anticipated mathematical ability 6) Introduction 7) TPCK Narration 8) Pupil Activity 9) Modification 10) Enrichment. The teacher used a variety of pedagogies and technologies merged for teaching the selected content.

Phases of TPCK Strategies Framework

TPCK Strategies Framework was designed to enhance the mathematical ability of higher secondary school students regarding instructional objectives conceptual understanding, procedural knowledge and problem-solving.

TPCK Strategies Framework covers nine phases-Content-Objectives Phase, Pedagogical Decision Phase, Technological Infusion Phase, Ability Streaming Phase, Foundation Phase, Task Management Phase, Sharpening/Boosting Phase, Final Plenary Phase, and Enrichment Phase as shown in figure 2.

Figure-2: Phases of TPCK Strategies Framework



The details of each phase in the development of the Technological Pedagogical Content Knowledge (TPCK) Strategies Framework are given below.

PHASE - I

CONTENT-OBJECTIVES PHASE:
In the first phase of the TPCK Strategies Framework, the teacher selects the content to teach and defines target behavior in terms of the desired behaviour.

i.e.: Content-Objectives Phase includes

(a) Selecting content to teach

(b) Defining the target behavior/ learning outcome of a content

(a) Selecting content to teach: The teacher selects the content area for teaching. For the present study, the teacher selected topics from the chapters' viz. Conic Sections, Introduction to Three-dimensional Geometry, Limits and Derivatives.

(b) Defining the target behavior/ learning outcome of content: The teacher lists out the instructional objectives to be attained at the end of the content area selected.

PHASE - II

Pedagogical Decision Phase: In the second phase of the experiment, the teacher takes decisions regarding the pedagogy to be used and activities to be combined**.**

i.e.: The Pedagogical Decision phase includes

(a) Fix an apt pedagogy

(b) Formulate the activity/ discourse types to combine

(a) Fix an apt pedagogy: The teacher determines the pedagogy that is more suitable to teach the selected topic and to attain the learning objectives. For the present study, the teacher used pedagogies like Demonstration, Simulation, Discussion, Digital Storytelling, Laboratory Method, Collaborative Learning, Inquiry Learning, Seminar and Problem-Solving Tasks, etc

(b) Formulate the activity/discourse types to combine: Teacher plans about suitable activities or discourse types to be included and assures learner participation. The number of tasks and time for each task are set well.

PHASE - III

Technological Infusion Phase: Emerging trends and developments in technology that are most relevant for the topic/content considering its utility and practicability is infused at this phase.

i.e.: Technological Infusion Phase includes

(a) Selecting appropriate technology/software

(b) Evaluating practicability of the technology selected

(a) Selecting appropriate technology/ software: The teacher selects the most appropriate software or technology according to selected pedagogy and content. For each content area, the teacher used different instructional devices like a Laptop and Projector for making use of web 2.O tools, videos, Blooket, Geogebra, and other application software in mathematics.

(b) Evaluating practicability of the technology selected: The teacher verifies whether the selected technology or software is practicable in the actual classroom situation.

PHASE - IV

Ability Streaming Phase: The teacher anticipates mathematical ability to be acquired through the integration of technology, pedagogy, and content.

i.e.: Ability Streaming Phase includes

(a) Mathematical ability to be inculcated

(b) Specifying the anticipated mathematical abilities

(a) Mathematical ability to be inculcated: By teaching a particular content using selected pedagogy and technology, the anticipated mathematical abilities namely conceptual understanding, procedural knowledge and problem-solving formed are identified.

(b) Specifying the anticipated mathematical abilities: The teacher specifies the mathematical abilities for teaching a particular content using different pedagogies and technologies.

PHASE- V

Foundation Phase: At this phase, the teacher directs students about the new way of learning the lesson. The teacher introduces a problematic situation interestingly either visually or orally and assesses the students' entry behaviour.

i.e.: Foundation Phase includes

(a) Orienting the lesson or Induction

(b) Introducing a problematic situation

(c) Testing the entry behaviour

(a) Orienting the lesson or Induction: The teacher orients students about the new way of teaching.

(b) Introducing a problematic situation: The teacher introduces a problematic situation to students in an interesting manner and allows space for students' independent thinking.

(c) Testing the entry behaviour: By the problem presented, the teacher assesses students' previous knowledge in the respective area.

PHASE- VI

Task Management Phase: The phase at which the teacher incorporates the activities by distributing and supplying systematically to those units which have to perform with the decision of the tasks assigned and then presented.

i.e.: Task Management Phase includes

(a) A Presentation focusing on the desired behaviour

(b) Progression/ Distribution of Task

(a) A Presentation focusing on the desired behaviour: The teacher presents the content integrated with suitable pedagogy and technology

(b) Progression/Distribution of Task: The learning progresses with the activities assigned.

PHASE- VII

Boosting/Sharpening Phase:
Boosting is done by adopting the principle of reinforcement. By this, the teacher ensures an enhancement of mathematical ability and then reinforces this with the integration of technological pedagogical content knowledge. Also, the teacher clarifies students' doubts.

i.e.: Boosting Phase includes

(a) Boosting up through TPCK

(b) Reach solution/Sharpening outcome

(a) Boosting up through TPCK: The teacher boosts the students with reinforcement.

(b) Reach solution/Sharpening outcome: Students can solve the problem and ensure the enhancement of mathematical ability.

PHASE- VIII

Final Plenary Phase: In the eighth phase, the newly learned thing becomes an integral part of the learner. This is made clear by feedback, reflection, and evaluation.

i.e.: Final Plenary Phase includes

(a) Assessment /Evaluation

(b) Reflection /Closure/Feedback

(a) Assessment/Evaluation: The teacher measures the attainment of the desired behaviour.

(b) Reflection/Closure/Feedback: Teacher collects feedback from students.

PHASE- IX

Enrichment Phase: In the last phase, the learned behaviour is enriched and followed up by the assignments given.

i.e.: Enrichment Phase includes

(a) Follow-up/Assignments

(b) Resources (more)

(a) Follow-up/Assignments: The learned ability is enriched by assignments or follow-ups given.

(a) Resources: More resources connected with the content are accessed by giving instructions regarding the sources.

Description of phases of TPCK Strategies Framework is given in figure 3.

Figure-3: Description of Phases of TPCK Strategies Framework

2. TPCK Script (TPCK- Based Lesson Transcript)

The researcher prepared lesson transcripts based on TPCK Strategies Framework for the selected chapters from XI standard Mathematics NCERT textbook prescribed for Kerala. It incorporated 33 learning points of 40 lesson scripts. TPCK Script followed the nine phases of the TPCK Strategies framework developed by the investigator. TPCK Scripts were prepared following ten distinct types of exercises for each learning point: 1) Content 2) Learning Objectives 3) Pedagogy 4) Technology 5) Anticipated mathematical ability 6) Introduction 7) TPCK Narration 8) Pupil Activity 9) Modification 10) Enrichment. These exercises are included in the nine phases of the TPCK Strategies Framework.

3. TPCK Strategies Framework Evaluation Proforma

The teacher prepared TPCK Strategies Framework and TPCK script and they were given to the experts for validation. The TPCK Strategies Framework was evaluated using an evaluation proforma. The evaluation proforma for experts was developed by Vijayan, V. & Joshith, V.P., (2018) on a 5-point rating scale. The qualities of good strategies were listed out for preparing the evaluation proforma and the most essential qualities were selected with experts' opinions.

It was developed by considering the following 12 components like Objectives, Content, Pedagogy, Technology, Presentation, Sequencing, Motivation/ Curiosity, Evaluation/ Feedback, Practicability/ Usability, Learner participation, Teacher role, and Integration. The investigator prepared 40 items based on the above aspects. On consultation with experts in the field and the supervising teacher, some items were modified and some were rejected. The final form of evaluation proforma consists of 20 items. The number of items in various components of the evaluation proforma (final) is given in table 1.

Table-1: Break up of Number of items in various components of Evaluation Proforma

Sl. No.	Components	No. of Items
1.	Objectives	1
2.	Content	2
3.	Pedagogy	2
4.	Technology	2
5.	Presentation	3
6.	Sequencing	1
7.	Motivation /Curiosity	1
8.	Evaluation/Feedback	2
9.	Practicability/Usability	2
10.	Learner participation	2
11.	Teacher role	1
12.	Integration	1
	Total	20

Administration of Evaluation Proforma for Validating TPCK Strategies Framework & TPCK Script

The investigator consulted 12 experts including Mathematics teacher educators, research officers, technical experts, higher secondary school teachers, and subject experts to evaluate the developed TPCK Strategies framework and TPCK Script. The evaluation proforma was given to

them for their feedback regarding the framework. The experts were requested to indicate their opinion regarding the framework by putting a tick mark (√) in the appropriate column. The responses were collected and scored. All the Statements were rated on a five-point scale of Excellent / Good / Moderate **/** Satisfactory/ Poor.

Individual Criterion Score

Excellent	= 5 points
Good	= 4 points
Moderate	= 3 points
Satisfactory	= 2 points
Poor	= 1 point

Analysis of TPCK Strategies Evaluation Proforma

The collected data were analysed using percentage analysis. The response patterns of the experts concerning the components are given in table 2.

Table-2: The ratings of experts on the TPCK Strategies Framework (in Percentage)

Sl. No.	Components	Item No.	Expert Rating in Percentage				
			Excellent	Good	Moderate	Satisfactory	Poor
1.	Objectives	1	75	25	0	0	0
2.	Content	2	50	50	0	0	0
		3	41.67	25	33.33	0	0
3.	Pedagogy	4	83.33	8.33	0	8.33	0
		5	33.33	50	16.67	0	0
4.	Technology	6	66.67	33.33	0	0	0
		7	66.67	33.33	0	0	0
5.	Presentation	8	50	41.67	8.33	0	0
		9	58.33	33.33	8.33	0	0
		10	66.67	33.33	0	0	0
6.	Sequencing	11	75	25	0	0	0
7.	Motivation / Curiosity	12	41.67	33.33	25	0	0
8.	Evaluation/ Feedback	13	50	41.67	8.33	0	0
		14	33.33	66.67	0	0	0

Sl. No.	Components	Item No.	Expert Rating in Percentage				
			Excellent	Good	Moderate	Satisfactory	Poor
9.	Practicability/ Usability	15	50	50	0	0	0
		16	58.33	33.33	8.33	0	0
10.	Learner participation	17	33.33	66.67	0	0	0
		18	50	33.33	16.67	0	0
11.	Teacher role	19	33.33	66.67	0	0	0
12.	Integration	20	50	33.33	16.67	0	0

From table 2, it is clear that the observed frequencies of the opinions-Excellent and Good- were very much greater than their counterparts for most of the Statements in the evaluation proforma. So it can be assured that the developed TPCK Strategies satisfy all the criteria of good mathematics learning giving importance to mathematical abilities. The TPCK strategies are flexible and so can be modified according to the requirements of the users if necessary.

Evaluation Report on TPCK Strategies Framework

A report on the evaluation by the experts in the concerned areas on Technological Pedagogical Content Knowledge Strategies was made. The major dimensions considered for evaluation were Objectives, Content, Pedagogy, Technology, Presentation, Sequencing, Motivation/ Curiosity, Evaluation/ Feedback, Practicability/ Usability, Learner participation, Teacher role, and Integration.

The inclusion of learning objectives in the TPCK Strategies Framework and TPCK Script was accomplished. The content selected for teaching using TPCK Strategies Framework with the support of TPCK Script was apt and it was logically progressing from simple to complex or concrete to abstract. Suitable pedagogies for each content area were adopted and facilitated collaborative learning.

Most of the suitable technologies were selected according to the content and animations were processed to provide clarity of concepts. The presentation can provide a visual experience to learners and activities were coined for mathematical abilities; the arrangement of phases was excellent in their opinion. There was also provision for motivation to students. Multiple methods to assess student performance were included in the framework and there is a provision for feedback.

The practicability of the activities included in the framework and usability for mathematics teachers were ensured. It is learner-focused and offers situations for creativity among students' key role for teachers while using the framework. The overall design of the framework was excellent.

The content validity and face validity of the framework and TPCK script were established by the evaluation proforma. Inter-rater reliability (inter judge reliability) refers to the consistency of two or more independent scores, raters, or observers. From Table 1, the consistency in the rating of different experts is verified. Hence the inter-rater

reliability was ensured.

Findings

The iterative nature of the design-based research process over the three years (2016-2019) produced a rich description and clarification of the instructional activities, tasks, forms of interaction, and methods of evaluation supporting the mathematics community of learners as a knowledge-building community in mathematics. Upon the completion of the design for the teaching of mathematics, key instructional strategies emerged in support of the identification of the TPCK strategies. The validity and reliability of the designed TPCK strategies were established.

Features of TPCK Strategies Framework

TPACK Strategies framework covers intervention through nine phases like Content-Objectives Phase, Pedagogical Decision Phase, Technological Infusion Phase, Ability Streaming Phase, Foundation Phase, Task Management Phase, Sharpening/Boosting Phase, Final Plenary Phase and Enrichment Phase. The phases have well defined syntax which can self-direct the teachers to create instructional designs in various domains of learning. The objectives Stated are specific to the context to apply, here the focus is kept on the practical context rather than theoretical notions and the activities listed are properly sequenced with the phases. The teachers' knowledge in managing activities was vital in focusing the strategies in this framework. It involves the integration of content, pedagogy, and technology and their interactions systematically which offers a motivating environment for practice allowing visual demonstrations, interactions to support learning activities. Finally, as an instructional strategy, TPACK is one of the most flexible frameworks in terms of content, pedagogy, and technology.

Discussion and Conclusion

The strategy evolved through research on the design of TPCK in mathematics teaching. The important features of the strategy include intervention on nine phases namely Content-Objectives Phase, Pedagogical Decision Phase, Technological Infusion Phase, Ability Streaming Phase, Foundation Phase, Task Management Phase, Sharpening/ Boosting Phase, Final Plenary Phase, and Enrichment Phase. All phases are clearly defined and systematic with well-defined objectives and properly sequenced activities. The teacher's role is that of a facilitator and classroom management was student-centered. The findings of the research reinforced the importance of instructor actions in creating an environment using technological pedagogical content knowledge where different types of knowledge components are integrated.

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Research Article

Awareness and Access to Assistive Technology among students with disabilities: Evidence from a special school

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Abstract

Acknowledging the abilities of all learners with disabilities equitably is a very complex process and it also requires modern technology. Efficient exercise of assistive technologies can positively assist any country in realizing inclusive/special education by helping learners with disabilities in schools. Regardless of the significance and constructive influence of assistive technologies, awareness and access to assistive technology in special education particularly in developing nations is inadequate. This case study of a special school has tried to understand the extent of awareness and access to assistive technology among the learners with disabilities and it also uncovers the experiences of the special educators in using and implementing assistive technology for the learners with disabilities.

Keywords: Assistive Technology, students with disabilities, special educators.

Introduction

A nation will not be judged primarily by its success in the sciences, technological powers and economic power. A nation will be judged by the way it includes all categories of people in the development activities to enable everyone to contribute towards nation-building. When it comes to social exclusion, other deprived groups based on caste, gender, etc. gain importance. The inclusion of persons with a disability takes a backseat in India. People with disabilities are facing accessibility and awareness problems in all areas. Technology is evolving at a remarkably rapid pace and has offered many possibilities for its users. Assistive technologies offer a range of prospective opportunities for differently-abled learners by amplifying their learning opportunities (Jacobsena, 2012). Assistive Technology is being developed for people with disabilities to (1) make the learning atmosphere more accessible (2) support them in learning (3) facilitate them to excel in the organization/workplace or (4) promote their independence or else enrich their quality of life (Blackhurst,2005). Assistive technology can help learners with disabilities to learn in a better way.

Assistive technologies are still a novelty even among people with disabilities residing in urban areas. The few available technologies that are not easily affordable, nor are they widely sold and supported. But still, in India most of the learners with disabilities are lacking information regarding the importance of assistive technologies. The development of education of the learners with disabilities is not only based on the teacher's assistance but also on the effective utilization of assistive technology. Most of the ICT centres and disability services centres are not accessible to learners with disabilities. Educators need to challenge themselves to explore assistive technology that will enhance all-round development skills for differently-abled learners (Jacobsena, 2012).

Operational Definition of Key Terms

Some of the key concepts as used in the present study have been operationally described as follows:

Assistive Technology: The term "assistive technology" means any device, software, or equipment that aids students with disabilities in learning, communicating, or functioning better. Assistive technology has the potential to be as high-tech as a computer or anything as simple as spectacles. Low tech devices for learners with disabilities are products that don't need much training, and are less expensive without any complex or mechanical characteristics. High tech assistive devices are the most multifaceted devices that have digital and may be computerized. It can be any object, piece of equipment, or product system. Assistive Technology helps students who experience issues with hearing, talking, composing, recalling, seeing, speaking, and numerous other things. Hearing aids, personal amplification systems, Braille displays, audiobooks, screen reading software, spectacles and memory aids are all examples of assistive technology products. The use and advantages of assistive technology differ from person to person based on their individual goals and characteristics. Therefore, different disabilities require diverse assistive technology.

Students with disability: It refers to learners who have long-term physical, intellectual, mental, or sensory impairments that, in interaction with barriers, hinder their full and effective participation in society equally with others.

Special School: It is a type of school that offers specially designed instruction, support, and services to suit the needs of students with special needs, such as those who have a variety of physical, behavioural, or cognitive issues. Special schools come in a variety of shapes and sizes, but they all serve the same purpose: to educate children whose needs cannot be satisfied in a mainstream setting.

Rationale

According to World Bank data, India is categorized as a lower middle-income country. The country's socio-economic groups, healthcare systems, and cultures are diverse. Healthcare facilities and resources are dispersed unevenly, and services are concentrated mostly in urban areas (World Bank, 2018). Many people have the luxury of breezing through elementary, middle, and high school without much difficulty. Now, imagine having a disability that prevented you from reaching a goal as simple as communicating with your classmates. Assistive technology has come a long way in providing those with disabilities the chance to learn and receive an education in the most normal way possible. Assistive technology services enable people to live healthy, productive, independent, and dignified lives by allowing them to participate in school, employment, and civic life (Director General WHO, 2017, p. 1, 3; Smith et al, 2016, p. 7; Borg & Ostergren, 2015, p. 301).

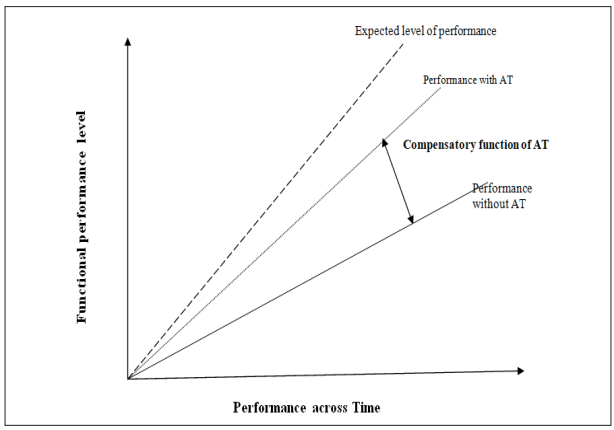
According to the 71st World Health Assembly, AT facilitates and encourages inclusion, participation, and engagement of people with disabilities, and the fact that 90 percent of those who need them don't have access to them has a significant negative impact on their education, employment, health, and mental wellbeing. Evidence shows that the awareness about Assistive technology is significantly low among professionals, disabled people, even students with disabilities in schools especially from low middle-income countries (Senjam, 2019). A lack of understanding and awareness

about the impact and possibilities of Assistive Technology for individuals with disabilities is a significant obstacle to accessing it. Parents also struggle to accept their children with disabilities because they have high expectations for regular development, which leads to a refusal to support Assistive Technology (Boot, 2021). This case study has been conducted in a special school to understand the level of awareness and access to assistive technology among students with disabilities and to explore the experiences of special educators in implementing and using assistive technology.

Conceptual Framework

According to the WHO's Third Committee Report (71st World Health Assembly, 26 May 2018), 90 percent of PWDs still lack access to ATs. Most PWDs and their families are thus left out, trapped in poverty and isolation. It makes PWDs more susceptible to increased disability. The stigma and dominance of negative outlook among parents, society and teachers, adds to the challenge not just of access, but also of retention and education of students with disabilities. Lack of financial resources is a significant barrier for many people who need assistive technologies (Zongjie, 2007). Boot et al. (2021) found that the abandonment of Assistive Technology was a barrier that negatively affected people with disabilities. Factors contributing to abandonment included inappropriate environments, inadequate customized Assistive Technologies, and insufficient training over time. Additionally, this study showed that people with disabilities often needed daily support from the caregivers to use the AT (or reminded to use it). Training that is adjusted to a person's disability level is needed when introducing AT. Furthermore, recurrent training is required to reinforce the user's ability to utilize AT independently. To meet this huge and unmet demand, WHO is leading the Global Cooperation on Assistive Technology (GATE) programme. Because of poor budget allocation, administrative inefficiency, stigma, and the intersegment of discrimination, India's legal framework for protecting PWDs' human rights is rendered mostly inaccessible (Ghosh, 2019). A majority of assistive devices are purchased directly by individuals with disabilities and their families (Albrecht, 2003). Approximately two-thirds of the users of assistive technology in India paid for their devices themselves, according to a national survey. Many technologies are prohibitively expensive for persons with disabilities, especially in low and middle-income nations. The expense of the computer, digital access, and assistive services, for example, was shown to be the most common reason for people with disabilities not utilising the resources effectively in a UK study (Piling, 2004). The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) was adopted by India in 2007, leading to the adoption of the Rights of Persons with Disabilities Act in 2016. A National Indicator Framework (NIF) has been designed to track and accomplish the SDGs and its linked targets like strengthening and extending rehabilitation including community-based rehabilitation, assistive technology, assistance and support services, and it acts as a critical tool for policymakers, resource allocation, researchers, and other concerned stakeholders (Government of India, 2015).

Figure-1: Conceptual Framework (Performance gap exhibited by students with disabilities across time, with assistive technology compensating and reducing the gap)



The conceptual framework for this case study has been illustrated based on the review of literature related to the concepts included in this paper. It represents the outline of the investigation for this study. This framework may help to comprehend how assistive technology impacts learners' development in learning. By enabling individuals to be productive and contribute in all aspects of life, assistive devices can considerably minimize inequities encountered by all persons with disability, including children and adults (Khasnabis, 2015).

Availability and Usage of Assistive Technology in the selected Special School

Assistive technology ranges from low-tech to high-tech, and they serve many different needs (Borg et al, 2015, p.14). The assistive technology devices utilized individually by students with varied visual impairments are mostly Braille slate & stylus (excluding Braille Embossers, Braille Display, Braille Printers, and Braille Translators), and Audio Recorders. Very few students who have access to personal computers at their homes are found to have NVDA software as it is a free and open-source portable screen reader for Microsoft Windows. The unavailability of some crucial software restricts the special educators from using Screen Magnification Software, screen readers like Jaws, Open Book OCR Scanning/ Reading Software for English & Hindi Languages.

The assistive devices utilized individually by students with varied hearing impairments are mostly analogue hearing aids and FM systems for partially impaired ones. The special educators are trained in Indian Sign Language. There is a lack of Assistive Listening Devices, tactile aids, digital hearing aids, etc. The appropriate services should accompany the Assistive devices, including recommendation, appraisal, financial support, ordering, suitability of the device, training of the user or caregivers, follow-up, and maintenance (Borg et al, 2015, p. 14). Appropriate services can make a big difference in how well assistive technology works (Borg et al, 2015, p. 14).

Research Objectives

This research intends to:

1. To find out the extent of awareness and access to assistive technology

among students with disabilities with relation to gender and residence type.

2. To explore the experience of special educators in implementing and using assistive technology for students with disabilities.

Research Questions

1. To what extent do students with disabilities are having awareness and access to assistive technology?

2. What are the perceptions and experiences of special educators in implementing assistive technology?

Methodology

The methodological overview will be discussed systematically across the following subsections: description of the design, sample selection, details of tools used, procedure followed for data collection.

Research design

The present study is a case study and it has been done in a special school where co-education is being provided to students with visual, hearing, and learning disabilities. The study utilized survey and focus group discussion with the students and special educators respectively. In the present study, the investigator studied the students' awareness and accessibility of assistive technology and experiences of Special Educators' in implementing and using Assistive Technology for the students with different disabilities.

Sample

The type of institution selected purposively for the case study includes the special school serving students with disabilities in the Bilaspur region of Chhattisgarh. The school is a Non-government (Aided) secondary school with residential facilities. A total eight teachers are working in the school including five trained subject teachers (trained in VI & HI), and one each for learning disability, Language & Communication disorder (speech therapist), and ICT respectively. The selection of the school was done on the basis of certain criteria which include: type of students with diverse disabilities served by the school, type of ICT infrastructure and services available and type of the teacher community involved. The age group of the sample students mostly ranges from 14 to 22 years. The special school selected for the case study is serving 120 students with visual and hearing disabilities.

Table-1: Participants' Characteristics on the basis of demographic variables

Locality	Category of Disability	Gender	Total Number of students
Rural (55)	Visually Impaired (41)	Female (13)	120 (Male-73, Female-43)
		Male (28)	
	Hearing Impaired (14)	Female (06)	
		Male (08)	
Urban (43)	Visually Impaired (28)	Female (13)	
		Male (15)	
	Hearing Impaired (15)	Female (07)	
		Male (08)	
Semi-urban (22)	Visually Impaired (19)	Female (07)	
		Male (12)	
	Hearing Impaired (03)	Female (01)	
		Male (02)	

The present study also included six (06) special educators rendering their services to the special school. A focus group discussion has been conducted with the special educators. It involved organized discussion with the individuals to gain information about their views and experiences in implementing and using Assistive Technology for the students with different disabilities.

Table-2: Characteristics of the Research Respondents (Special Educators)

Name*	Gender	Age	Specialization in
SE1	Male	43	Visual Impairment
SE2	Male	36	Language & Communication disorder
SE3	Female	52	Visual Impairment
SE4	Female	41	Hearing Impairment
SE5	Male	29	Learning Disorder
SE6	Female	38	Hearing Impairment

*the names of all special educators have been coded (SE for Special Educator) to uphold anonymity

Tools Used

The tools used to measure the dimensions and to collect the data are presented in table number 2.

Table-3: Table showing tools used for collection of data with respect to the variables of the study

Variables	Tools used	Dimensions of the Tools used/Discussant points	Constructed by
Awareness and Access to Assistive Technology	Questionnaire for students' Awareness and Access to Assistive Technology	**1.** Awareness about: **i.** Availability of AT in school lab **ii.** Taking assistance during AT glitches **iii.** Utility of new AT services other than used ones **2.** Ability to use AT independently **3.** Problems in using AT	Investigator
Special Educators' experiences in implementing and using Assistive Technology	Focus group Discussion for Special Educators	**1.** Assistive technology and students' performance **2.** Selection of Assistive Technology **3.** Assistive technology and Curriculum **4.** Low tech and high-tech assistive technology devices	Investigator

Procedure of data collection

i) From Students with disabilities: The tool namely, Questionnaire for students' Awareness and Access to Assistive Technology was administered to the sample. There were many students who had troubles with communication while surveying and therefore, their teachers and peers acted as interpreters for those learners. While collecting information from the students with hearing disabilities, the teachers helped the researchers to collect exact data from the students by using Indian sign language. Questions regarding the respondent's awareness of assistive technology and access to assistive technology have been analyzed using percentage comparison. The frequency of the respondents is also presented in percentages.

ii) From Special Educators: The investigators also conducted a Focus group Discussion for Special Educators and noted down their experiences regarding implementing and using Assistive Technology.

Results and Discussion

All questions regarding the respondent's awareness of assistive technology and access to assistive technology are analyzed using percentage comparison. The frequency of the respondents is also presented in percentages.

RQ1. To what extent differently-abled students are having awareness and access to assistive technology (AT)?

All the items of the questionnaire have been analyzed and interpreted individually. Awareness and access to assistive technology have been understood by using percentage comparison through background variables as follows:

Figure-2: Distribution of respondents based on their awareness about assistive technology available for their use in school lab

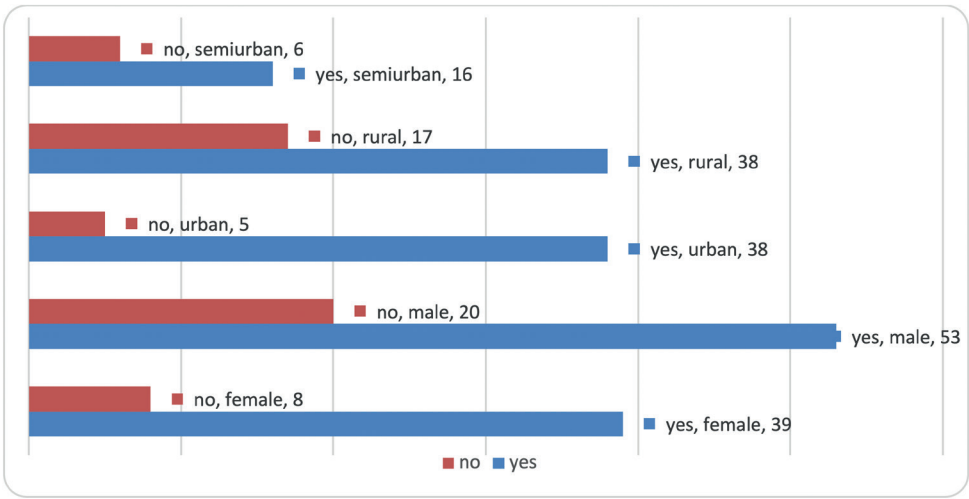
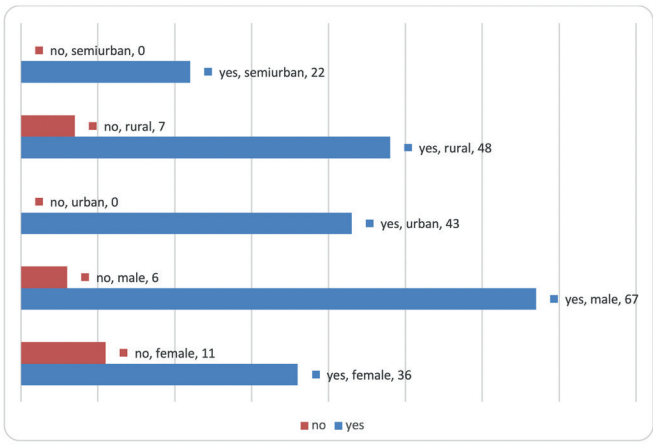


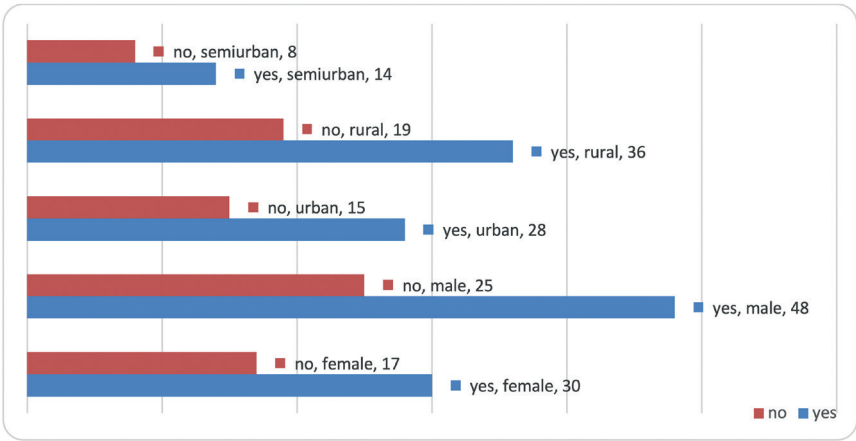
Figure 2 clearly shows that 39 (82.97 percent of the total female population) of the female respondents have awareness of the assistive technologies available for their use in the school computer lab as compared to 53 (72.60 percent of the total male population) of the male respondents. Further, 38 (88.37 percent of the total urban population) of the Urban respondents are more familiar with the assistive technologies than 38 rural (69.09 percent of the total rural population) and Semi-Urban students (72.27 percent of the total semi urban population).

Figure-3: Distribution of respondents based on their awareness to contact experts related to assistive technology glitches/concerns



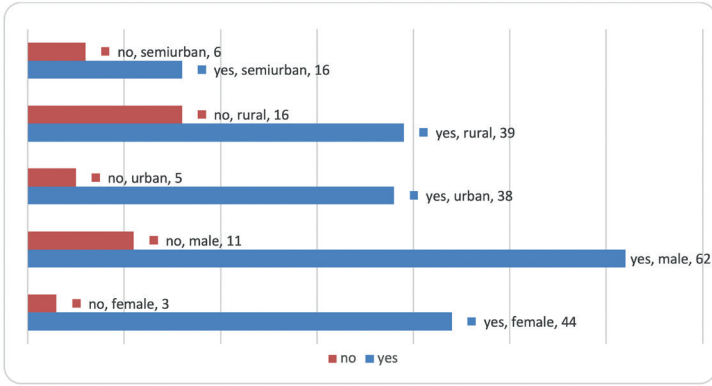
Respondents are much aware of their need to contact people, if they have any glitches related to assistive technology. According to Figure-3, 67 (91.78 percent) of the male respondents are aware of the resourceful persons who can help them in fixing their technological concerns as compared to 36 (76.59 percent) of the female respondents. All urban and semi-urban respondents know those who need to be contacted if they have any assistive technology concerns.

Figure-4: Distribution of respondents based on their awareness about the new assistive technology services that are more useful than the devices that they are using now



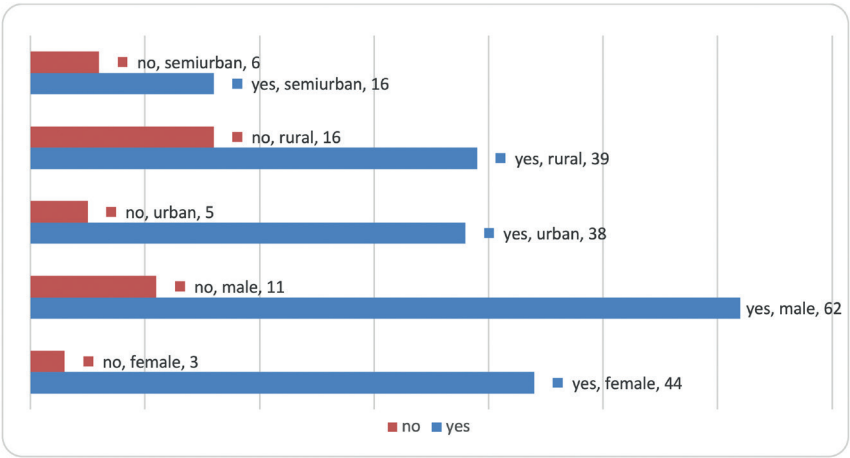
It is evident from Figure-4 that there is not much difference between 48 (65.75 percent) of the male respondents and 30 (63.82 percent) of the female respondents regarding awareness of new assistive technology services, which are more useful than the devices that they are using right now. Further, 28 (65.11 percent) of the urban respondents, 36 (65.45 percent) of the urban respondents and 14 (63.63 percent) of the semi-urban respondents are aware of new assistive devices other than those which are being used by them.

Figure-5: Distribution of respondents based on their ability to use assistive technology devices independently



The data in Figure-5 shows that 44 (93.61 percent) of the female respondents are better at using assistive technology devices independently than 62 (84.93 percent) of the male respondents. Furthermore, 38 (88.37 percent) of urban respondents can use assistive technology devices independently in comparison to 39 (70.90 percent) of the rural respondents and 16 (72.72 percent) of the semi-urban respondents.

Figure-6: Distribution of respondents based on their problems in using assistive technology



Data in Figure-6 shows that 41 (56.16 percent) of the male respondents experience problems in using assistive technology as compared to 22 (46.80 percent) of the female respondents. It is evident that most of the students are encountering problems while using AT. Nearly half of the students are having problems using assistive technology. However, 30 (54.54 percent) of the rural respondents encounter problems while using assistive technology as compared to 22 (48.83 percent) of the female respondents and 12 (54.54 percent) of the semi-urban respondents.

RQ2: What are the perceptions and experiences of Special Educators in implementing Assistive Technology?

A focus group discussion assists in gaining insights into people's collective understanding of daily life and how persons are influenced by others in a group situation. A focus group discussion has been conducted with the special educators of the same school to know their understanding of assistive technology and to explore their experiences in using and implementing assistive technology.

Assistive technology and students' performance

Hopkins (2016) noted that there is a wide scope of assistive technology that can open numerous avenues for learners with disabilities. Most of the teachers keep an eye on the progress of their learners before and after implementing assistive technology and they are witnessing a reasonable change. For differently-abled students, assistive technology is a boon.

Most of the students perform exceptionally well with assistive technology. Assistive technology acts as a catalyst in the process of learning. Other than increasing students' performance, it also enhances the level of independence (Sabana, Special Educator).

To the maximum extent they do not have to depend on others and their social interaction increases. A number of assistive devices are accessible to help teachers improve their learners' functional abilities by providing learning opportunities and active involvement in events (Starcic & Istenic, 2010).

Need of Collaboration in selecting Assistive Technology

The students may encounter trouble completing every assignment at home if the parents are not skilled in assistive technology (Judge, 2000; Messinger-Willman & Marino, 2010). Especially in rural areas, parents cannot contribute much because of the unawareness of new assistive technology.

We cannot select an assistive device for a student if it cannot be handled by the student and his family. So, many things are to be kept in mind during the selection of technology starting from its cost, complexity, accessibility, and so on (Tarun, special educator).

There should be an understanding and purposeful sharing of ideas between teachers and parents in selecting assistive technology. To make it successful the teacher, students, and parents have to contribute equally (Sarath, special educator).

Assistive technology and Curriculum

Alkahtani (2013) noted that assistive technology assists differently-abled learners to enhance their ease of access to the curriculum and quality of the learning experience. Because of this technology only, students can cope easily with the curriculum in the long run.

Assistive technology gives different avenues to students' development. Assistive technology assists the students with disability to get the best out of the curriculum by making them independent to a larger extent. The success of assistive technology is evaluated based on how it goes hand in hand with curriculum and methods of instruction (Alaknanda, Special Educator).

Without AT, it is a tough task to explore and transact the curriculum flexibly. Special educators have a common view that each element has its own and equal importance and all are interlinked.

Low-tech and high-tech assistive technology devices

Special educators opined that low tech devices are more successful than high tech devices. Because students are more confident and comfortable in using low tech devices and proper training of low-tech devices is given to the learners. However, all teachers know the importance of high-tech devices, and how much it is beneficial if used efficiently.

High-tech assistive technology devices are somewhat more sophisticated and because of their complexity, they are less successful than low-tech assistive technology devices. All students can use low-tech assistive technology devices, but few are there who can use high-tech devices efficiently (Mousami, Special Educator).

Inadequate training and support services within classrooms and at home can also be an obstacle to implementing assistive technology (Judge, 2000, p. 128). All teachers have a similar opinion that both high and low-tech devices can be successful only when implemented properly.

Table-4: Selected data, Special educators understanding of Assistive Technology

Perception towards Assistive Technology	Yes	Not sure	No
Question1: Does the performance of students' increases with the proper implementation of assistive technology?	✓✓✓ ✓✓✓		
Question2: Is assistive technology more significant than the curriculum and method of instruction for the success of special education students?	✓✓	✓✓✓	✓
Question3: Have you seen any differences in the success rate between high and low-tech assistive devices?	✓✓	✓✓✓	✓
Question4: Do you feel teacher/ student/parent collaboration in the selection of assistive technology is important for its success?	✓✓✓ ✓✓✓		
Question 5: Do you have assistive technology available in your classroom for students that can also be used outside of their individualized educational programme?	✓✓	✓	✓✓✓
Question 6: Does the implementation of high-tech assistive devices include adequate training?	✓✓✓ ✓✓✓		

Discussion

This study presented the awareness and accessibility of Students with diverse disabilities quantitatively. It is evident from the study that the female students are more aware of the facilities available in their school laboratory and using them independently than the male respondents because of the curiosity shown by the female students towards ATs and are acquainted with the existing software which they also used in their previous schools. However, there are still many students including both males and females who are ignorant of the facilities available in their school laboratory. It is found that almost all students from urban and semi-urban localities are much aware of their need to contact people if they have any glitches related to assistive technology because of their accessibility to the services provider situated in nearby towns. There is not much difference among male and female students regarding new assistive technology services other than those which are being used by them. Urban respondents are found comfortable in using assistive technology devices independently with fewer difficulties as compared to the rural and semi-urban respondents. It is because of the support from their caregivers who are quite more aware of the Assistive services.

The experiences gathered from the Special Educators using Focus group discussion helps in understanding the use of Assistive Technology qualitatively. Regarding the collaboration in selecting

ATs for students, they collectively opined that students with varied disabilities want to be empowered to individually choose and use Assistive Technology, but they cannot do this in a setting that is not supportive of such choices. Parents also have problems in accepting their child with a disability, as they had expectations for usual development, which in turn leads to a non-acceptance of supporting ATs. There is a lack of high tech Assistive devices in their schools like Digital Hearing Aids, Perkins Braille Assisting Listening devices because of their complexity they are less successful than low-tech assistive technology devices.

Conclusion

Students' awareness and access to assistive technologies are not sufficient. For example, students do not have much access to assistive technology but are well aware of its importance in their lives. They know that it enhances their academic performances and makes them independent. After analyzing the different views of special educators, it can be concluded that if assistive technologies are implemented properly, it can certainly provide fruitful outcomes and also promote independence among learners. Collaboration between parents and teachers is important and information should be shared between parents and teachers about the means and methods of children's development. Appropriate training should be provided by the government disability service centres in implementing new assistive technology devices. Special educators should be provided with orientations and workshops regarding the use of new assistive technologies. Therefore, quality research should be promoted, especially in the field of assistive technology.

Countries like India that have ratified the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) and agreed to work towards the SDGs will ensure that all people with intellectual disabilities who need Assistive Technology have access to high quality and affordable products.

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Research Article

Effectiveness of Digital Pedagogy on Teaching Competency in Physical Science among B.Ed. Students with Special Reference to Constructivism

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Abstract

Digital technology has changed many aspects of our life. The impact of digital technology in India across the past four decades has been enormous. Even in this digital era, there is a huge demand for skilled and competent teachers all over the country. A quality teacher education programme requires changes in pedagogical studies. Digital pedagogy can be used to develop the teaching competency among students in the teacher education programme. Digital pedagogy is the study and use of contemporary digital technologies in teaching and learning. It can be effectively implemented with constructivist teaching. Student teachers can be trained to facilitate the learner to construct knowledge rather than just passively receiving information. The science teacher is expected to be a facilitator of scientific knowledge. Pedagogy of physical science is dynamic and ever new domain of knowledge. Keeping in view the above concerns of pedagogy of physical science and to bring quality and excellence in the teaching of physical science, the authors have attempted to study the effectiveness of digital pedagogy in the teaching of physical science with a constructivist approach.

Keywords: Constructivism, Constructivist approach, Digital Pedagogy, Physical Science, Teacher Education

Introduction

Teacher education has grown exponentially in the past ten years to meet the demands of quality teachers in both private and government institutions. After the implementation of the Teacher Education Curriculum Framework, 2014, the attention is focused on the quality pedagogical practices at the B.Ed. level. Student teachers should be properly trained to meet the challenges in the contemporary digital-oriented society (Craig Blewett., 2020). Teachers are expected to handle e-resources. The present teacher education curriculum of physical science includes aims and objectives of teaching physical science, teaching methods and strategies and curriculum reform projects. Adequate practices are given to the student teachers before they go for 80 days' internship in schools. When the digital pedagogy is applied, the teaching competency of the student teachers will be enhanced (Salin SN. & Noor Aida Mahmor, 2018). Student teachers who use a constructivist approach in the teaching of physical science can develop their teaching competency with the support of digital pedagogy. The researcher used the experimental method to study its effectiveness among the students and teachers of physical science.

Meaning and Concept of Digital Pedagogy

Digital pedagogy emphasizes the use of contemporary digital technologies, using digital tools thoughtfully, and paying attention to the impact of digital tools on learning. Digital pedagogy

can be applied to any concept. A teacher should plan, prepare, and execute the digital pedagogy for the selected content. It can be applied to the online environment, face to face environment, and hybrid environment. Teachers encourage students and also themselves to think critically about new things (Wadmany, Rivka, Kliachko, Sarah, 2014).

According to Paulo Freire (2018), the term pedagogy is not ideologically neutral. There is no such thing as a neutral educational process. There are different forms of digital technologies such as Communication technology, Web technology, Data mining, Data Warehousing, Database technology, and Cyber technology. Digital pedagogy will be effective only when the teacher uses the desired technology appropriate to the content. Teachers and also learners can use the appropriate digital technology in a better way when they are thinking critically about the nature and effects of that technology (Valerie Anderson, 2020). The use of digital technology will enhance the teaching-learning process and will change the teaching-learning experience. The digital pedagogy varies from the use of presentation software like PowerPoint to flipped classrooms.

Constructivism

Constructivism emphasizes the construction of knowledge rather than just taking in information. Twomey Fosnot (1989) defines constructivism by reference to four principles viz., learning, in an important way, depends on what we already know, new ideas occur as we adapt and change our old ideas; Constructivism requires meaningful learning through rethinking old ideas and bringing new conclusions about new ideas.

The curriculum in a constructivist classroom begins with the whole and expands to include the parts. Students work primarily in a group. Students' inquiry, hypotheses, and interests are highly valued. Learning is constructed on the ideas that the students already have. Thus, the learning is interactive and not repetitive.

Teachers have an interaction with students to construct their knowledge. Knowledge is seen as dynamic with experience. Finally, the student's knowledge and the acquisition of higher-order skills can be assessed through observations and points of view.

Constructivist Teaching

Constructivist teaching is based on the idea that learning occurs as learners are actively involved in a process of meaning and knowledge construction as opposed to passively receiving information (Audrey Gray, 1996).

Knowledge is not a thing simply shared by the teacher in the classroom, but it should be constructed through the active participation of learners in the teaching-learning process and the mental process of development. Learners are the builders of the knowledge and the creators of the knowledge. A teacher should facilitate a learning environment that is conducive and suitable for such learners. Piaget (1975) viewed that learners encounter an experience or conflict with the way of thinking that gives rise to a State of imbalance. Now, negotiation connects teachers and students in a common purpose. It is the customs building teaching to fit the individuals who attend the class. Constructivist teaching offers options and choices for the students.

There are several components to be included in constructivist teaching. A teacher can incorporate the main components in planning the lesson. The following are from the 5E model encompassing the phases Engage,

Explain, Explore, Extend, and Evaluate; steps which educators have traditionally taught students to move through in phases.

Engage: Students are acquainted with the concept through connecting to prior knowledge or linking with earlier lessons discussed, contextual situations, experiments followed by questions to think or analyze.

Explain: This phase is meant for the treatment of the concepts or the procedures with various strategies and methodologies. Explanations given to the concepts, providing illustrations with analogies, asking questions to scaffold are the main activities during this phase of teaching.

Explore: The teacher will allow students to do some activities or experiments, discussions, and student explanations. The use of appropriate learning resources will support learners to gain knowledge. A teacher can provide a task for collaborative learning. Concept maps and graph organizers can be used as scaffolding devices to explain the links and concepts assess the attainment of concepts, check for anticipated and unforeseen misconceptions, etc.

Extend: This phase includes providing new situations, problems or questions wherein the students can apply the concepts to identify principles learnt in the situations provided or solve the given problem or be able to work in the given situation by applying what is learnt.

Evaluate: The teacher will review the lesson by asking questions on the subject matter covered in the class by keeping the learning objectives in mind. Students' attainability is evaluated in this phase. The teacher's role is to clarify misconceptions if any.

At the end of the unit, a teacher should relate the application of what is learnt with real life.

Constructivist Teacher and Digital Pedagogy

Teachers play multiple roles in facilitating learning, such as connecting to prior knowledge, demonstrating, explaining, reinforcing, giving examples with analogies, giving tasks to perform, scaffolding, forming groups and assigning tasks, assisting and guiding learners and evaluating the learning outcomes. (Barber Wendy, King & Sylvia Buchamn, 2015).

In all the phases various kinds of technologies can be used to enrich the teaching-learning process effectively. The teacher provides students with experiences that allow them to hypothesize, infer, observe, predict, classify, and invent. The constructivist teacher fosters critical thinking and creates active and motivated learners.
Constructivist teachers must acquire competencies in various skills including selection, collection, production, reflection, and presentation of digital content.

Selection: Student teachers are instructed to navigate the content in technology-mediated contexts, and evaluate the quality and validity of the sources

Collection: Student teachers are trained to compile exciting and accessible materials for learners. They have to provide a wide range of problem-solving and practical skills to facilitate children's learning.

Production: Student teachers can create their e–materials, which can help enhance their creativity and digital literacy. Digital demonstration will encourage the student teacher to explain any content thoroughly.

Reflection: It is important that when creating materials for physical science learners it is important to conduct a needs analysis to present materials that are motivating and age-appropriate and work closely with software developers to create sound pedagogical resources.

Presentation: An effective presentation is possible with a suitable lesson plan and practices of teaching skills. Student-teachers should develop their potential with suitable communication skills and technological skills.

Statement of the Problem

The problem selected for the study is "Effectiveness of Digital Pedagogy on Teaching Competency in Physical Science among B.Ed. students with special reference to Constructivism". The investigator attempts to study the effective use of digital pedagogy by the teacher trainees in physical science.

Objectives of the study

- To study the effectiveness of digital pedagogy among the student teachers in their teaching competency in physical science in the constructivist style of teaching.
- To compare the teaching competency in the teaching of physical science with skill-based ICT approaches and through the conventional approach.
- To find out the achievement of student teachers with digital pedagogy using emerging technologies and the internet to meet the needs of the individual learners.
- To find out the achievement of students for the various stages of development of lessons such as Engage, Explain, Explore, Extend, and Evaluate with the use of digital pedagogy.

Hypothesis

- Student teachers who have practised in digital pedagogy will be competent in the teaching of physical science in the constructivist style of teaching.
- There is no significant difference between the mean scores of the pretests of experimental and control group students.
- Student teachers who have practised digital pedagogy differ significantly in their teaching competency.
- There is a significant difference between the student teachers using the digital pedagogy and the student teachers using the conventional method in various stages of development of lessons such as Engage, Explain, Explore, Extend, and Evaluate.

Need for the study

To bring effective improvement in the quality of teacher education, it is necessary to focus attention on emerging technologies. Now, many teachers are thinking of using recent technological advancements to enrich their teaching competency. Physical science teachers are not exceptional. The use of digital pedagogy at the B.Ed. level will support them to enrich their teaching competency. Hence, it is important to study the effectiveness of digital pedagogy in physical science at the B.Ed. level.

Scope of the study

The investigator attempted to know the effectiveness of digital pedagogy on teaching competency. The study will be of great help for the student teachers and teacher educators since the concept of teaching has been changing from time to time. One can teach well only when he has a better teaching competency. In

this context, the investigator attempted to study the effectiveness of digital pedagogy on teaching competency at the B.Ed. level.

Review of Related Literature

Dominik PetKo (2012) examines teacher affiliation for the constructivist style of teaching which is often considered to facilitate the pedagogical use of digital media. The study's survey of 357 Swiss secondary school teachers revealed a significant positive correlation between will, skill and tool variables and the combined frequency and diversity of technology used in teaching.

M Ally (2014) used the competency profile for the digital teacher to train and orient the digital teacher of the future and the research revealed that emerging technologies, artificial intelligence and the internet will make the student-teacher meet the needs of the individual learners.

Salin S.N and Noor Aida Mohammad (2018) conducted a survey to examine the attributes of meaningful learning that student teachers perceived as enabling them to improve their digital pedagogy. The findings reveal that the attributes of meaningful learning activities contribute to the improvement of teachers' knowledge of and skills in using Web 2.0.

Sarah Prestridge (2008) suggested that skill-based ICT practices could be considered for those teachers who are operating in a traditional teacher-centred approach where developing skills are in focus. Interestingly, these teachers agree with beliefs that align with digital pedagogies.

Methodology

The present study is experimental research. The method used for the study was the experimental method. The nature of the experiment is pre-posttest equivalent group design. The independent variables in the study were the teaching of physical science. The dependent variable in the study was the teaching competency using Digital Pedagogy concerning constructivism.

The population of the study was those students studying B.Ed. and Integrated B.Ed. programme with a pedagogy of physical science as one of the courses in the Karnataka State. A Random sampling technique was used to select the sample. The sample selected for the study consisted of 77 student teachers studying B.Ed. and Integrated B.Ed. programmes at the colleges in Mysuru district with the pedagogy of physical science as one of the course papers. Among them, 39 belong to the experimental group and 38 belong to the control group based on their preference between digital pedagogy and conventional one.

The investigator developed a tool and named it 'Digite(a)ch' that comprises various digital technology tools to facilitate the student teacher to select, collect, produce, and reflect the content cum methodology. This tool was made available to the student-teacher in the cloud platform so that they could operate at any time. The researcher validated it for the present study. The researcher also developed a tool called evaluation Proforma which contains criteria for evaluating the teaching competency with special reference to constructivism.

Student teachers in both the experimental group and control group prepared the unit plan and lesson plans for chapter 8, 'MOTION' in the 9th standard Science book of NCERT publication. Student teachers prepared a suitable lesson plan for teaching the content in the constructivist approach. The experimental group prepared PowerPoint, blogs, and stored them in the database. They have downloaded

the suitable simulations and animations from the websites and stored them in the database. The experimental group prepared questions for continuous assessment to conduct online testing. In this study, the t-Test to analyze the differential hypotheses is the statistical technique used.

Analysis of Data

The data collected through the experimentation were processed and the results are presented in the tabular form. The mean and standard deviation were calculated for the variables. All the data were analyzed with a level of significance established at 0.05 levels.

Table-1: 't'- test for the mean of the Pre-test scores of control and experimental group student teachers with respect to the different phases in the teaching-learning process

Phases	Group	Number	Mean	S.D.	Calculated 't' value	Remarks
Engage	Experimental	39	1.2256	1.1799	0.0030	N.S
	Control	38	1.2271	1.1563		
Explain	Experimental	39	0.7524	0.7456	0.0833	N.S
	Control	38	0.7612	0.8795		
Explore	Experimental	39	0.5612	0.6854	0.1312	N.S
	Control	38	0.5647	0.6956		
Extend	Experimental	39	0.2145	0.5544	0.2141	N.S
	Control	38	0.2204	0.5124		
Evaluate	Experimental	39	0.2714	0.8454	0.0385	N.S
	Control	38	0.2965	0.8714		

The 't' values from table 1 show that there is no significant difference between the experimental and control groups concerning different phases of the teaching-learning process. The mean scores of the experimental group and control group reveal that both the groups are equal in different phases of the teaching-learning process. Hence, the framed null hypothesis is accepted.

Table-2: 't'-test for the Mean of Differences of Pre and Post-test scores of control group students concerning phases of the teaching-learning process

Phases	Number	Mean of differences	Standard error	t value	Remarks at 5% level
Engage	38	7.7895	2.8102	17.0835	Significant
Explain	38	8.0756	2.7584	18.0124	Significant
Explore	38	8.3125	2.0654	23.2130	Significant
Extend	38	8.5124	2.0456	25.2452	Significant
Evaluate	38	8.6235	1.9968	27.2564	Significant

Table 2 shows that 't' values of the control group are significant at 0.05 level. This reveals that there is a significant difference between the mean scores of pre and post-test of the control group in the different phases

of the teaching-learning process. It is therefore concluded that the conventional method of teaching has made a significant achievement to the control group students in all the phases.

Table-3: 't'-test for the Mean of Differences of Pre and Post-test scores of experimental group students concerning the phases of the teaching-learning process

Phases	Number	Mean of differences	Standard error	t value	Remarks at 5% level
Engage	39	11.1254	3.1514	23.5645	Significant
Explain	39	11.8565	3.7545	24.1425	Significant
Explore	39	13.5241	2.5625	26.8456	Significant
Extend	39	14.2151	2.2541	28.3256	Significant
Evaluate	39	14.9656	1.3365	31.256	Significant

It is found from Table 3 that the calculated t values are significant at 0.05 level. This suggests that there is a significant difference between the mean scores of the pre and post-test of the experimental group concerning different phases of the teaching-learning process. It may be Stated in other words that the experimental group students practised through digital pedagogy performed significantly in the phases of the teaching-learning process such as Engage, Explain, Explore, Extend, and Evaluate.

Table-4: 't'-test for the mean of post-test scores of experimental and control groups of students concerning the phases of the teaching-learning process

Phases	Group	Number	Mean	S.D.	Calculated 't' value	Remarks
Engage	Experimental	39	14.2356	3.2345	8.7584	Significant
	Control	38	8.2565	2.8795		
Explain	Experimental	39	13.9656	3.4154	7.5142	Significant
	Control	38	8.2356	2.4578		
Explore	Experimental	39	14.2536	3.1854	7.3564	Significant
	Control	38	7.9656	2.5465		
Extend	Experimental	39	14.1547	3.0025	10.4174	Significant
	Control	38	8.1235	2.1454		
Evaluate	Experimental	39	14.2535	3.2464	8.5648	Significant
	Control	38	8.4547	2.1014		

Table 4 shows that the observed 't' value is significant at 0.05 level. It is inferred that the Experimental and Control group students are not similar in the post-test concerning the different phases of the teaching-learning process. The higher mean scores achieved by the experimental group may be due to the effect of digital pedagogy. The framed hypothesis is accepted.

Table-5: 't'-test for the Mean gain scores of control and experimental groups of students concerning the phases of the teaching-learning process

Phases	Group	Number	Mean	SD	't' value	Remarks at 5% level
Engage	Experimental	39	11.1254	3.1965	6.1325	Significant
	Control	38	7.7895	2.7896		
Explain	Experimental	39	11.8565	3.1254	7.6545	Significant
	Control	38	8.0756	2.4758		
Explore	Experimental	39	13.5241	2.6595	7.9965	Significant
	Control	38	8.3125	2.2125		
Extend	Experimental	39	14.2151	2.5142	8.0145	Significant
	Control	38	8.5124	2.1125		
Evaluate	Experimental	39	14.9656	2.0123	8.2534	Significant
	Control	38	8.6235	2.0656		

Table 5 shows that the observed 't' values are significant at 0.05 level. It is inferred that the control and experimental group students are not similar in the post-test concerning the phases of the teaching-learning process. The higher mean scores achieved by the experimental group may be due to the effect of the experimental treatment given through digital pedagogy. Hence, the framed hypothesis is accepted.

Findings of the Present Study

Based on the pre-test scores, it is observed that both control and experimental group students are having similar mean scores. There is no significant difference in the mean scores of experimental and control groups concerning different phases of the teaching-learning process. Based on the analysis of pretest and post-test scores of the control group, it is observed that there is a significant difference of 0.05 level in all the phases of the teaching-learning process which shows that the control group students have performed equally in the pre-test and post-test. The conventional method influenced the control group better. From the analysis of pre and post scores of experimental group students, it is observed that the impact of digital pedagogy was significant among the experimental group. The experimental group of students achieved significantly higher gain scores than the control group students. The experimental group students exposed to digital pedagogy achieved more score gains in the different phases of the teaching-learning process such as Engage, Explain, Explore, Extend, and Evaluate.

Discussion and Conclusion

Pre-test scores analysis shows that there was no significant difference in the previous teaching competency of both experimental and control groups in all five phases. This shows that both the groups are equal before the treatment. When the pretest and post-test scores were compared, it was found that the traditional method of teaching and teaching through digital pedagogy was significantly effective. Achievement of both groups was found significant. As the gain scores analysis is more suitable and appropriate, it showed that the teaching competency of the students in the experimental group was significantly higher than the students in

the control group. The digital pedagogy might have helped the students to teach effectively and efficiently as well as it helped to exhibit all constructive teaching skills. It is to be noted that the previous studies as well as the present study have found that significant effects like digital pedagogy in the teaching-learning process led to the effective teaching competency of the B.Ed. students in physical science.

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Research Article

Role of Social media in Learning Science

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Abstract

The means of communication and information dissemination are being revolutionized by social media. Today, there are a plethora of social networking sites to choose from. It is undeniable that social networking platforms have a huge effect on both "digital natives" and "digital immigrants." The researcher attempted to investigate the role of social media in learning science subjects, taking into account the impact of social media on both "digital natives" and "digital immigrants." The study adopted a mixed-method research design. The case study survey method was employed to conduct the research. The purposive sampling method was employed to select a public school from the Dhenkanal district of Odisha. 150 Senior Secondary and Secondary school students studying in classes 9 to 12 participated in the study. A questionnaire was prepared with 30 items to collect the data. The findings of the study revealed that social media plays an important role in the teaching-learning process. Social media when used creatively and mindfully could be very beneficial to the students as well as the teachers. Several drawbacks were identified for using social media in learning.

Keywords: Communication, Engagement**,** Information dissemination, Learning process, Social media, Science Education

Introduction

Technology's rapid advancement has caused a paradigm shift in every aspect of our lives including education (Varish & Sharma, 2020). In this digital age, attempts should be made to improve people's lifestyles to keep up with the latest trend. The recent COVID-19 pandemic turned out to be a blessing in disguise for technology adoption across all social strata. Almost all simple transactions were digital, and people's apprehension about using technology decreased. This could be seen as a move closer to the Government of India's Ministry of Electronics and Information Technology launching the Digital India program, which aims to turn India into a digitally empowered society and knowledge economy. The government has also made continuous efforts in the field of education to close the digital divide. The Ministry of Human Resource Development, Government of India, took one such commendable step by launching Study Webs of Active Learning for Young Aspiring Minds (SWAYAM). In addition, the NEP 2020 proposes establishing a National Education Technology Forum to provide a forum for the free exchange of ideas about how to use technology to improve learning, evaluation, planning, and administration. Formal learning is being replaced by technology-enhanced learning. In recent times, a multitude of educational platforms are available. Technology integration is no longer limited to the classroom. With the ease with which the internet can be accessed, a variety of options for communicating, collaborating, networking, exchanging information, and constructing knowledge are accessible at any time and from any place. One such platform which has become a part and parcel of every individual is social networking sites or social media.

Rationale of the study

The means of communication and information dissemination are being revolutionized by social media. Social media is described by the Government of India's Ministry of Communications and Information Technology as "any web or mobile-based platform that allows a person or agency to communicate interactively and share user-generated content." It is an Internet-based platform that allows sharing of information (Bassell, 2010). Dabbagh and Reo (2011) explained Social media as "a type of online tool used to establish and maintain the connection with friends and acquaintances". It offers multiple opportunities for students to be engaged, form networks, and learn social skills (Dragseth, 2019). The basic aspect of social media is that it links like-minded individuals, allowing them to interact and build awareness that contributes to community sustainability.

Today, there are a plethora of social networking sites to choose from. Numerous software and applications are being produced in the market as a result of technological advances. Collaboration projects, blogs and microblogs, content communities, social networking platforms, virtual gaming environments, and virtual social worlds were all classified as social media by Kaplan and Haenlein in Framework & Guidelines for Use of Social Media for Government Organizations, published in 2010.

It is undeniable that social networking platforms have a huge effect on both "digital natives" and "digital immigrants." According to Oberst et al. (2017), social media is appealing because it serves as a forum for young people to shape social identities. Social media is a "highly visible factor in the daily lives of our students" (Fiona &Ingo, 2018) and has a major effect on psychological well-being and satisfaction (Choi & Noh, 2019). Studies have identified that social media has had a major impact on how people learn (Ellis & Ellis, 2015; Greenhow & Lewin, 2016; Mpungose, 2020). Social media has revolutionized how the new generation "learns, communicates, and develops" (Rajasekhar & Jaishree, 2020). Social media allows for collaborative online learning and can impact both students and teachers (Clement, 2020). In the educational process, social media not only aids in communication and networking, but also in the sharing of learning materials among learners, teachers, experts, and others (Joan, 2020).

Studies have shown that using social media plays a significant role in the teaching-learning process. Learning when combined with social media in teaching prospective science teachers' TPACK was successful (Setiawan & Phillipson, 2019). Social media not only aids in learning but also aids in changing young learners' perceptions and interactions in science (Wilson & Boldeman, 2012). Social media has demonstrated its ability to bridge the gap between science and family by allowing children to engage with science at home through social media platforms (Tyler & Vanstone, 2017). Also, science teachers believe that social media when used as a tool, offers opportunities for students' advancement (Akif et al, 2020). When utilised for collaborative learning, social media has a significant influence on engagement with students, tutors, and virtual knowledge exchange (Ansari & Khan, 2020). Furthermore, the efficiency of social media in strengthening students' communication abilities in the issue of fluids was discovered (Fatimawati et al, 2019). Social media has been proven to be a useful technique for improving communication between teachers and students (Khatun & Al-Dhlan, 2017; Sahrain et al, 2020). The internet and online social media were useful in enhancing productivity

and contentment, with the goals of encouraging internet users to communicate with others and increasing the number of online communication partners among teenagers with complex communication needs (Grace et al, 2014). When used in conjunction with a multimedia-based curriculum, social media has been shown to improve creativity among students studying art, design, and digital media (Al Hashimi et al, 2019). The Physics Learning Media course, which was aided by Instagram, proved excellent in improving students' creative thinking abilities (Irwandani et al, 2020). Furthermore, social media contributed to the improvement of university students' reading skills (Al Momani, 2020). Evidence of extensive social media use was reported in language acquisition (Istifci & Dogan, 2021).

Research questions

1. Do social media play any role in learning science? If yes, how?
2. Is social media a boon or bane for the students in learning science?

Objectives of the study

The researcher after a review of the literature and considering the influence of social media on the "digital natives" as well as the "digital immigrants" felt the need to study the role of social media in learning science subjects. The objectives of the study were taken as:

- To explore the different types of Social Networking Sites (SNSs) that students use.
- To investigate the role of social networking sites (SNSs) in science education.
- To study the benefits and disadvantages of using social media to learn science.

Operational definition

Social media: Social media is a technology-enabled medium where anyone may engage and exchange information, ideas, knowledge, and any kind of expression or thinking.

SNSs: A virtual community that links and allows both students and teachers to exchange ideas, study, educate, and share information and knowledge.

Methodology

Research design: The study adopted a mixed-method research design. The descriptive survey method was employed to conduct the research.

Population

Senior Secondary and Secondary school students studying in the public schools of Odisha were considered as the population for the study.

Sampling methodology and samples

The purposive sampling method was employed to select a public school from the Dhenkanal district of Odisha. 150 Senior Secondary and Secondary school students studying in classes 9 to 12 participated in the study.

Tool

A questionnaire was prepared with 30 items to collect the data. The survey was divided into four parts. The first section included demographic details, such as gender, age, and the class they were studying, as well as the resource availability for access to SNSs. The second section included items for extracting knowledge from SNSs as well as the fundamentals of their use. The third section contains an item about how social media aids science learning and students' perception toward using it as a learning tool. The final segment contains items to determine the

disadvantages, if any, of using social media to learn science.

Result and findings

The analysis of the data indicated various findings which are discussed below.

Demographic findings and general information about social media usage

A total number of 150 students studying in class 9 to 12 participated in the study. Out of which, 62.5 percent were male and 37.5 percent were females. The maximum number of participants (52.8 percent) were studying in grade 11th, while 21.5 percent were in grade 12th students, 13.2 percent in grade 9th and 12.5 percent were studying in grade 10th.

Table-1: Demographic information of the students who participated in the study

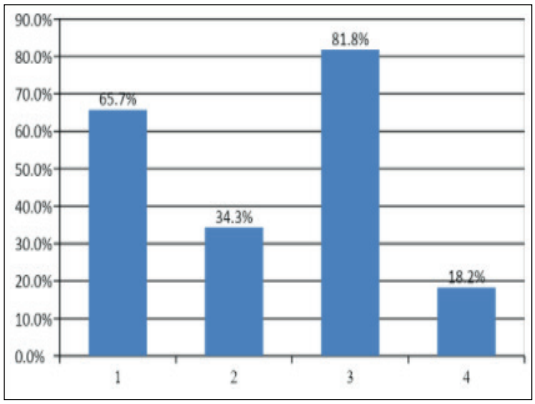
Grade				Gender		Age		
9th	**10th**	**11th**	**12th**	**Female**	**Male**	**13-14 years**	**15-16 years**	**17-18 years**
13.2%	12.5%	52.8%	21.5%	37.5%	62.5%	20.8%	52.8%	26.4%
20	19	79	32	56	94	31	79	40
Total	150			150		150		

65.7 percent of the students reported owning their smartphones while 34.3 percent do not.

97.9 percent of the students confirmed, having an internet connection while 2.1 percent do not have an internet connection.

A maximum of the students (81.8 percent) were found to be active on social media and they reported having a social media account.

Graph-1: Personal attributes of the students



50 percent of the students were found to be using social media mainly to update about the happenings in the world.

63.4 percent of the students were found to be fully aware of the opportunities offered by social media in the learning of science.

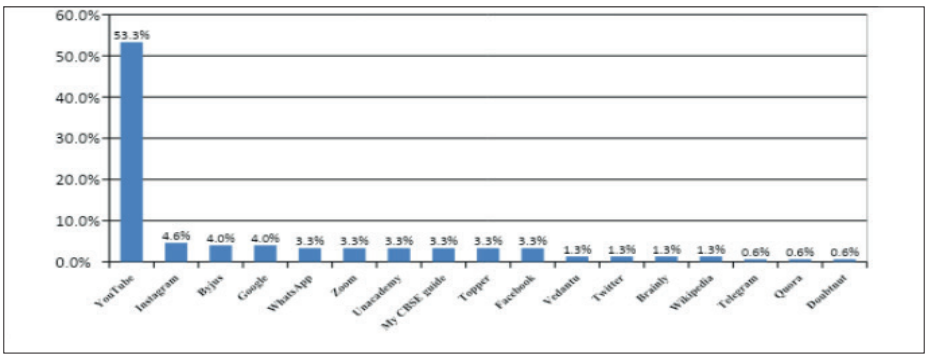
Objective-1: To find out various categories of Social Networking Sites (SNSs) used by the students.

YouTube was the most frequently used SNSs by the students for learning science. Applications that are based on educational purposes like Byju, Unacademy were also found to be in use by the students. Facebook, Whatsapp, Telegram, Twitter were also reported to be used for learning science.

Table-2: (SNSs) used by the students for learning science

SNSs	No. of students using it	Frequency
YouTube	80	53.3%
WhatsApp	5	3.3%
Telegram	1	0.6%
Vedantu	2	1.3%
Zoom	3	3.3%
Unacademy	3	3.3%
Byjus	6	4%
My CBSE guide	3	3.3%
Topper	3	3.3%
Instagram	7	4.6%
Twitter	2	1.3%
Quora	1	0.6%
Facebook	3	3.3%
Brainly	2	1.3%
Wikipedia	2	1.3%
Google	6	4%
Doubtnut	1	0.6%

Graph-2: (SNSs) used by the students for learning science



Objective-2: To explore the role of SNSs in learning science

81.1 percent of the students used social media platforms for learning science. Except for 3.5 percent, 80.6 percent of the students found learning science from the social media platform interesting while 16 percent of them were unsure.

70.7 percent of the students also reported that using social media in learning science increases the interest as well as the attention of students towards the subject.

62.5 percent of the students reported the effectiveness of learning science from social media platforms, while 9.7 percent do not feel its effectiveness.

The students reported that 40.3 percent of the science teachers used social media platforms for teaching, 37.5 percent used it sometimes and 22.2 percent never used social media platforms for science teaching.

Except for 4.9 percent of the students, other students agreed that social media could be used as a learning platform for science.

80.5 percent of the students reported that social media helps to collaborate with other students for science learning.

86.8 percent of the students expressed that social media provides entertaining and mind stimulating activities for learning science which makes learning joyful and interesting.

88.9 percent of the students Stated that social media if used creatively could be used very successfully in learning science.

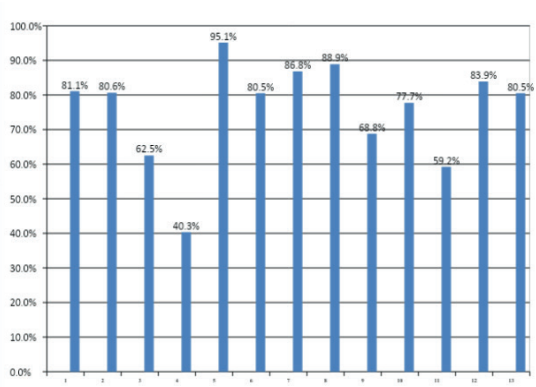
68.8 percent of the students ascertained that social media could be used as a tool for learning sciences by linking it to real-life situations.

77.7 percent of the students felt that social media provides a platform for the students to interact with experts in sciences.

59.2 percent of the students Stated that social media plays an important role in nurturing learners' instinctive curiosity and encouraging the spirit of inquiry.
83.9 percent of the students reported that social media supports various learning styles and through social media, a learner can learn at their own pace.

80.5 percent of the students reported that plenty of learning materials for science subjects are available on social media platforms. It makes them independent learners and can learn anytime from anywhere.

Graph-3: Role of SNSs in learning science



Objective-3: To study the challenges and drawbacks of using SNSs in learning science

43.7 percent of the students reported that social media could be a great distraction for students. It could distract the students from learning and sometimes end up in social media addiction. Moreover, 70 percent of the students opined that social media is not easy for all students to manage for educational purposes.

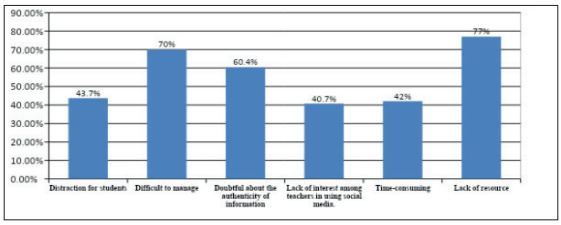
60.4 percent of the students were not sure if social media provides authentic information. The content that is disseminated and the learning materials that are made available online can be deceiving at times.

40.7 percent of the students expressed that there is a lack of interest among teachers in using social media. Because of this social media usage could be restricted in classrooms and schools.

42 percent of the students felt that learning through social media is time-consuming as it requires lots of searching and filtering the information.

77 percent of the students Stated that social media could be restricted in the learning process if proper resources in the form of smartphones, PCs, internet connection, etc. are not available to the students as well as the teachers.

Graph-4: Challenges and drawbacks of using SNSs in learning science



Discussions

According to the findings, the majority of students (65.7 percent) own mobile phones and have 97.9 percent internet access, highlighting the importance of the internet and smartphones in everyone's lives. Zachos et al. (2018) and Lenhart (2015) agree with the study's findings. The study found YouTube to be the most popular social media platform among students, contrary to the findings of Alabdulkareem (2014), Tess (2013), and Sánchez (2014), who found Whatsapp and Facebook to be the most popular media networks, respectively. WhatsApp was proven to be quite successful in increasing teacher and student involvement by Khatun and Al-Dhlan (2017). The study also demonstrates the importance of social media in the classroom. Gray et al. (2013) discovered a similar result in their study. It was confirmed that using social media to collaborate with other students for science learning and interaction is beneficial, which is consistent with Dragseth's (2019) and Wilson and Boldeman's (2012) findings. The study reveals 40.3 percent of science teachers use social media platforms for teaching. It may be due to a lack of resources in educational institutions or a lack of technical knowledge on the part of the teachers. Platforms on social media offer engaging and mind-stimulating activities for studying science, which not only makes learning enjoyable and interesting but also draws the attention of young students. According to the study, social media plays an important role in education and learning. When utilised creatively and efficiently, it promotes learning. This conclusion is consistent with the findings of Alabdulkareem (2015), who

observed that instructors and students are enthusiastic about utilising social media in the classroom, believing that it will enhance their learning experiences. However, the study discovered significant drawbacks to adopting social media as a learning tool. Some of the limitations highlighted in the study, similar to Hussain et al. (2018) were social media addiction owing to frequent use, doubtful information on social media, and a lack of suitable learning materials.

Conclusions

The findings of the study revealed that various information regarding the role of social media in the educational process of learning science. It was found that social media plays an important role in the teaching-learning process. Social media when used creatively and mindfully could be very beneficial to the students as well as the teachers. Several disadvantages of using social media were also identified. It is the responsibility of the teachers and the parents to monitor the usage of SNSs by the students. Digital education should be imparted to students from a very young age. They should be kept aware of the benefits and drawbacks of using social media at all times. To guide and protect them from cyberbullies and cybercriminals, appropriate information should be disseminated at the appropriate time, and in the appropriate direction. Along with the students, the teachers, and the educators should also upskill themselves with new technology. Learning, when integrated with technology, is more interesting and much more impactful.

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Research Article

Effectiveness of Online Support Services during Covid-19: A case study of IGNOU

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Abstract

The pandemic Covid-19 has compelled human society to maintain social distancing and it has not allowed us to continue our education through the traditional face to face mode. It has taught us to opt for platforms with technologies, which have not been used before. In this situation, many students are preferring their education through Open and Distance Learning (ODL) or online learning mode. Most of the educational institutions are also offering online support services to tackle the pandemic Covid-19 situation. In order to understand the effectiveness of online support services an online survey using Google form was conducted among learners, coordinators, and counsellors of Indira Gandhi National Open University (IGNOU) during the lockdown period for Covid-19. The data collected through questionnaires were put together in the form of tables and a simple percentage method is used for the analysis. Their views are analyzed and found some important factors which are required to enhance the effectiveness of online support services. It is very interesting to note that about 88 percent of learners prefer online mode of admission but only 17 percent of learners prefer a soft copy of the study materials. Maximum learners are agreeing to continue online induction meetings and online counselling classes in future. The majority of the learners, coordinators & counsellors recommended conducting online examinations and online evaluations.

Keywords: Online support services, ODL system, Effectiveness, Covid-19, IGNOU

Introduction

Education enables human beings to lead them in the right direction. Real education enables one to stand on one's legs and makes them perfect. Perfection indicates the ability of human beings to address various aspects of life encountered in society. The development of an individual and the progress of a nation depend on education. The education sector is a critical determinant of a country's economic future. But, the sudden outbreak of Covid-19 has badly affected the education sector of the whole world. The pandemic Covid-19 has not allowed us to continue our education through the traditional face to face mode. The entire idea of education from the primary level to the highest level realized a major change and it has taught us to adopt new methods of education with technologies. In this situation, many students are preferring their education through ODL or online learning mode. ODL facilitates open entry and access to learning opportunities enhances the employability skills of the learner and makes them achieve their goals in life. Distance education institutions play a vital role in providing higher education to all irrespective of the limitations imposed by social status or demographic constraints. The ODL system was encouraged in the early eighties and became famous in India after the establishment of IGNOU in 1985. Since then IGNOU has been playing the leading role in India for the ODL system. The support services at IGNOU are managed through the

Regional Services Division (RSD) with the support of Regional Centers (RCs) and Learner Support Centers (LSCs). RCs are established by the University to coordinate and supervise the work of LSCs in the region (IGNOU profile). The LSCs are headed by a Coordinator with other supporting functionaries. The academic counsellors are mostly drawn from the conventional system of higher education. The RCs and LSCs provide facilities in terms of admission, counselling, assignment evaluation, conducting Term End Examination (TEE) etc. The Covid-19 has affected educational systems worldwide, leading to closures of schools, colleges and universities. Most governments temporarily closed educational institutions in an attempt to reduce the spread of pandemic Covid-19. The only way to stop the spread of this deadly virus was to maintain social distancing. India went under complete lockdown from the 25th of March, 2020. It has affected approximately 825 million students due to school closures in response to the pandemic (Wikipedia). In India, more than 32 crores of students have been affected by the various restrictions and the nationwide lockdown for Covid-19. Though it is an exceptional situation in the history of education, Covid-19 has created many challenges and opportunities for educational institutes to strengthen their technical knowledge and infrastructure (Pravat, 2020a). The lockdown has given them a ray of hope for teachers and students to continue their educational activities online. The Ministry of Human Resource Development (MHRD), Govt. of India has taken several digital initiatives to continue learning during the pandemic Covid-19 (Pravat, 2020b). During the lockdown period for Covid-19, online learning is the best platform to keep learners/educators engaged and safe by maintaining social distance. The Govt. of India has initiated different online learning platforms to continue educational activities during the lockdown period which have also been recognized by UNESCO and World Bank (Pravat, 2020c). IGNOU has not stopped its support to the learners and has been providing online support services during the pandemic Covid-19. Based on the MHRD/UGC order (UGC), IGNOU has also used various platforms and ICT initiatives to reach out to learners all over the country and internationally in partner institutions. In an earlier study, Garg, S et al. (2013) had emphasized on digitization of all support services of IGNOU including admission, counselling, and assessment system. They had also suggested proper training to all stakeholders of IGNOU on digitized support services. Sood, N (2020) has studied the online teaching-learning process of IGNOU during Covid-19 and found that the majority of the learners (about 74 percent) expressed excellent and very good experience on online teaching-learning methods. The study by Agarwal, S et al. (2020) also support that online learning is feasible and student satisfaction is very high. In most of the studies, network connectivity and technical knowledge were the major problems faced by teachers as well learners. In this study, an attempt has been made to understand the effectiveness of online support services provided by IGNOU during Covid-19 times.

Objective of the Study

The objective of the study is to:

- Analyze and understand the effectiveness of online support services during pandemic Covid-19.
- Analyze the views/perceptions of learners and their suggestions for future learners.
- Analyze the views/perceptions of Coordinators/Counsellors and their advice for improvement of the system.

- Suggest corrective measures to improve the online support services of IGNOU.

Sample Size and Methodology of the Study

An online survey was conducted among IGNOU learners during the lockdown period for Covid-19. The structured questionnaires were distributed to the email addresses of learners, coordinators, and counsellors of IGNOU Regional Centre, Bhubaneswar through Google form. Records of students were obtained from University records. Two sets of questionnaires were prepared, one is for learners and the other is for coordinators/counselors. For learners, the Google form consisted of 20 questions with 1 open-ended question for their comments and 427 learners responded. The Google form for counselors/coordinators consisted of 15 questions with 1 open ended question for their comments and 50 counsellors/coordinators responded. The sample size for analyzing the responses of learners is 427, whereas the sample size for coordinators/ counsellors is 50. The study undertaken includes both primary and secondary data. The primary information for the study was collected through questionnaires. The secondary data was obtained from various journals, books, magazines, and websites. The data collected through questionnaires were put together in the form of tables and a simple percentage method is used for the analysis. The perceptions/views of learners, coordinators and counsellors are collected and an attempt has been made to understand the effectiveness of online support services of IGNOU during the pandemic Covid-19. Lessons learned on the effectiveness of online support services of IGNOU are personal views of the author which are based on analysis of the data received from the respondents and his own experience.

Limitations of the Study

Every research study has some limitations. Some of the limitations observed in the study are pointed as below:

- The primary data is collected through a structured questionnaire and the sample size is only limited to 427 learners and 50 coordinators/ counsellors.
- The perception of the respondents is limited to the period of the study.
- The study is limited to the lockdown period due to pandemic Covid-19.

Findings of the Study

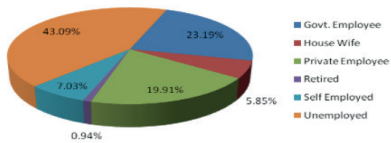
To understand the various factors on the effectiveness of online support services of IGNOU, one online survey was conducted and a total of 427 learners and 50 counsellors/coordinators responded. Their responses are analyzed through the following tabular data and figures:

Table-1: Programme wise classification of Learners

Programmes	Master's Degree (MDP)	Bachelor's Degree (BDP)	Management (MP)	Bachelor's of Education (B.Ed)	P.G Diploma	Diploma	Certificate
No. of respondents (%)	142 (33.26%)	123 (28.81%)	9 (2.11%)	45 (10.54%)	32 (7.49%)	56 (13.11%)	20 (4.68%)

Among the respondents, it is observed that the highest number of learners from the Master Degree Programme attended online classes, whereas the lowest number of learners of Management Programmes attended the online classes. Sizable learners from both MDP and BDP are showing interest in online classes as per the present sample.

Figure-1: Employment status of Learners



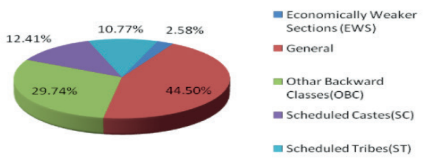
It is observed from Figure-1 that the highest numbers of unemployed learners (43.09 percent) are showing interest in online support services. The Govt. employed learners are showing more interest than the private and self-employed learners for online activities. The lowest numbers of retired persons are showing interest in online support services.

Table-2: Social status of learners

Social Status	Married	Unmarried	Male	Female	Rural	Urban	Tribal
No. of respondents (%)	115 (26.93%)	312 (73.07%)	196 (45.90%)	231 (54.10%)	268 (62.76%)	140 (32.79%)	19 (4.45%)

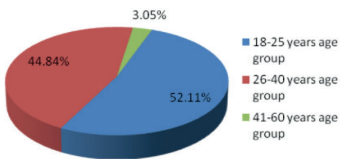
Data shows that more unmarried learners and more female learners are responding in online activities. Rural learners are found to be more responsive than urban learners for online activity.

Figure-2: Social category of learners



Data of respondents of the sample as shown in figure-2 shows that more General and OBC category learners are responding towards online activities, whereas fewer responses have been received from SC, ST, and EWS sections.

Figure-3: Age group of learners



The figure-3 indicates that more young learners in the age group of 18-25 years are responding in online activities, whereas very fewer responses are received from the learners in the age group of 41-60 years.

Table-3: Responses of learners on modes of admission

Query	**What was the mode of your fresh admission in IGNOU?**		**Do you have internet connection with your own Mobile/Laptop/ Computer?**		**How did you take online admission in IGNOU?**			
Option	Offline mode	Online mode	Yes	No	It was done by myself using Mobile/ Laptop/ Computer	It was done by Others	It was done by relatives with my knowledge	Not Applicable
No. of respondents (%)	72 (16.86%)	355 (83.14%)	417 (97.66%)	10 (2.34%)	269 (63%)	60 (14.05%)	60 (14.05%)	36 (8.9%)

Analysis of the above data shows that about 83 percent of learners have done their admission through online mode. The above study on the availability of facilities shows that 97 percent of the learners are having internet connectivity with their mobile/laptop/computer. About 63 percent of learners had done their admission by themselves using their own gadgets, whereas about 28 percent of learners had done their admission through others.

Table-4: Preference of learners on the mode of admission & type of study materials

Query	**Which mode of admission of IGNOU do you prefer?**		**Which type of study materials of IGNOU do you prefer to study?**	
Option	Offline mode	Online mode	Hard copies of materials	Soft copies of materials
No. of respondents (%)	51 (11.94%)	376 (88.06%)	353 (82.67%)	74 (17.33%)

It is observed from the above data that about 88 percent of learners prefer the online mode of admission, but about 17 percent of learners prefer soft copy of the study materials. Though maximum learners prefer the online mode of admission, very few learners like to follow soft copies of the materials. It indicates that learners are more comfortable in using hard copies of study materials during this era also.

Table-5: Perceptions of learners on online induction meeting

Query	Have you attended any Online Induction meetings?		If Yes, how did you feel by attending the online Induction meeting of IGNOU?				If NO, what was the reason for not attending the online induction meeting of IGNOU?				
Option	Yes	No	Satisfied	Not satisfied	Satisfied to some extent	Not applicable	Did not get any prior information	Do not have the facility to attend online meetings	Faced network connectivity problem	Unable to use the technology	Not applicable
No. of respondents (%)	247 (57.85%)	180 (42.15%)	109 (31.5%)	22 (6.36%)	57 (16.47%)	158 (45.66%)	117 (27.4%)	27 (6.32%)	116 (27.17%)	26 (6.09%)	141 (33.02%)

In this sample, about 58 percent of learners have attended online induction meetings and about 48 percent of learners are satisfied with attending the same. Very few learners (6 percent) are dissatisfied with the online induction meetings. The reason for not attending the online induction meeting indicates that about 27 percent of learners did not get any prior information, 27 percent faced network connectivity problems, 6 percent had no proper facility and 6 percent could not use proper techniques.

Table-6: Opinion of learners on online counselling classes

Query	Have you attended any online counselling classes?		If YES, how did you feel about attending online counselling classes?				If NO, what was the reason for not attending online counselling classes?				
Option	Yes	No	Satisfied	Not satisfied	Satisfied to some extent	Not applicable	Did not get any prior information	Do not have the facility to attend online meetings	Faced network connectivity problem	Unable to use the technology	Not applicable
No. of respondents (%)	115 (26.93%)	312 (73.07%)	99 (23.19%)	26 (6.09%)	14 (3.28%)	288 (67.45%)	177 (41.45%)	24 (5.62%)	99 (23.19%)	27 (6.32%)	100 (23.42%)

Table- 6 shows that about 27 percent of total learners have attended online counseling classes and about 26 percent of learners are satisfied in attending the same. Very few learners (6 percent) are dissatisfied with online counselling classes. The reason for not attending the online counselling classes indicates that more learners (about 41 percent) did not get any prior information, 23 percent faced network connectivity problems, 6 percent had no proper facility and 6 percent could not use proper technique.

Table-7: Views of learners on online induction meeting & counselling class

Query	Do you recommend an online induction meeting of IGNOU to continue in future?				Do you recommend the online counselling classes to continue in future by IGNOU?			
Option	Yes	No	Agree to some extent	Never	Yes	No	Agree to some extent	Never
No. of respondents	303 (70.96%)	45 (10.54%)	67 (15.69%)	12 (2.81%)	307 (71.9%)	46 (10.77%)	68 (15.93%)	6 (1.41%)

As per the data of Table-7, maximum learners (about 87 percent) agreed to continue online induction meetings in future, but about 13 percent of learners disagreed with the proposal. Similarly, more learners (about 88 percent) agreed to continue online counselling classes in future, but about 12 percent of learners disagreed with the plan.

Table-8: Recommendation of learners on online assessment

Query	**Do you recommend the process of submission of online assignment responses and evaluation by IGNOU?**				**Do you recommend for conducting TEE and evaluation through online mode by IGNOU?**			
Option	Yes	No	Agree to some extent	Never	Yes	No	Agree to some extent	Never
No. of respondents (%)	247 (57.85%)	90 (21.08%)	70 (16.39%)	20 (4.68%)	199 (46.6%)	122 (28.57%)	75 (17.56%)	31 (7.26%)

Table-8 shows that about 74 percent of learners recommended online submission and evaluation of assignments, but about 26 percent of learners disagreed with the proposal. Similarly, about 65 percent of learners agreed to conduct TEE and evaluation through online mode, but about 35 percent of learners disagreed with the plan.

Table-9: Overall perception of learners on online support services

Query	**Your overall experience on online support services provided by IGNOU**				
Option	Excellent	Satisfactory	Pleasant	Not satisfactory	Not applicable
No. of respondents (%)	117 (27.4%)	157 (36.77%)	66 (15.46%)	37 (8.67%)	50 (11.71%)

About 27 percent of the learners Stated that their experience on online support services of IGNOU is excellent. Though the majority of the learners (about 52 percent) are satisfied/feel pleasant, about 9 percent did not have such an experience and are dissatisfied. Hence, a learner-friendly approach from functionaries at all levels of the Open University towards optimizing learner satisfaction would encourage the learners to actively pursue their studies.

Table-10: Social status of counsellors/coordinators

Gender		**Employment Status**				**Present location**		
Male	**Female**	**Govt. Employee**	**Private Employee**	**Retired**	**Self Employed**	**Rural**	**Urban**	**Tribal**
40 (80%)	10 (20%)	31 (62%)	15 (30%)	2 (4%)	2 (4%)	7 (14%)	39 (78%)	4 (8%)

Data from above Table-10 shows that male respondents are higher than females. About 92 percent of the total counselors/coordinators are employed but very few (4 percent) of them are self-employed. Only 4 percent of retired counsellors/coordinators have responded to the queries. It is observed that most of the respondents of the sample belong to the urban belt and very few of them belong to the tribal belt.

Table-11: Preference of counsellors/coordinators on the mode of admission & type of study materials

Query	**Do you have an internet connection with your own Mobile/ Laptop/ Computer?**		**Which mode of admission of IGNOU do you prefer?**		**Which type of study materials of IGNOU do you prefer to follow?**	
Options	Yes	No	Offline mode	Online mode	Hard copies of materials	Soft copies of materials
No. of respondents (%)	50 (100%)	0 (0%)	1 (2%)	49 (98%)	21 (42%)	29 (58%)

It is observed from the above data that almost all respondents are using their own mobile/laptop. 98 percent of counsellors/coordinators prefer the online mode of admission, but only 2 percent prefer the offline mode. Nearly 60 percent of coordinators/counsellors prefer soft copy of the study material and 40 percent prefer to use hard copies. Though maximum coordinators/ counsellors prefer online mode of admission, about half of them like to follow hard copies of the materials.

Table-12: Perceptions of counsellors/coordinators on online induction meeting

Query	**Have you attended/ conducted any Online Induction meeting of IGNOU?**		**If Yes, how did you feel by attending/conducting an online Induction meeting of IGNOU?**			
Option	Yes	No	Satisfied	Not satisfied	Satisfied to some extent	Not applicable
No. of respondents (%)	8 (16%)	42 (84%)	8 (16%)	0 (0%)	0 (0%)	42 (84%)

In this sample, only 16 percent of coordinators/counsellors have conducted/attended online induction meetings and all of them are satisfied with this online activity.

Table-13: Perceptions of counsellors/coordinators on online counselling classes

Query	Have you conducted any online counselling classes of IGNOU?		If Yes, how did you feel by conducting online Counselling classes of IGNOU?			
Option	Yes	No	Satisfied	Not satisfied	Satisfied to some extent	Not applicable
No. of respondents (%)	13 (26%)	37 (74%)	13 (26%)	0 (0%)	0 (0%)	37 (74%)

In this sample, only 26 percent of coordinators/counsellors have conducted online counselling classes and all of them are satisfied in conducting the online counselling classes.

Table-14: Recommendations of counsellors/coordinators on online induction meetings & counselling classes

Query	Do you recommend an online Induction meeting of IGNOU to continue in future?				Do you recommend the online counselling classes to continue in future by IGNOU?			
Option	Yes	No	Agree to some extent	Never	Yes	No	Agree to some extent	Never
No. of respondents (%)	39 (78%)	1 (2%)	10 (20%)	0 (0%)	37 (74%)	3 (6 %)	10 (20%)	0 (0%)

Table-14 shows that 98 percent of coordinators/counsellors approved the online induction meeting in future, but only 2 percent of coordinators/ counsellors disapproved to proposal. Similarly, 94 percent of coordinators/ counsellors approved online counselling classes in future, but only 6 percent disapproved of the plan.

Table-15: Recommendations of counsellors/coordinators on online assessment

Query	Do you recommend the process of submission of online assignment responses and evaluation by IGNOU?				Do you recommend conducting TEE and evaluation through online mode by IGNOU?			
Option	Yes	No	Agree to some extent	Never	Yes	No	Agree to some extent	Never
No. of respondents (%)	38 (76%)	3 (6%)	9 (18%)	0 (0%)	18 (36%)	12 (24%)	19 (38%)	1 (2%)

Table-15 shows that about 94 percent of coordinators/counsellors recommended online submission and evaluation of assignments, but very few coordinators/counsellors (6 percent) disagreed with the proposal. Similarly, about 74 percent of coordinators/ counsellors agreed conducting TEE and evaluation through online mode, but 26 percent disagreed with the plan.

Table-16: Overall perceptions of counsellors/coordinators on online support services

Query	**Your overall experience on online support services provided by IGNOU**				
Option	Excellent	Satisfactory	Pleasant	Not satisfactory	Not applicable
No. of respondents (%)	15 (30%)	9 (18%)	16 (32%)	2 (4%)	8 (16%)

30 percent of counsellors/coordinators described their experience on online support services of IGNOU as excellent. Though half of the counsellors/ coordinators feel satisfactory/pleasant about online support services of IGNOU, 4 percent did not have such an experience and are dissatisfied.

One option was also given in the questionnaires for the learners and counsellors/coordinators to share their remarks on any other points on online support services of IGNOU.

Some of the important remarks by learners are listed as below:

- The online learning facilities provided by IGNOU are very good, but it needs some improvement. Prior information through SMS should be delivered to the registered mobile numbers so that more learners can participate.
- Some are requesting IGNOU to facilitate the online submission of Dissertation work/Project work. Some are requesting IGNOU to conduct online workshops and practicals also.
- Some learners pointed out that the online classes are not applicable for all learners due to the unavailability of proper network facilities in some remote areas or the lack of technical knowledge of the learners.
- Some learners suggested that offline support services should be provided in addition to online support services.
- Some learners thanked IGNOU for providing online class recordings available on YouTube & Facebook links. Some proposed IGNOU to start a fully online assessment system.

Some of the important remarks by Coordinators/Counsellors may be listed as:

- *LSCs* should be provided with all online facilities with required technical gadgets. Special application software for providing seamless online support services should be developed and implemented by IGNOU.
- All LSC functionaries and counsellors should be oriented properly about the online support services of IGNOU.
- The remuneration of counsellors for the online counselling classes should be higher than face to face counselling classes.

Discussion & Conclusion

Analysis of this study reveals some major points as discussed below:

- Most of the learners have done their admissions through online mode using their own mobile/laptop/ computer.
- Though maximum learners prefer the online mode of admission, very few learners like to follow soft copies of the materials. It indicates that learners are more comfortable in using hard copies of study materials during this era also.
- More learners are satisfied in attending the online induction meetings and very few of them are dissatisfied. The main reason for not attending the online induction meeting indicates that either they could not get any prior information or faced network connectivity issues.
- The measure reason for not attending the online counselling classes indicates that they could not get any prior information and faced network connectivity problems. So, IGNOU should take the proper initiative to provide prior information regarding the online activities, so that more learners can avail the facility.
- Maximum learners are agreeing to continue online induction meetings (about 87 percent) and online counselling classes (about 88 percent) in future.
- The majority of the learners (about 74 percent) recommended online submission and evaluation of assignments. Similarly, most of the learners agreed to conduct of online examinations and evaluations.
- Though most of the coordinators/ counsellors prefer the online mode of admission, about half of them like to follow hard copies of the materials.
- During lockdown for Covid-19, few coordinators/counsellors could conduct online counselling classes with induction meetings and all of them are satisfied.
- The majority of the coordinators/ counsellors recommended for continuing the online counseling classes and online induction meetings in future.
- Though half of the total Counsellors/ Coordinators felt satisfactory/ pleasant about online support services of IGNOU, very few of them did not have such an experience and are dissatisfied.
- IGNOU should strengthen its online support service system to tackle the pandemic situation like Covid-19 and should come forward to resolve the difficulties faced by the stakeholders. From the analysis of the paper, it is clear that most of the stakeholders are comfortable with the online support service system of IGNOU. IGNOU should provide proper orientation to all the counsellors and LSC functionaries on the provision of efficient online support services. The University policies must include various individuals from diverse backgrounds including remote regions, marginalised and minority groups for effective delivery of online support services. As most of the stakeholders of IGNOU are satisfied with online support services, it should be continued after the pandemic Covid-19 also. Further, a detailed statistical study may be undertaken to explore the possibilities of making online support services more effective.

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Research article

Status of ICT Integration in Teacher Education Institutions of Assam: An Exploratory Study

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Abstract

The present study is an attempt to explore the status of ICT integration in institutional activities, teaching, assessment, professional development, and internship of Teacher Education Institutions (TEI) of Assam. A survey method was used for the study. The sample consists of four TEIs, 20 Teacher Educators (TE) and 80 Trainees selected randomly from TEIs affiliated to Guwahati University of Assam, India. Three self-developed questionnaires were used by the investigator for data collection. The collected data were analyzed by using frequency, average and percentage and accordingly interpretations are made. The study revealed that- i) All the TEIs have minimum ICT facilities and resources available are in functional condition; ii) majority of TEIs use ICT for performing various institutional activities; iii) majority of the teacher educators were found sometimes using ICT for teaching-learning, assessment, and for professional development; iv) most of the trainees were found not using a variety of ICT devices and applications for learning and teaching during internship and v) lack of technical skills among teacher educators and trainees are major challenges in the path of effective utilization of ICT. The study has proposed for developing techno-pedagogical skills of teacher educators and trainees to effectively integrate ICT in teaching-learning, administration, assessment and evaluation as well as professional development.

Keywords: ICT, Integration of ICT, Teacher Educators, Teacher Education Institutions, Trainees.

Introduction

Teacher education plays a vital role in providing quality education to trainees and in-service teachers. Information & Communication Technology (ICT) constitutes an essential part of a teacher education programme with the purpose to help in integrating it in teaching, assessment, and professional development. For this to happen, teacher educators must possess knowledge and skills of using ICT devices and applications. Realizing the significance of ICT in teacher education, different committees and commissions in India have stressed ICT integration in teacher education. The National Policy on Education (1986) and Programme of Action (1992) stressed the need to employ educational technology to improve the quality of education. The National Curriculum Framework (NCF) 2005 position paper on "Teacher Education" Stated that the use of ICT in meaningful ways makes it easy for teachers to create interesting projects, problem-solving situations, and virtual exposures to effective learning conditions. The National Curriculum Framework for Teacher Education (NCFTE) in 2009 recommended that teacher education needs to orient and sensitize the teacher to distinguish between critically useful, developmentally appropriate and the detrimental use of ICT. The

National Council for Teacher Education Regulations (2014) has further taken the initiative to make ICT literacy a compulsory one in pre-service teacher education. Apart from these, the Government of India has implemented numerous schemes, programmes and initiatives such as DIKSHA, NROER, e-Pathshala, e-PG pathshala, PMeVidya, e-Yantra, Olabs, etc. to promote effective integration of ICT in the field of school and teacher education. It is expected that all the stakeholders of school and teacher education need to integrate ICT in teaching, assessment, professional development, and administration.

Review of Related Literature

Research in the field of teacher education has indicated a mixed finding concerning the integration of ICT in TEIs. Mohalik (2020) reported that 20 percent of trainees use digital devices for using PPT in class, create digital learning materials, and provide feedback to students during internships. Lack of infrastructure, competency, poor leadership support and attitude towards ICT are barriers in the integration of ICT indicated by Andoh (2019). Nasreen & Chaudhary (2018) found that teacher educators and trainees perceived a lack of infrastructural facilities for ICT integration in teacher education programmes. Pandey (2018) revealed that the utilization of ICT is very much essential in the theory classes of teacher education. Angadi (2016) reported that the quantity of computers and ICT used in teacher education institutions is less and it is mainly focused on the learning of ICT skills. Aslan & Zhu (2016) indicated that pre-service teachers as well as starting teachers need more training to become competent in the use of ICT in education. Ghavifekr & Rosdy (2015) found that technology-based teaching and learning is more effective in comparison to traditional classrooms in teacher education institutions. Chemwei & Koech (2014) found that there is a moderate level of integration of ICT in teacher training colleges. Ungar & Ilıuz (2014) highlighted three integration levels (basic, focused and creative) of ICT integration in teacher training. Goldstein & Shonfeld (2014) Stated that teacher training colleges incorporated a variety of ICT-based learning assignments related to presentation and learning management. Mwalongo (2011) reported that teacher educators use a wide range of ICT tools for teaching, administration, professional development, and personal use.

The above analysis indicated a smaller number of studies in the area of ICT integration in teacher education especially in the State of Assam, India. Hence, the present study "Status of ICT Integration in Teacher Education Institutions of Assam" is relevant. The investigators raised the following research questions:

Research Questions

- What are the ICT facilities and resources available in teacher education institutions?
- How ICT is integrated by teacher education institutes for performing various institutional activities?
- How ICT is integrated by teacher educators and trainees for teaching, assessment, professional development, and during an internship in teaching?
- What are the different issues and challenges in integrating ICT in teacher education institutions?

Objectives

- To study the availability of ICT facilities and resources in teacher education institutions.
- To study the integration of ICT by a teacher education institute for

performing various institutional activities.

- To study the integration of ICT by teacher educators for teaching, assessment, and professional development.
- To study the integration of ICT by the trainees for teaching and learning during the internship programme.
- To find out issues and challenges in integrating ICT in teacher education institutions.

Methodology

A survey method was used to explore the ICT integration in teacher education institutions of Assam, India. The sample consisted of four Teacher Education Institutions (TEI), 20 Teacher Educators (TE), and 80 Trainees selected randomly from TEIs affiliated to Guwahati University of Assam. The investigator used three self-developed questionnaires for the principals, teacher educators, and student teachers. Each tool consisted of both close-ended and open-ended items. Content validity of all tools was ensured by taking experts comments and suggestions during tool development. The test-retest reliability (.67) was estimated for closed-ended items in all the tools by giving seven days gaps. All these data were collected by personal visits to four TEIs. The collected data were processed and analyzed in MS excel by using frequency, percentage and average and accordingly tables and graphs were prepared as per the objectives of the study. The detailed analysis and interpretation are presented in the following pages.

Analysis and Interpretation

Table-1: Availability of ICT facilities in TEI's

Sl. No.	Digital Devices	Available (in average/%)	Usable (Frequency & %)
1	Desktop	19.25*	77 (100%)
2	Laptop	3.25	8 (61.54%)
3	Projector	75%	3 (100%)
4	Digital Camera	75%	3 (100%)
5	Scanner	1.75	7 (100%)
6	Printer	2.25	9 (100%)
7	Interactive White Board	2.5	10 (100%)
8	Wi-Fi Connection	100%	4 (100%)
9	Smart Classroom	0	0
10	Computer Laboratory	100%	4 (100%)
11	Power Backup	75%	3 (85.71%)
12	Speaker	3.75	15 (100%)
13	Router	75%	3 (100%)
14	Microphone	2.25	9 (100%)
15	Computer Table	19.25	77 (100%)

*Average

The table-1 indicated that all the four TEIs were having a computer laboratory, desktop, laptop, Wi-Fi, etc. and were fully functional. On average, three laptops per TEIs were available, but all were not functional. 75 percent of TEIs have digital cameras, projectors, scanners, power backup, and routers. No TEI has a smart classroom.

Table-2: Availability of ICT application/services in TEI's

Sl. No.	ICT Applications/Services	Availability (Frequency & %)
1	Institute Website	4 (100%)
2	Official email id	4 (100%)
3	Facebook/Twitter account	3 (75%)
4	Online Library Catalogue	1 (25%)
5	Group email for each class	0 (0%)
6	WhatsApp group for students class wise	3 (75%)

The table-2 revealed that all the four TEIs have institute websites and official email id. Three TEIs have class wise WhatsApp groups for students and Facebook/Twitter accounts. No TEIs have a group email for each class and only one institute has the facility of an online library catalogue.

Table-3: Use of ICT by TEI's for student-related work

Sl. No.	Name of Administrative works	Usage (Frequency & %)
1	Online application for student admission	3 (75%)
2	Online receipt of payment from students	2 (50%)
3	Group messaging to parents and students	2 (50%)
4	Biometric attendance system for students	4 (100%)
5	Online assessment for students	1 (25%)
6	Online publication of result	4 (100%)
7	Online issue of mark sheet and certificate	4 (100%)
8	Online feedback from students and parents	1 (25%)

It is found from table-3 that all the institutes are using ICT for biometric attendance of students, publication of results and issue of mark sheet and certificate. 50 percent of institutes are using ICT for group messaging to parents and students and for online receipt of payment from students. Further, 75 percent of institutes are making use of ICT for online applications for admission. Only 25 percent of institutes are utilizing ICT for online assessment and feedback.

Table-4: Use of ICT by TEI's for administration

Sl. No.	Name of Administrative Works	Usage (Frequency & %)
1	Online application for recruitment	2 (50%)
2	Online tender notice for institute work	0
3	Biometric attendance system for teachers	4 (100%)
4	Online submission of performance appraisal report of staff	4 (100%)
5	Online notice to staff and students	3 (75%)
6	Online official record-keeping	1 (25%)
7	Online financial management	1 (25%)
8	Online issue of books in the library	0
9	Online catalogue for library	1 (25%)
10	Using ICT for teaching	4 (100%)
11	Monitoring staff performance via CCTV	2 (50%)

The table-4 revealed that all TEIs are using ICT for biometric attendance of teachers and submission of performance appraisal reports. 75 percent of TEIs use ICT for online notice to staff and students. Further, 50 percent of TEIs employ ICT for application for recruitment, providing e-circular regarding official matters as well as for monitoring staff performance. No TEIs use ICT for online tender notice for institute work and the online issues of books in libraries. Only 25 percent of TEIs use technology for library catalogue, keeping of official records, and financial management.

Table-5: Use of ICT for teaching & learning by teacher educators

Sl. No.	Items	Always (N & %)	Sometimes (N & %)	Never (N & %)
1	Collect study material	12 (60%)	8 (40%)	0
2	Read e-books/materials	3 (15%)	17 (85%)	0
3	Prepare PPT for teaching	0	20 (100%)	0
4	Use PPT in teaching	0	20 (100%)	0
5	Create digital learning materials (Audio/video)	0	20 (100%)	0
6	Communicate online with students	5 (25%)	15 (75%)	0
7	Use social networks for teaching purpose	3 (15%)	16 (80%)	1 (5%)
8	Use video clips for teaching	0	19 (95%)	1 (5%)
9	Use different online library	0	2 (10%)	18 (90%)

10	Use mobile application (Edmodo/Google class) for teaching	1 (5%)	0	19 (95%)
11	Use group email of class for academic purpose	0	6 (30%)	14 (70%)
12	Use group WhatsApp of class for academic purpose	7 (35%)	12 (60%)	1 (5%)
13	Share online material with students	1 (5%)	18 (90%)	1 (5%)

The table-5 indicated that 60 percent of teacher educators always use ICT for collecting study material from the internet, 35 percent use group WhatsApp of class for academic purposes and 25 percent of teacher educators always communicate online with students. All teacher educators sometimes use ICT for preparing and using PPT for teaching and for creating digital material. 95 percent teacher educators sometimes use video clips for teaching purposes, 90 percent of educators share online materials with students, 85 percent of educators sometimes use ICT for reading e-books, 80 percent of educators use social networking for teaching. Further, 95 percent and 90 percent of teacher educators never use any mobile applications and different online libraries, respectively.

Table-6: Use of ICT for assessment & evaluation by teacher educators

Sl. No.	Items	Always (N & %)	Sometimes (N & %)	Never (N & %)
1	Provide online assignments	0	13 (65%)	7 (35%)
2	Receive online assignments	0	10 (50%)	10 (50%)
3	Prepare test items	5 (25%)	14 (70%)	1 (5%)
4	Share student's result	2 (10%)	7 (35%)	11 (55%)
5	Portfolio assessment	0	4 (20%)	16 (80%)
6	Conduct online test	0	1 (5%)	19(95%)
7	Maintain student's record	6 (30%)	14 (70%)	0
8	Provide feedback via online	0	4 (20%)	16 (80%)
9	Blog assessment	0	4 (20%)	16 (80%)

In assessment and evaluation, 30 percent of teacher educators always use ICT for keeping a student's record, 70 percent of teacher educators sometimes use ICT for preparing test items, 65 percent educators sometimes provide online assignments and 50 percent receive online assignments. Further, 80 percent of educators never use blog assessment, online assessment, and Google Forms.

Table-7: Use of ICT for professional development by teacher educators

Sl. No.	Items	Yes
1	Use of ICT for doing online courses like MOOC/SWAYAM	3 (15%)
2	Member of any online professional group	4 (20%)

3	Share study materials with the professional group	4 (20%)
4	Subscription of online journal	9 (45%)
5	Attending orientation/refresher course	13 (65%)
6	Creation of digital teaching-learning materials	20 (100%)
7	Attend online seminar/workshop	2 (10%)
8	Online interaction with subject experts	2 (10%)
9	Use of ICT for reviewing research	19 (95%)
10	Familiarity with data analysis software (SPSS/Alta Vista)	10 (50%)
11	Use of ICT for skill development in teaching/research	20 (100%)

It is noticed from table-7 that all teacher educators use ICT for skill development in teaching and research and the creation of digital teaching-learning materials. ICT is used by 95 percent of teacher educators for reviewing research. 65 percent of teacher educators attended orientation and refresher courses on ICT in the last three years; 50 percent of educators were familiar with data analysis software and 45 percent of them have online subscriptions to different journals.

Table-8: Use of ICT by the trainees during the internship

Sl. No.	Items	Yes (F & %)
1	Planning lesson	47 (58.75%)
2	Prepare lesson plan	39 (48.75%)
3	Collecting additional information about the topic	76 (95%)
4	Find learning resources on the internet for teaching	68 (85%)
5	Read online books and other materials	58 (72.5%)
6	Develop audio/video materials as learning resources	36 (45%)
7	Prepare PPT	33 (41.25%)
8	Prepare classroom notes	73 (91.25%)
9	Get an idea about innovative strategies for teaching	10 (12.5%)
10	Assess students in the classroom	7 (8.75%)
11	Provide homework/assignment	6 (7.5%)
12	Provide feedback to students	4 (5%)
13	Refer to online journal for teaching	13 (16.25%)
14	Communicate with peers, student teachers and teacher	79 (98.75%)

The table-8 indicated that 98.75 percent of trainees communicate online with peers and teacher educators. 95 percent student teachers use the internet for collecting reference materials during internship. 91.25 percent of trainees use ICT for preparing classroom notes, 85 percent of student teachers use the internet for finding learning resources, 72.5 percent of trainees read online books and 58.75 percent of trainees use ICT for planning lessons. 95 percent of trainees did not provide online feedback to students and 92.5 percent of trainees did not provide online assignments/homework. 91.25 percent

of trainees did not use any online assessment technique and 87.5 percent of trainees did not adopt innovative teaching strategies. It can be viewed that although some of the trainees use ICT in some areas of teaching-learning, the majority of the trainees do not utilize ICT for many important aspects of teaching.

Table-9: Use of applications by the trainees for teaching during the internship

Sl. No	Name of Applications/Websites	Yes (Frequency and %)
1	GeoGebra	0
2	YouTube	78 (97.5%)
3	SlideShare	45 (56.25%)
4	Blog	13(16.25%)
5	WhatsApp	72 (90%)
6	Facebook	33 (41.25%)
7	e-pathshala	16 (20%)
8	Mail	77 (96.25%)
9	Mahara	0
10	Digital repository	0

The table-9 reveals that 97.5 percent of trainees use YouTube and 96.25 percent use email for teaching and learning purposes during internship. Slide share application is used by 56.25 percent, WhatsApp by 90 percent and Facebook by 41.25 percent of trainees during internship. Lower percentages of trainees like 16.25 percent & 20 percent of trainees were using blog & e-Pathshala applications, respectively. It is also seen from the above table that most of the trainees did not use different types of applications and even some of them were not aware of various ICT applications which can be used for teaching-learning purposes.

Table-10: Challenges of integrating ICT in TEI's

Sl. No.	Challenges	Yes (F and %)
1	Lack of interest to use ICT	2 (10%)
2	Poor internet connection	12 (60%)
3	Lack of technical support staff in the institute	12 (60%)
4	Lack of electricity during office hours	1 (5%)
5	Lack of facilities in the classroom	19 (95%)
6	Lack of technological knowledge	12 (60%)
7	Lack of awareness about the use of ICT	11 (55%)
8	Lack of time to prepare teaching through ICT	16 (80%)
9	Non-functional ICT equipment	4 (20%)

Table-10 revealed that more than 80 percent of teacher educators opined that lack of smart classroom facilities and lack of time for preparing teaching through ICT are the main barriers to ICT integration. Further, 60 percent of teacher educators viewed lack of technological knowledge, lack of adequate technical support staff, and poor internet connectivity as hampers in the integration of ICT. 55 percent of teacher educators considered lack of awareness about the use of ICT as one of the issues in ICT integration in TEIs.

Major Findings

- All the teacher education institutions have desktops, laptops, printers, white boards, Wi-Fi connection, and computer laboratory, but 75 percent of TEIs have a projector, a digital camera and power backup and no TEI have smart classrooms for teaching.
- Seventy-five percent of TEIs use ICT for admission and 50 percent use ICT for online payment of fees and group messaging to students and parents, online application for recruitment, notice to staff and students and monitoring students and staff by CCTV. No TEIs use ICT for inviting tender for work and issuing library books to students and staff.
- The majority of teacher educators sometimes use ICT for assessment and evaluation, especially in preparing test items, sharing results and keeping students' records.
- More than 50 percent of teacher educators were found utilizing ICT for professional development like using ICT for skill development in teaching/research, creating digital teaching-learning materials, reviewing research and attending orientation/refresher courses.
- More than 50 percent of trainees use ICT for planning lessons, collecting resource materials, reading e-books, preparing class notes, communicating with peers and students. YouTube, Slide share, WhatsApp, and email during the internship. No trainees use mobile applications, such as GeoGebra, Mahara, Edmodo, etc. which are very useful for teaching-learning purposes.
- Lack of technological knowledge, lack of support staff, poor internet connection, and unavailability of smart classrooms were the major challenges in the path of effective integration of ICT in TEIs.

Discussion of Result

The findings regarding the availability of ICT facilities revealed that all the four teacher education institutions have functional ICT devices like computer laboratory, desktop, scanner, printer, interactive whiteboard, website, official email, etc. But all TEIs do not have a projector, power backup and smart classrooms. This finding is supported by Andoh (2019) who reported that lack of infrastructure competency, poor leadership support and attitude towards ICT are barriers to the integration of ICT. Further, Angadi (2016) found that the quantity of computers and ICT used in teacher education institutions is less. It is also found that ICT has not been fully integrated into performing different activities related to students, staff, administration, teaching, assessment, and publication of results. However, in terms of biometric attendance system and online submission of staff's performance appraisal report, ICT has been used adequately. Chemwei & Koech (2014) indicated that there is a moderate level of integration of ICT in teacher training colleges. Additionally, Goldstein & Shonfeld (2014) Stated that teacher training colleges incorporated

a variety of ICT-based learning assignments related to presentation and learning management. In terms of teaching, learning and assessment, the majority of the teachers were found sometimes using ICT. More than 50 percent of teacher educators were found utilizing ICT for their Continuous Professional Development. Mwalongo (2011) reported that teacher educators use a wide range of ICT tools for teaching, administration, and professional development. It is also revealed that more than 50 percent of trainees use ICT for preparing classroom notes, finding learning resources, and planning lessons. Moreover, the study indicated poor use of ICT applications by the trainees during the internship. Mohalik (2020) found that trainees use digital devices during the internship in teaching programmes for planning lessons, preparing learning materials, and presenting the lesson. Finally, the study portrayed the lack of relevant devices, technological competency, and staff as a major challenge for effective integration of ICT. But Nasreen & Chaudhary (2018) found that teacher educators and trainees perceived the lack of infrastructural facilities as a barrier for ICT integration.

Educational Implications

The authorities of TEIs must provide relevant devices, applications and technical staff so that ICT can be effectively integrated into different institutional activities as well as teaching-learning. All the teacher educators must be motivated to develop life-long learning habits by proper utilization of ICT based courses like MOOC, SWAYAM for their professional development. The use of ICT during the internship helps in making the trainees familiar with different ICT applications and services, such as NROER, e-Pathshala, GeoGebra, Mahara, Kahoot, YouTube, Mentimeter, Blog, SlideShare, PMeVidya, SWAYAMPRAVA TV channels, etc. which are useful for teaching-learning purpose. Hence, ICT must be taught rigorously in TEIs, so that all trainees would develop technological pedagogical skills.

Conclusion

Integration of ICT in teaching and training is becoming a new normal. Technology should be utilized to enhance educational practice as well as to create new pedagogical strategies for the improvement of teacher training. Teachers can indeed perform better in ICT only when they practice it during their training. Hence, it needs to be first integrated in the teacher education programme. Unless and until teacher educators demonstrate utilization of ICT in teaching-learning process, it won't be conceivable to set up another generation of educators who will viably utilize the new apparatus for teaching and learning. Therefore, constructive and meaningful integration of ICT in teacher education is inevitable to produce more innovative and creative techno teachers who can effectively teach digital native learners in future.

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Research Article

Use of ICT in Teaching-Learning Process in Elementary Level Teacher Education Institutions of Odisha

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Abstract

Preparing teachers for the twenty-first century requires the use of Information and Communication Technology (ICT) in Teacher Education Institutions (TEIs). In this context, the present study examines the availability of ICT resources in elementary level teacher education institutions of Odisha. The study focused on the use of ICT in teaching-learning processes i.e. transaction of theory and field-based activities. The study also analyzed the perspectives of student teachers and teacher educators on the use of ICT in the teaching-learning process. The sample of the study consisted of six DIETs selected randomly from thirty DIETs of the State. Six Principals, thirty-six Teacher Educators (TE), and 120 student teachers of 6 elementary level TEIs of Odisha participated in the study as respondents. A descriptive survey method approach was followed for data collection and analysis. The study found that all TEIs have a computer/ICT lab on their premises and they are well connected with the Internet and other digital equipment, but most of the Teacher Educators were not literate on computer knowledge, so they are facing challenges to implement ICT based teaching-learning practices. The poor networks obstruct the smooth use of ICT in the classes in most of the sampled TEIs. Based on findings, the paper presents educational implications.

Keywords: ICT, Elementary level teacher education Institutions, DIET, Teaching-learning process, Teacher Educators, Student– teachers

Introduction

Preparing pre-service teachers with ICT skills and expertise is now considered a critical component of every teacher-education programme to prepare them to meet the educational demands of the twenty-first century. Most teacher preparation programmes now provide ICT expertise and training to ensure that aspiring teachers are well trained to use ICT in their classrooms. (Gülbahar, 2008). In light of the growing importance of ICT in 21st-century teaching-learning skills, it's worth investigating whether ICT is part of the elementary school teachers' toolkit from the start. Some studies have shown that most teachers are hesitant to use ICT in their classrooms because it was not part of their teacher training or their first year of teaching. (Prensky, 2001; Rosenthal, 1999). As a result, when ICT was implemented, teachers found it difficult to adapt to new ways of working. Teacher cognitions take years to form, according to Verloop, Van Driel, and Meijer (2001), so they can't easily be modified. However, ICT has been described as having the ability to encourage creative teaching by offering a variety of resources that can be used to facilitate learning (Almekhlafi & Almeqdadi, 2010), and it has thus become an integral part of elementary

teacher preparation. UNESCO has made incorporating ICT into education a priority in its efforts to ensure justice and access to education. To promote ICT in education, UNESCO takes a systematic and all-encompassing approach. Access to education, equity, quality learning and teaching, teacher professional development, and educational management and governance will all benefit from ICT.

Integration of Information and Communication Technologies (ICTs) in elementary teacher education is a means to support high-quality teaching and learning, involving teacher educators, teachers, student teachers and leaders. It requires how best to explore the uses of ICT for meaningful learning of students. In the present digital world, students must be given opportunities to learn with effective and efficient integration of ICTs in the classroom. Integrating Information and Communication Technologies (ICTs) in education is highly challenging, especially in the teacher education sector. While there are several factors for the successful integration of ICTs in teaching and learning, professional development of teacher educators, strong leadership support, and institutional commitment play a significant role.

As we can understand that nowadays ICT plays an important role in teaching-learning process. The use of ICT in the classroom helps both teachers and students in their teaching-learning process. The use of ICT in teaching motivates students towards learning. ICT helps teachers to transact the classes easily instead of arranging a lot of readymade TLMs. Now a day, most of the elementary teacher training programs around the world have ICT integrated skills in their training component (Yüksel & Kavanoz, 2011). Thus, compared to their predecessors, the elementary level pre-service teachers of today are in a better position to make ICT a part of their teaching-learning process because of the training they have received. The use of ICT in the teaching-learning process is a relatively new phenomenon and it has been the educational researcher's focus. Teachers and administrators face the difficult task of effectively integrating technology into classroom activities. E-learning, e-communication, easy access to knowledge, online student registration, online advertising, reduced burden of holding hardcopy, networking with resourceful people, and other innovations that ICT has brought to the teaching-learning process are just a few of the innovations that ICT has brought to the teaching-learning process. All of these variables, however, increased the likelihood of effective ICT incorporation in the teaching-learning process. If teachers and administrators are to be persuaded of the importance of using ICT in their teaching-learning process and administration, further training of teaching personnel in pedagogical issues and administration training for administrators should be increased.

Need and Justifications

The teaching-learning process has changed in the twenty-first century, and teachers must be able to incorporate ICT tools into their lessons to fulfil today's educational requirements (Kong et al., 2014). As a result, new teachers need to incorporate ICT into their teaching-learning practices as soon as possible. Several types of researches have been undertaken to determine the extent to which pre-service teachers use ICT. The majority of studies find that pre-service teachers use ICT in their lesson delivery far too infrequently. (Al-Ruz & Khasawneh, 2011; Dawson, 2008; Liu, 2012). Ineffective teacher preparation systems have been blamed in several types of researches for the lack of ICT use (Albirini, 2006; Liu, 2012; Scheeler, 2008).

One of the most frequently mentioned limitations of teacher education programmes is that they primarily provide students with ICT information, rather than how to effectively integrate ICT into curriculum material (Oblinger & Obliger, 2005; Wachira & Keengwe, 2011). Teachers' competency levels in using ICT in their teaching-learning activities must be increased by effective preparation (Koh & Frick, 2009). The new generation of elementary pre-service teachers has been dubbed "digital natives," a term that refers to a generation that grew up in the digital age. (Vodanovich, Sundaram & Myers, 2010). Digital natives are also defined as having a high degree of enthusiasm for using information and communication technologies (Junco, 2014). This raises the possibility that they will use ICT in their classrooms more often. However, according to many surveys, the majority of these pre-service teachers use various ICT services widely outside the classroom for personal use and very little in the classroom for teaching-learning activities. The majority of research on pre-service elementary teachers' use of ICT has centred on determining how well teacher training programmes prepare teachers to use ICT in their teaching-learning activities. (Liu, 2012; Murley, Jukes, & Stobaugh, 2013). Effectiveness of ICT i.e. mobile applications have been reported in the monitoring of activities of DIETs of Odisha (Nayak and Behera, 2019)

The use of ICT in the teaching-learning process is to improve teaching-learning and appraisal processes, promoting teacher training and professional development, enhancing educational access and streamlining educational planning, management, and administration, including admissions, attendance, and assessment processes, among others. (NEP, 2020). In the present scenario educational technology, such as resources, techniques, and materials are being used for improving the quality of education. The systematic use of ICT resources is important for the effectiveness of teaching and related activities so that we can achieve better learning outcomes. Apart from the curricular boundaries different universities, colleges, training institutes, different sectors of the job even if in some schools ICT is used preferably and frequently. So, elementary teacher education institutions, such as DIETs, an educational and training institute, must be linked with the use of ICT in the teaching-learning process. Use of ICT may reduce the use of paper in the teaching-learning process. A page of paper may not be visible to all students in a big classroom/more than 100 students in a classroom. But one page in the computer attached with a projector can be visible to all learners in the class. So, the use of ICT can save a lot of money and other resources. Many videos related to subject-based science-related 3-D pictures, innovative, motivated & inspiring videos can be used in the regular classroom. So, every DIET should use ICT in their regular classes and training sessions for better visibility of learners. Using the internet, blogger, Google classroom, zoom meet, etc. in teaching-learning can enhance the learnability within the educational process. Online quiz competitions, assignments and other types of evaluations can be done very easily. So, it is essential to use ICT in the teaching-learning process of different elementary teacher education institutions for enriching ICT knowledge among pre-service student teachers and in-service teachers. The present study attempts to address the issues by investigating the use of ICT in the teaching-learning process in elementary level Teacher Education Institutions (TEIs) of Odisha. The rationale behind this study was to see the ICT used by teacher educators, student teachers and other stakeholders in preparing elementary teachers and

other associated teaching-learning activities. It's critical to determine if ICT is included in this collection of abilities because, as Liu (2012) points out, this framework lays the groundwork for their future teaching-learning practices; if ICT isn't included from the start, it might be difficult to incorporate it later.

Objectives

1. To study the availability of ICT resources in elementary level teacher education institutions of Odisha.
2. To study the use of ICT in the teaching-learning process i.e. transaction of theory and field-based activities.
3. To study the perspectives of the use of ICT by student teachers and teacher educators of elementary level teacher education institutions of Odisha.

Research Questions

1. Whether ICT lab or all the components related to ICT Lab are available in each elementary level teacher education institution i.e. Computer, Laptop, LED TV, Projector, and Internet facility?
2. What are the uses of ICT in elementary level teacher education institutions?
3. How are ICTs used in the teaching-learning process of elementary level teacher education institutions?
4. What are the challenges/problems faced by the student-teachers in the use of ICT in pre-service teacher education programmes?

Methods and Procedure

Research design: The study adopted a descriptive survey research method.

Population: As per the Directorate of TE and SCERT, Odisha (2020) there are 30 District Institute of Education and Training, 04 Block Institute of Education and Training, 31 Government Elementary Teacher Education Institutions (ETEIs), 02 Government Elementary Teacher Education Institutions (SC & ST Development) and 01 Non-Government Aided Secondary Training School managed by Minority Community of the State. The population of the study consisted of all the DIETs in the State of Odisha, including all the Heads of the institutions, pre-service teachers and teacher educators.

Sample: From the population, 6 elementary level teacher education institutions (DIETs) were randomly selected by the researcher. In those institutions, all the Heads of the Institutions were the participants of the study. From each sampled institute twenty pre-service teachers and six teacher educators of the selected institutions were again randomly selected for the study. The details of the sample are presented in Table 1.

Table-1: Details of Sample of the Present Study

Name of the Sample DIETs	No. of Student Teachers	No. of Teacher Educator/ Senior Teacher Educator	No. of Principal
DIET, Kalahandi	20	6	1
DIET, Khordha	20	6	1
DIET, Kendrapada	20	6	1
DIET, Keonjhar	20	6	1

DIET, Sonepur	20	6	1
DIET, Rayagada	20	6	1
Total	120	36	6

Tools: Self-developed questionnaire for student teachers and teacher educators, interview schedule for Principal and observation schedule were used for the present study. Questionnaires consisted of a series of questions (close and open-ended).

Procedure of data collection: The data were collected with the help of a self-developed questionnaire, interview schedule, and observation schedule.

- A structured questionnaire consisting of 16 items was used to collect data from the 2nd year D.El. Ed. Student-teachers relating to the use of ICT for learning purposes.
- Besides that, personal interviews were conducted to elicit candid responses from the Teacher/Sr. Teacher Educators and Principals with the help of the interview schedule.
- With the help of an observation schedule, the researcher observed the use of ICT in some theory classes, practical classes, and some other activities by the students and teacher educators. The availability of equipment of ICT and their maintenance were also observed by the researcher in the ICT lab and classrooms.

Delimitations of the Study

The present study was limited to 6 DIETs in the State of Odisha, India. BIETs and other elementary teacher education institutes have not been covered under the scope of the study. The study was conducted during the session 2018-19.

Data Analysis and Interpretation

The data gathered were analysed by using both quantitative and qualitative analysis techniques.

1. Availability of Resources in Sampled DIETs

Table-2: Number of Resources available in different DIETs

Resources	DIET – A	DIET – B	DIET – C	DIET – D	DIET – E	DIET – F
ICT Lab	1	1	1	1	1	1
Internet	Connected	Connected	Connected	Connected	Connected	Connected
Computer	17	25	25	21	30	24
Laptop	2	4	3	3	4	3
Projector	2	3	2	3	3	2
Sound Box	2	2	1	2	8	2
LED TV	1	1	0	1	2	1
Pen Drive	10	5	3	1	6	8
Printer	6	3	2	4	5	1
Related CDs, DVDs	3	15	1	1	15	1

It becomes clear from table-2 that all DIETs have a computer/ICT lab on their premises. All DIETs are also connected to the Internet. All institutes also have computers, laptops, projectors, etc. Some DIETs have less no. of pen drives and CD/DVDs. One DIET has no LED TVs.

2. Use of ICT in DIETs for different activities

Table-3: Use of different types of ICT Resources (in %)

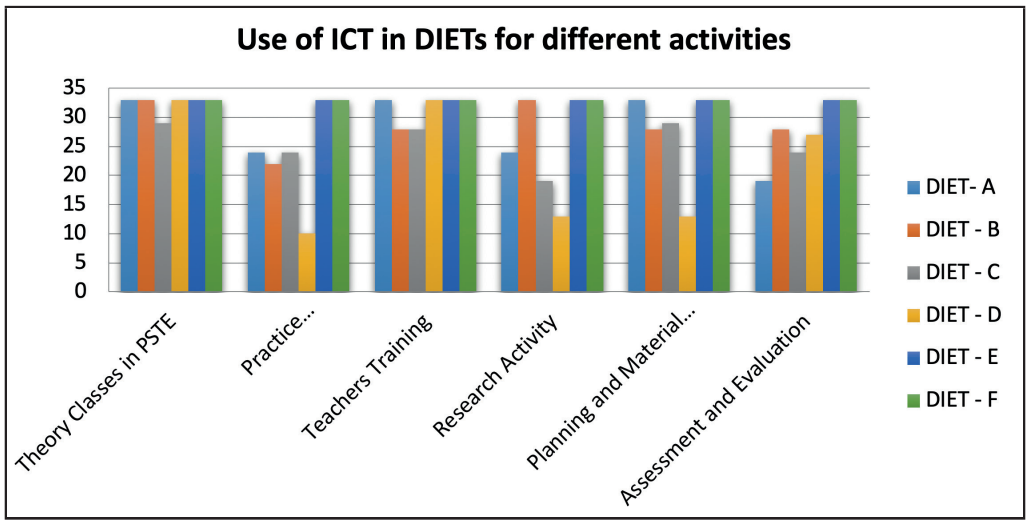
Uses of ICT	DIETs	I	II	III	IV	V	VI	VII	VIII	IX	Avg. % of use of resources
Theory classes in PSTE	A	57	29	71	71	29	0	43	29	14	38
	B	14	14	29	29	14	0	14	0	29	16
	C	0	29	57	71	71	0	71	43	14	40
	D	0	90	90	90	20	0	90	50	10	49
	E	100	100	100	100	100	0	100	50	50	78
	F	0	0	0	0	50	50	0	0	0	11
Practice teaching/ Internship	A	29	29	29	43	29	0	14	29	0	22
	B	0	14	29	14	0	0	0	0	0	6
	C	14	14	43	14	0	0	14	14	43	17
	D	0	70	80	60	0	0	90	50	0	39
	E	0	0	100	0	0	0	0	100	100	33
	F	0	0	50	0	50	0	0	0	0	11
Teachers training / ISTE	A	43	43	57	57	43	14	43	29	14	38
	B	29	0	14	14	0	0	14	0	14	9
	C	14	14	86	71	57	0	71	43	71	47
	D	60	90	90	90	50	0	90	70	10	61
	E	100	100	100	100	100	100	100	100	100	100
	F	0	0	0	50	0	50	0	0	0	11
Research Activity	A	29	43	57	14	14	14	43	29	14	29
	B	0	14	14	14	14	0	0	0	0	6
	C	14	43	57	43	14	0	57	43	43	35
	D	10	80	90	30	20	10	90	70	10	46
	E	100	100	100	50	0	0	100	100	0	61
	F	0	0	0	50	0	50	0	0	0	11
Planning & Material development	A	57	43	29	43	43	14	29	29	14	33
	B	0	14	0	0	0	0	14	14	14	6
	C	29	57	71	43	29	0	29	57	86	45
	D	20	90	90	20	20	20	80	80	20	49
	E	100	100	100	100	100	100	100	100	50	94
	F	0	0	0	0	0	50	50	0	0	11

Assessment/ Evaluation	A	43	43	57	29	29	14	14	14	14	29
	B	0	29	29	14	14	0	14	14	0	13
	C	43	71	29	0	14	14	0	43	57	30
	D	60	80	80	20	10	10	80	80	10	48
	E	100	100	100	100	100	100	100	100	100	100
	F	0	0	50	0	50	0	0	0	0	11

N.B: I-ICT Lab, II-Computer, III-Laptop, IV-Projector, V-Sound Box, VI –LED TV, VII-Pen Drive, VIII-Printer, IX-CDs/DVDs

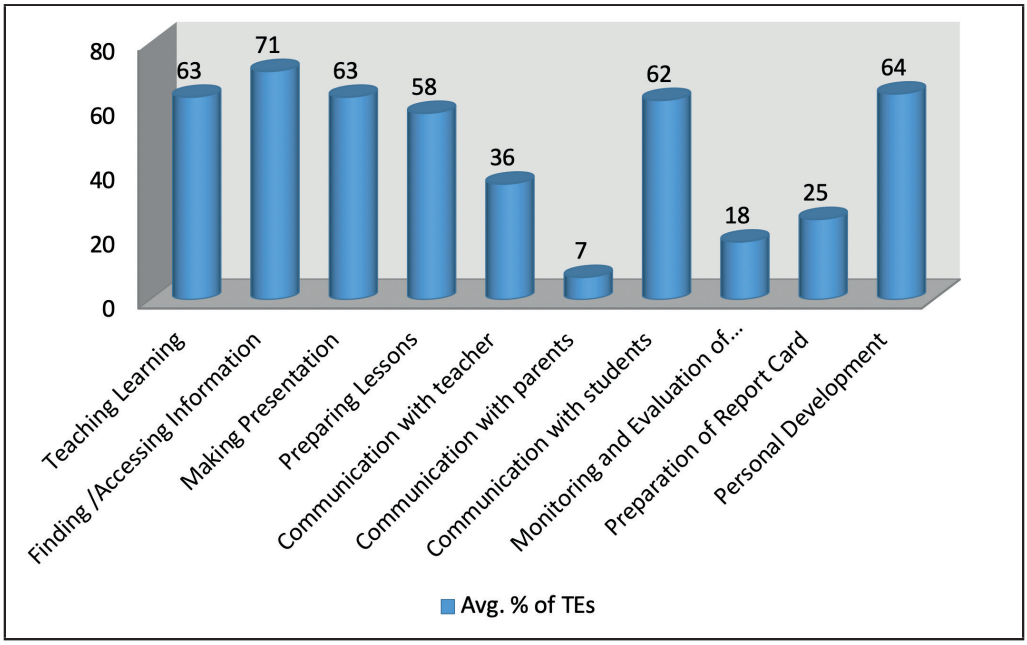
From table-3, it has been reflected that in almost all institutes' TEs are using LED TV very few times for any types of activities in DIETs. They are mostly feeling comfortable with the resources like a projector, laptop, and soundbox. Out of six sample DIETs; one DIET has used almost all resources in each activity.

Figure-1: Use of ICT in DIETs for different activities



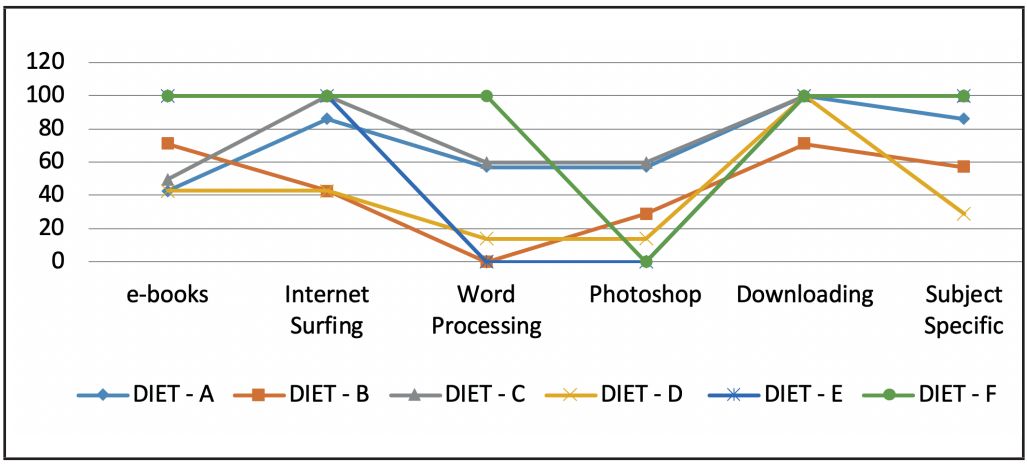
From the data given in figure 1, it has been reflected that most of the TEs are using ICT in their theory classes and teachers' training. Teacher Educators from two of DIETs out of six sample DIETs are using ICT in most of the sectors compared to that other of DIETs. But it is observed that in practice teaching and research activity, the use of ICT is very lesser than that of other activities.

Figure-2: Average Percentage of TEs using ICT in Teaching and beyond the Teaching- Learning Process



From figure 2, it has been reflected that the highest percentage of TEs from different DIETs is using ICT in Finding/ Accessing Information, while the lowest use of ICT in case of communication with parents. Two DIETs are using ICT most of the time in different aspects compared to other DIETs. But on average, most of the TEs are using ICT in the case of finding/accessing information, personal development, teaching-learning, making presentations, communication with students and preparing lessons. It is observed that the use of ICT in the monitoring and evaluation of students' performance and preparing report cards is minimal.

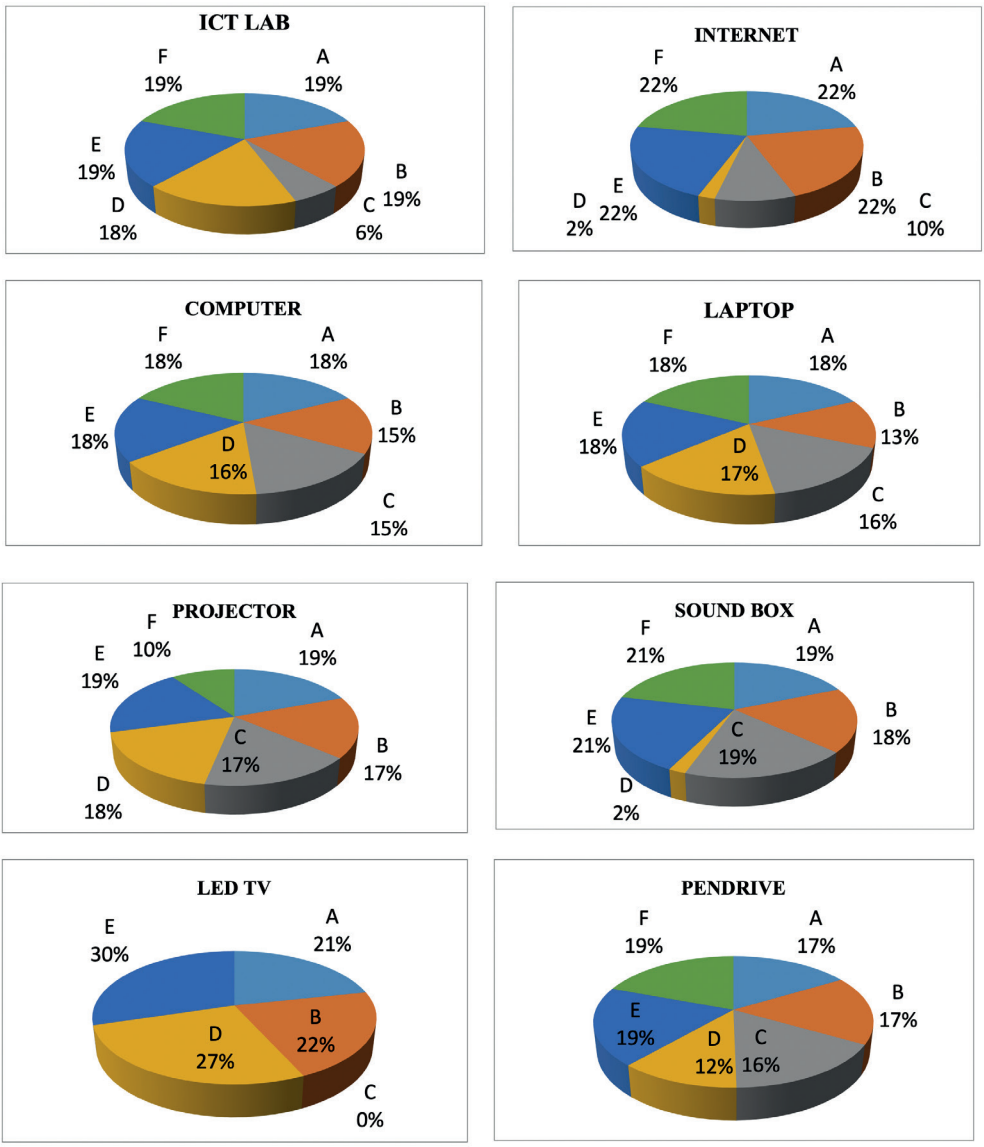
Figure-3: Use of ICT by Teacher Educators in Teaching – Learning Process

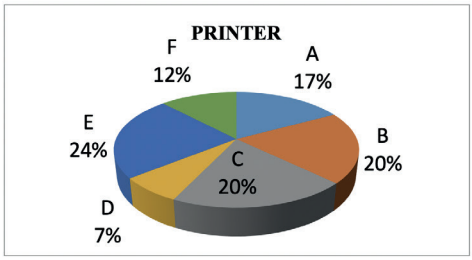


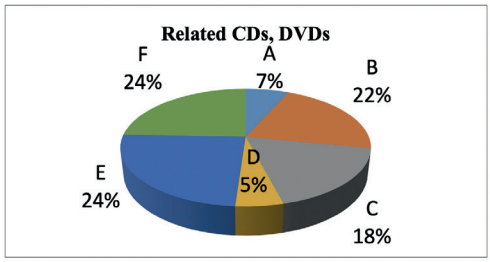
From figure 3, it has been reflected that almost all TEs are using technology for Downloading, Internet Surfing, and Subject-Specific purposes very often. Most of the TEs are lacking the use of Word Processing and Photoshop. Among all DIETs, one DIET's TEs are using technology in the above cases very few times. Two DIETs are using ICT frequently.

3. Maintenance of ICT resources

Figure-4: Maintenance of ICT Resources



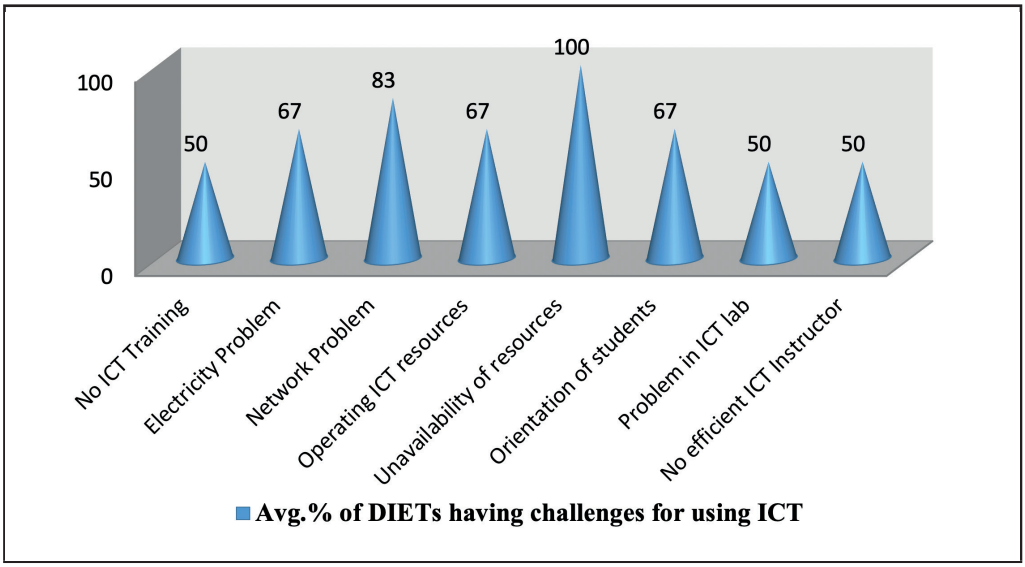




From figure 4, one DIET (C) needs to keep more focus on the development of ICT labs. Internet facility is very low in DIET (D), which is situated in hilly and forest areas. Almost all DIETs have proper maintenance of Computers, but there is a lack of adequate laptops. Maintenance of projectors, soundbox, LED TV, Printers, and Pen drive is in average condition. All the sampled DIETs do not have sufficient and well CDs/DVDs resources.

4. Challenges Faced by The Principals, Teacher Educators and Student-Teachers in Use of ICT

Figure-5: Challenges Faced by the Principals, Teacher Educators, and Student-Teachers



From figure 5, it is clear that the students – teachers, teacher educators and Principals of different DIETs are facing challenges for the use of ICT in teaching–learning process. 1) Most of the TEs have inadequate computer knowledge because of a lack of basic Computer training. 2) There are some DIETs where regular power cuts happen. Inverters/ batteries are there only for Computer Lab, not for all the classrooms. 3) Availability of the internet is a problem in two DIETs. 4) Use of ICT resources is a challenge for a TE in the class for completing the session in time due to inadequate training. 5) Computer labs of some DIETs are not up to date with recent resources.

Major Findings

The major findings of this research are described below:

- Approximately (90–95) percent of teacher educators (TEs) are using ICT in their theory classes and in teachers' training programs to make the process more effective.
- Resources like Projector, Laptop, and Soundbox are mostly used by almost all institutes' TEs. The Use of LED TV was very less.
- The majority of teacher educators (TEs) from different DIETs are using ICT in Finding/Accessing Information, while the lowest in use of ICT in the case of Communication with parents. But on average, most of the TEs are using ICT in the case of finding/accessing Information, personal Development, Teaching-Learning, Making presentations, Communication with students and Preparing Lessons.
- It is observed that the use of ICT in the monitoring and evaluation of students' performance and preparing report cards is not very satisfactory.
- The majority (95 percent) of TEs are using technology for Downloading, 79 percent using Internet Surfing and Subject-Specific purpose. All DIETs have a computer/ICT lab, Computers, Laptops, Projectors, etc. Some DIETs have less no. of Hard Discs like Pen drives, and CD/DVDs. In most of the sampled DIETs, there is a problem with high-speed internet connection.
- In one of the sampled DIETs, ICT Lab is not in good condition and the internet facility is very low. Almost all DIETs have proper maintenance of computers, but inadequate laptops. Maintenance of projectors, soundbox, LED TV, printers, and pen drive is in average condition. These are also challenges in the adequate use of ICT in the teaching- learning process.
- Some DIETs are having regular electric power cuts. Inverters/ batteries are available only for computer labs, but these are not available for all the classrooms. Frequent network problems occur in most of the DIETs.
- As all TEs have no basic computer knowledge, operating/ connecting ICT resources is a challenge for a TE in the class, by which a TE can't complete the session in time.
- There are also not sufficient resources which are required in ICT based teaching–learning process in some DIETs, which creates many problems for successful completion of a class.
- Some DIETs have no ICT instructors and some have ICT instructors. Teacher educators and ICT instructors have inadequate training on ICT use and integration. Inadequate training is a challenge for the smooth operation of ICT resources.

Discussion

The first objective was to study the availability of ICT resources in DIETs of Odisha. It was framed to know if the actual resources related to ICT are available in DIETs or not. This is also found that all DIETs have a Computer/ ICT Lab on their premises. All DIETs have arranged the internet connections with the computer(s), according to their availability. Internet connection problems occur in many of the DIETs. This may be due to the different geographical environments, unavailability of all the required instruments/materials related to network connection and irregularity

of electricity supply. All DIETs have computers, laptops, projectors, LED TV, Soundbox, etc. The number of resources are not the same in all sample DIETs. Some DIETs have fewer Hard Discs, Pen drives, and CD/DVDs. The numbers may be due to less knowledge of the staff (teaching and non-teaching) or Principals about the proper use of ICT resources. Further, it is noticed that maintenance of Lab is not done equally in all DIETs. Maintenance of all the above-mentioned resources is in average condition.

The second objective was to study the use of ICT in teaching-learning process i.e. transaction of theory and field-based activities. It was framed to know how the teacher educators implemented the technological knowledge in their theory and practical classes. This is also found that most of the TEs are using ICT in their theory classes, in different curricular and co-curricular competitions, research activities, and in-service teacher's training programmes which is contradictory with the previous research findings of Albirini (2006); Liu (2012); and Scheeler (2008). Most of the Science TEs are using ICT in their classes. Most of the TEs are using Projectors, Laptops, and Soundbox. They mainly use PowerPoint presentations for their teaching-learning process. But their use of LED TV is very negligible. This may be due to some DIETs focusing on more use ICT, whereas others are not so serious about the use of ICT in their institutions which is supported by the previous studies of Al-Ruz & Khasawneh (2011); Dawson (2008) and Liu (2012). It is observed that the use of ICT in the Monitoring and Evaluation of students' performance and preparing report cards is not very satisfactory. Most of the TEs use ICT for internet surfing and downloading. Out of the sample DIETs, teacher educators of two DIETs are using ICT frequently. This may be due to a lack of coverage of training and orientation for all TEs. All the TEs of the DIETs in Odisha have not taken the training for computer literacy (Computer literacy TEs are very low). The TE & SCERT also has initiated to give training on ICT integration to TEs. This will have an impact on quality teacher preparation at the elementary level. A mobile application is designed by TE & SCERT to monitor the progress of different activities of DIETs. This will be helpful for the quality improvement of pre-service teacher education programmes. Further, it is observed that one sample DIET uses ICT for teaching-learning, in different curricular and co-curricular competitions, in-service training programmes most of the time compared to other sample DIETs. The innovation may be used by other DIETs of the State.

The third objective was to study the perspectives of the use of ICT as per the views of student teachers and teacher educators. It was framed to know the challenges faced by the student-teachers and teacher educators. It is found that there are some DIETs where regular power cuts happen. Inverter/ batteries are there only for Computer labs and these are inadequate for all the classrooms. High-speed internet is not available and frequent network problems occur in most of the DIETs. This may be due to the irregular electricity supply and different geographical areas. Operating/connecting of ICT resources is a challenge for a TE in the class, which a TE can't complete the session in time, this may be due to all TEs are not aware of the basic computer knowledge as studied earlier by Oblinger & Obliger (2005) and Wachira & Keengwe (2011). There are also not sufficient resources which are required in teaching–learning process in some DIETs, which creates many problems for a successful transaction of class. The Computer Lab of some DIETs is not up to date. Further, it is evident that some

DIETs have no ICT instructors which creates a big challenge for smoothly operating ICT resources; this reflects in earlier research of Liu (2012) and Murley, Jukes, & Stobaugh (2013). All these problems are happening due to the less knowledge or no knowledge of the head or staff of the institutions about the use and maintenance of ICT resources supported in previous studies by Albirini (2006), Liu (2012) and Scheeler(2008).

Implications and Conclusion

The NEP (2020) envisions quality education by the integration of technology in the teaching-learning process of school education and teacher education. The study was conducted to find out the uses of ICT in the teaching-learning process of elementary level teacher education institutions in the State of Odisha. Based on the findings, the paper suggested certain implications which will have an impact on the Student-Teachers, Teacher Educators, Principals, and the State for designing a better curricular environment in TEIs.

The TE and SCERT, Odisha has taken initiatives for establishing and enabling the environment to promote the usage of ICT especially in Higher Secondary and Secondary govt./aided schools in rural areas and enrichment of existing curriculum and pedagogy by employing ICT tools for teaching and learning (http://scertodisha.nic.in/ict-initiative-in-teachers-education/). More ICT resources need to be provided to all elementary teacher education institutions. As all Teacher Educators have not been oriented with ICT, so accordingly a plan may be designed. Refresher training on ICT may be planned. Curriculum Planners may design the syllabus for students–teachers of DIETs on ICT.

Teacher Educators may be inspired by the Teacher Educators of other DIETs who are using ICT in their regular classes innovatively. They may try to enhance their capacity on ICT. Teacher educators can exchange thoughts on the use of ICT from one another to enhance the use of ICT.

They may take interest in giving an orientation on computer knowledge to their student teachers. More effort needs to be made by teacher educators and student teachers in the integration of ICT for assessment, field-based activities apart from monitoring and governance by the State. The TE & SCERT has also begun to provide TEs with training on ICT integration. This will affect on the standard of elementary teacher training. The TE & SCERT have created a mobile application to monitor the progress of DIET activities. This would continue to increase the efficiency of the pre-service teacher education programme in the State.

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Research Article

Why do MOOCs fail on completion Rate? An Analysis of SWAYAM Courses

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Abstract

Massive Open Online Courses (MOOCs) have transformed the traditional open and distance learning (ODL) system and bridged the arbitrary distance between face-to-face and ODL in the last decade. Since their starting in 2012 (commonly known as Year of MOOC), MOOCs have gained momentum and attracted millions of learners worldwide, and India is not an exception. SWAYAM (a MOOC platform launched in 2016 by the Government of India) is the most prominent MOOC provider in India. While judging the success of any MOOC, there are two distinct criteria. One is enrollment (massiveness) and another is retention and completion rate (certification ratio). MOOCs offered on SWAYAM are also being judged on these two criteria. The average completion rate is approximately 4.60 percent on SWAYAM. To explore the reasons for the low completion rate, the researcher has collected, and analyzed the perception of 537 dropout learners from two SWAYAM courses and concluded that many learners are dropping out from SWAYAM MOOC because they have never joined the course with the intent of certification. Other important reasons identified in the study are course instructors' failure in sustaining the interest of learners and engaging them in class; non-availability of all modules at the same time; offering the courses in English and not in Hindi or other regional languages; lack of clarity in announcements, longer duration of lectures, and the challenge of sustaining learners' motivation such courses. The researcher has suggested the implications of these findings for course coordinators, host institutions, and policymakers.

Keywords: MOOC, SWAYAM-MOOC, Completion rate, MOOC Dropping out

Background of the Study

Massive Open Online Courses (MOOCs) have gained momentum in the past decade. Around the world, many universities/institutions have offered the MOOC; even The New York Times declared the year 2012 as "Year of MOOC" (Pappano, 2012) because of the hype. The first MOOC was offered in 2008; since then, MOOCs have seen phenomenal growth in the 21st century (Lederman, 2019). As MOOC has become an almost a decade old phenomenon and many big players at the international level and India are offering thousands of MOOCs every year, this is a time to reflect on some critical issues. One of the most debated issues related to MOOCs is their retention and completion rate. While reviewing various popular MOOCs worldwide, retention and speed of completion have emerged as common issues.

There are two dimensions of looking at the success of any MOOC; one is enrollment, and the other is the rate of completion. Believers of both aspects have their arguments and reasons. MOOCs offered for knowledge

purposes are looked at in terms of enrolment figures. The term "Massive" in MOOC refers to it. A MOOC attracts people. Since starting, the considerable enrollment number has been a key determinant. The MOOC offered by Harvard and the Massachusetts Institute of Technology has attracted around 370,000 students in its first official course (Pappano, (2012). During 2017-19, the online programme offered by National Institution for Open Schooling for untrained in-service teachers through the Indian MOOC platform SWAYAM has attracted nearly 1.4 million learners. "Many students took MOOCs for knowledge or edification, rather than for a credential, (Reich and Ruipérez-Valiente, 2019)". The statistics available with various MOOC platforms reflect the popularity of MOOCs in terms of numbers (Shah 2020), but some critics do not agree with it. They argue that many platforms do not provide enough learning progress data analytics; therefore, only considering the enrollment is not a good idea.

Reich and Ruipérez-Valiente (2019) show that during five years of MOOCs offered by MIT and Harvard MOOCs, the course completion rate did not increase substantially; instead, it fell. They also highlight that for participants who joined the MOOC from 2013-14 to 2017-18, only 3.13 percent of the participants completed their courses, a decrease of 4 percent compared to the figures from two previous years and a nearly 6 percent decrease from 2014-15. On the Indian MOOC platform SWAYAM, the completion rate is also around 4.61 percent at present. (SWAYAM, April 2021), anyone who starts a MOOC barely completes it (Murrey, 2019). If this is the scenario and worldwide data reflects it, it is urgent to investigate it. While reviewing the articles and reports, the researcher had come across many such instances. The researcher has also offered two MOOC courses on the SWAYAM platform in which enrolment was 8311 and 2900, respectively, in July 2020 cycle. Still, less than 10 percent of learners have participated in all activities, and less than 3 percent have applied for certification. This decrease in the number of participants completing the course called for an in-depth study to explore the possible reasons for such a low completion rate.

Review of the literature

The researcher has reviewed various articles/researches done on the issue. The review's objectives were to identify the possible reasons identified by other researchers and have an overview of the problem. Huntemann, in a report published by Murrey (2019), hinted that if the learners "struggle on a course section, it might be because the material is not worded clearly … or videos are too long". It indicates that issues related to course design are important. The video length is an issue as in many MOOCs, especially being offered on the SWAYAM platform, the video length is about 30 minutes each. As learners in India are not well equipped with ICT learning skills and their attention span is also less, the duration of the video can be an issue. Guest (2019) identified that one way to keep students engaged in the free classes offered by hundreds of universities is to provide a certificate of completion for a fee. He quoted S. Sriram, an Associate Professor of Marketing at the Stephen M. Ross School of Business, according to Sriram, "The act of paying for the certificate and the motivation derived from wanting to earn the certificate leads to a 10 to 12 percent rise in student engagement." But certification asks for a fee. Sometimes, the cost is too high; it may not be affordable to many learners in India. Waters (2020) found that most people who signed up for any course for free never finished it. According to him, the course completion rates are around 10

percent, though he found that the paid courses had better completion rates. Leonard (2019) believed that though the number of MOOCs has increased, many MOOCs are not fulfilling the promises and completion and retention rates are very low, undermining the hype that MOOCs are for everyone. Newton (2020) has also reported that MOOCs had abysmal completion rates from the start, these courses have attracted tens of thousands of learners, but very few stuck around long.

This does not mean that there was no effort to increase the retention rates. Many course instructors have practised various strategies to increase the retention rate. But all are not successful. A comprehensive study by nine researchers, Kizilceca et al. (2020), found that efforts to put "interventions" at the front of MOOC classes did not boost completion rates, even though the authors had good reason to think they would. They went ahead and commented that MOOCs are mainly the "marketing tools and revenue sources" for "certificate" sellers. Ahearn (2019) reported that only 5 to 15 percent of students earn a certificate in a MOOC. But a contradictory finding was also reported by him about 2U with 88 percent completion rate, Harvard Business School with an 85 percent completion rate, and at Acumen with an 85 percent rate of completion, which was initially only 5 percent, which is a rare phenomenon in online courses and MOOC. He further highlighted his strategies like making students complete an application, imposing a final deadline, availability of learning materials for specific intervals, a series of "live" or synchronous events, integrating Platforms like Facebook Live, Zoom, Slack, and WhatsApp for continuous engagement, etc.

Reports available at class central (Shah, 2020) and other platforms suggest that contrary to the completion rate, enrollment increases by the day in MOOCs. Every year, thousands of new courses are added on various platforms like Edx, Coursera, SWAYAM, Future learn, Udacity, etc. Analysis of the review gives two apparent signals. One, the low completion rate is a worldwide phenomenon, and two, there are encouraging examples, where efforts are consistently made to increase the completion rate successfully.

Statement of the Research Problem

Outcomes of the review and personal experience of the researcher as course coordinator of two SWAYAM courses has propelled the researcher to conduct a study with the dropout learners of the SWAYAM courses. The researcher has formulated the following research Statement: To study "the reasons for dropping out from the MOOC: Learners' perception".

Operational Definitions

- **Dropping out:** In the present context, dropping out means the learners who enrolled themselves in SWAYAM MOOC courses, but did not appear in the term-end examination, i.e., did not apply for the certification.
- **MOOC:** Though MOOC stands for massive open online courses, in the present context, MOOC means two courses offered on the SWAYAM platform by the researcher, i.e., Learning and Teaching and Pedagogy of Science.
- **Learners' perception:** The learners who have enrolled themselves in the MOOC, but have not completed the course and left it without certification. The reasons enlisted by the learners to leave the course have been considered as learners' perceptions.

Delimitations of the Study

- The study is delimited to only the learners of two SWAYAM courses, i.e., Learning and Teaching and Pedagogy of Science, in July 2020.
- The exact contact details of the learners were not possible keeping the privacy clause in mind; the sample was taken from informal telegram groups associated with the courses.
- The tool developed for the study was not the standardized one; it was an online tool developed using the Google Form.

Objectives of the Study

- To study the perception of dropout learners towards MOOC completion.
- To analyze the reasons enlisted by the learners for dropping out of a MOOC.

Research Design

The research is a qualitative survey conducted in post-facto settings, i.e., after dropping out from MOOC, learners' perception was collected.

Population and Sample

As already Stated, that study is delimited to the learners enrolled in two SWAYAM MOOCs, i.e., Learning and Teaching and Pedagogy of Science in the July 2020 cycle. The total enrollment in the course "Learning and Teaching" was 8133, and in the course "Pedagogy of Science" was 2990, i.e. total enrollment was 11,123. Only 252 and 128 learners have submitted their final assignment after completing all the tasks. The rest of the learners were considered to drop out. Hence, the population for the study is 10,743. As it was impossible to use personal contact details available with the course coordinator due to ethical and privacy issues to collect the perception, the telegrams groups were used as the sampling frame. The number of learners in the telegram groups was 2059 and 731 for both courses.

The online tool link was circulated with the learners in these groups, and request reminders were sent five times in a time of 15 days. A total of 537 learners have submitted their responses. These 537 learners may be considered as the sample for the study, from which responses were collected conveniently. The response rate is 19.25 percent.

Tool for the data Collection

The researcher developed an online tool for collecting the data. In the tool, some possible reasons identified by the researcher during the literature review were categorized under the six (06) broad categories, i.e., Course Design, Content and Language, Activity and Quizzes, Lack of Communication, Length and Duration, and Personal Reasons. Under each category, reasons already identified were listed, and learners were asked to identify the causes most suited to them for leaving the course in-between. With already listed reasons, learners were also asked to identify/give the grounds, that they found suitable, but is/are not listed in the tool.

The content validity of the tool was established by a review of the tool by experts, i.e., expert validity. Being a qualitative tool, there was no definite answer of any items; hence, the reliability was not established in any numerical value.

All the reasons given by the learners were collected; their frequencies and percentages were calculated to analyze the data.

Analysis and Interpretation of the Data

- **Reasons for enrolling in the courses**

  The first item of the tool was framed to find out why the learners preferred to enrol in the course. The six pre-identified reasons were given in the choice with an open-ended option under any other reason. The findings are tabulated as below:

Table-1: Reasons for attending the Course

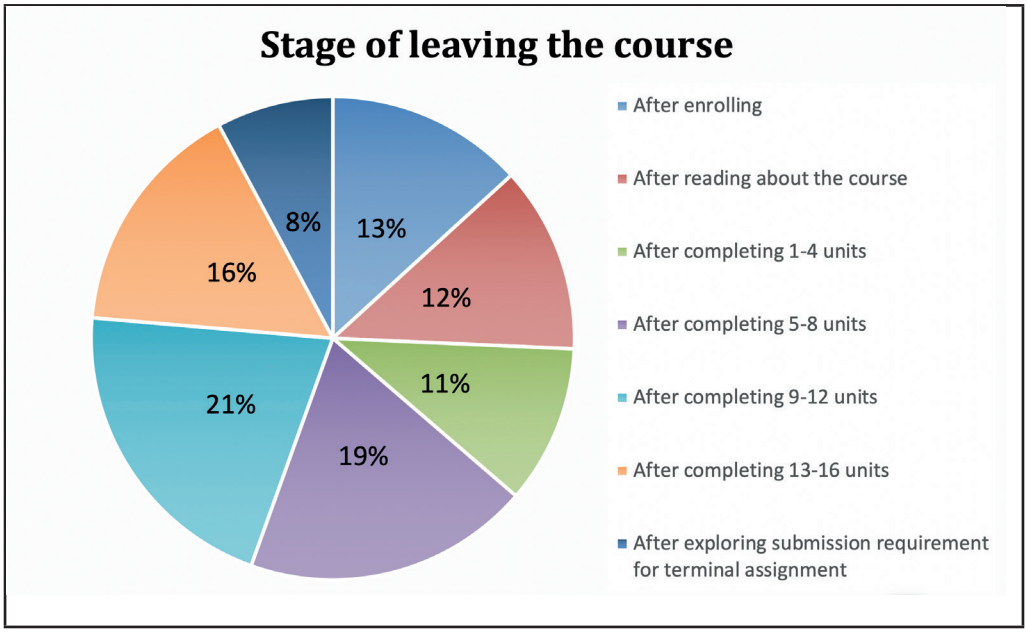
Reasons for attending the Course	N	Percentage
Interest in the Topic	34	6.33
Just for knowing about the SWAYAM platform	26	4.84
Excited to do a MOOC course	31	5.77
Earning certificate for Professional Development	12	2.23
Exploring the modules	63	11.73
Understanding about design and development of MOOC	27	5.03
Any Other reason: Part of B.Ed. Curriculum	201	37.43
Any Other reason: Preparing for competitive Examination	143	26.63

As shown in table 1, 37.43 percent of the learners have joined the course, because it was part of their degree programme, i.e., part of B. Ed, the curriculum at their university. But surprisingly, the second largest group was those learners preparing for any competitive examination like TET, which stands at 26.63 percent. The third important reason was that 11.73 percent of learners were only exploring the modules, which meant content exploration was their key motive, not the completion or certification. Though there were other reasons, these three are found as the most important reason for enrolling in the programme.

- **The stage of leaving the course**

  The second item in the tool was related to the stage at which they have left the course. Though the modules were 16 weeks, the long curriculum is distinctly divided into four major areas, having 16 weekly modules. Hence, only seven options were given to the learners, i.e., after enrolling, after reading about the course, after completing 1-4 units, after completing 5-8 units, after completing 9-12 units, after completing 13-16 units and after exploring submission requirements for the terminal assignment. Responses have been shown in the graph below:

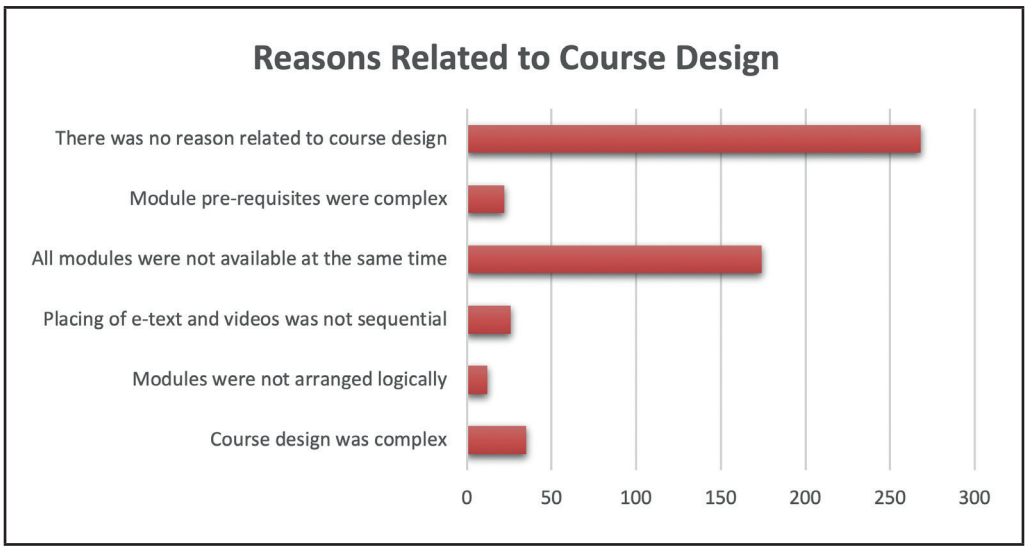
Figure-1: The stage of leaving the course



From figure 1, it is evident that most learners have left the course in middle sections, i.e., 21 percent after completing 9-12 units and 19 percent after finishing 5-8 units. But an important number of learners have left the course even after going through only 1-4 units, i.e., 16 percent. Only 8 percent of learners have reported leaving the course after going through the submission requirements of terminal assignments. The data is so distributed on this aspect that conclusive reasons cannot be extracted.

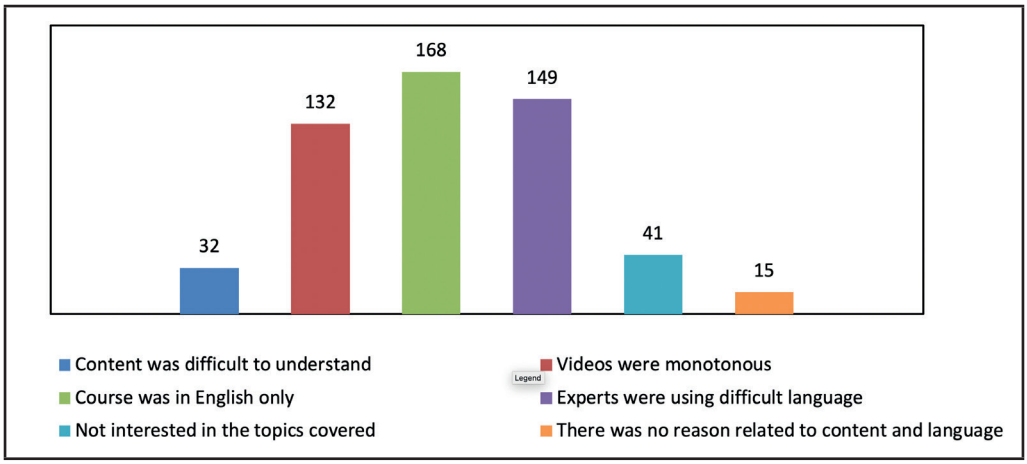
- **Reasons for leaving the course**
  - **Course Design:** The first dimension of the study to identify the reasons for leaving the course was related to "course design." Total five options were given to learners in this section. One additional option was given if the learner did not find any reason for course design. As shown in figure 2, the analysis reflects that for 49.91 percent of learners, there was no reason related to course design, which has prompted them to leave the course in between. However, 32.4 percent of learners have cited why all modules were not available simultaneously. This observation is in tune with the finding that nearly 26.63 percent of learners have joined the course to prepare for competitive examinations. They may be looking to get all content in one go. But, as these were 16 weeks long MOOCs, modules were released weekly as per the schedule. Other reasons were not important in this section as only 6.52 percent of learners found the course design complex.

Figure-2: Reasons Related to Course Design



- **Content and Language:** the second dimension of the study was to find out reasons related to content and language. The researcher has enlisted five reasons in this section with one option "no reason related to content and design". The finding of the section is as follows:

Figure-3: Reasons related to the Content and Language

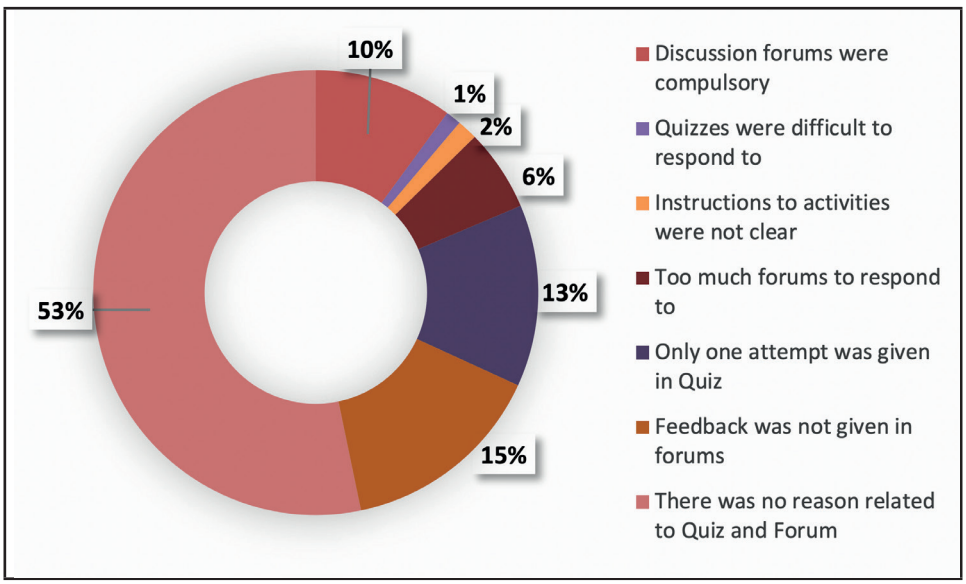


Graphs in figure 3 indicate that the most important reason related to content and language was that the content of the course was in the English language only. About 31.28 percent of learners have cited this as one of the reasons to leave the course. The second preferred reason was also related to language, i.e., the language used by experts in the video was not easily understandable to 27.75 percent of the learners. The third important reason was the learners' monotonous videos (24.58 percent). This is well accepted and valid as most of the videos are talking heads without much interactivity. This sometimes makes

the video boring, and learners prefer to read the content despite watching the videos. The important finding can be concluded from this section that, in total, 97.21 percent of learners have cited at least one reason related to content and language, and most of these are associated with language. This reflects that course coordinators should look seriously at the language used in videos, and text should be compatible with the learners' linguistic abilities.

- **Quizzes and Forums:** like most MOOCs, SWAYAM MOOCs also have two essential quadrants for continuous assessment and interaction, i.e., module end quizzes and discussion forums. Generally, after each module, a module end quiz is given to learners to respond; the instructors post a discussion forum question for discussion, interaction (peer-to-peer and teacher-learner, both). In both the MOOCs, these components were given with every module. The researcher tries to find out if there is any reason related to these components that triggered the dropping out. The response on this aspect was collected with the help of six items, i.e., discussion forums were compulsory, quizzes were challenging to respond to, instructions to activities were not clear, too many forums to respond to, only one attempt was given in quiz, feedback was not given in forums along with an item that there was no reason associated with quiz and forum. The findings have been shown in the following pie-chart:

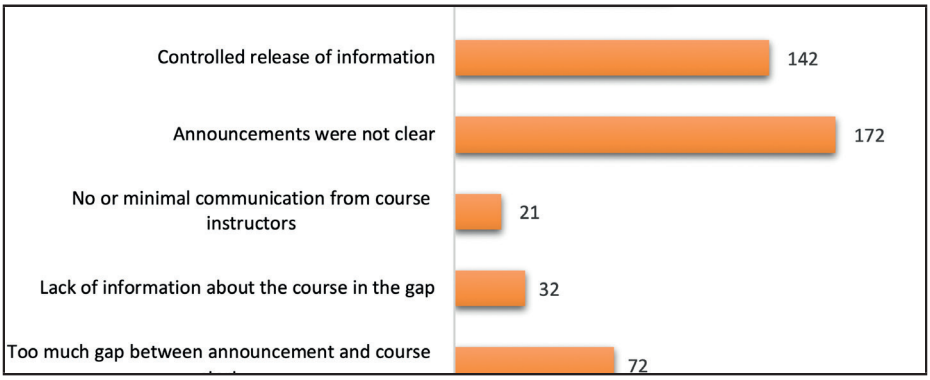
Figure-4: Reasons related to Quizzes and Forums



The pie-chart responses indicate that around 53 percent of the learners did not consider any reason related to quizzes and forums for dropping out from MOOC. Though, a few have reported some issues associated with these two aspects like for around 15 percent of learners, feedback not given on the forum posts was a reason; for 13 percent, only one attempt was given in the quiz was a matter of concern. For nearly 10 percent, compulsory discussion forums were the issue. These three indicators are also essential and can be used in subsequent cycles for improvement.

- **Communication with learners:** In any long-duration MOOC, continuous communication with learners is a key consideration. In SWAYAM MOOC, announcements are the main communication tools. Though discussion forums are also there to maintain two-way communication, the communication through discussion forums is mainly academic, and most of the time, it is related to the content. The researcher also used a parallel medium of communication in the Telegram Channel. Still, all learners have not joined the channels, as it was officially integrated with the SWAYAM platform. The researcher asked the learners about issues related to communication with the help of five items, along with an article citing no reason related to communication is an issue. Outcomes on this dimension as presented graphically as under:

Figure-5: Reasons related to communication with the Learners

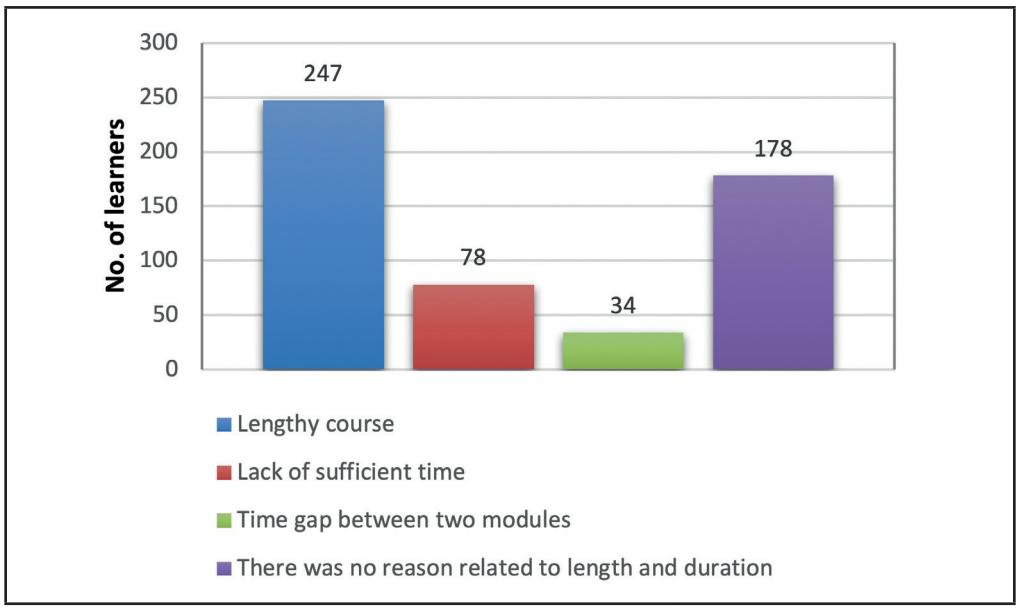


Analysis of the data related to the aspect of communication indicates that lack of clarity in announcements (32.03 percent) was the key issue followed by controlled release of the information (26.44 percent) and too much gap between the course announcement and course start (13.41 percent). However, 18.25 percent of learners have reported no reason related to communication.

This result is expected as the announcement section was not functioning correctly due to some technical glitch at SWAYAM central, and course instructors were releasing only necessary information. The announcement section was never used for informal communication with the learners; a telegram channel replaced it, but hardly 25 percent of learners subscribed.

- **Length and Duration:** As both, the MOOCs offered on SWAYAM were of 16-weeks duration. Four (04) weeks gap between course announcement and course publishing and one month time was enhanced due to unforeseen situations arising due to Covid-19. Learners were also asked about this aspect, because the review has suggested that short duration MOOCs have better retention rates.

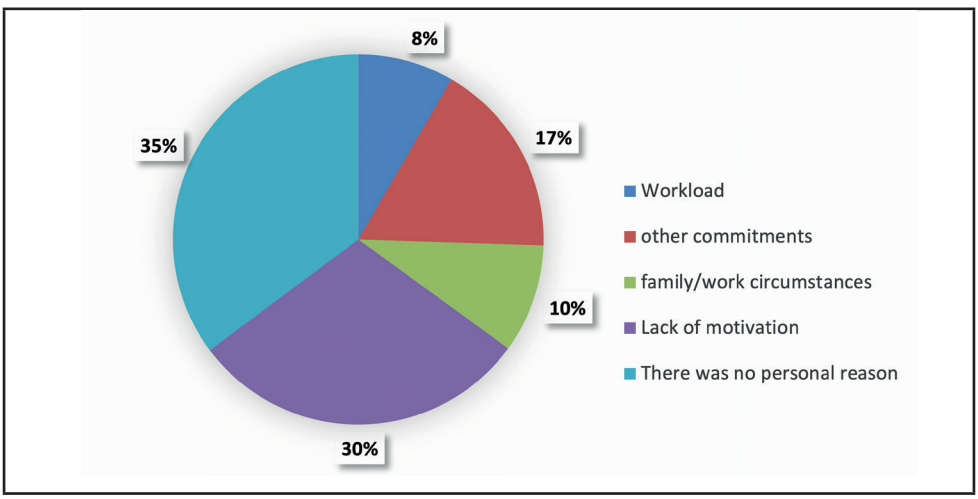
Figure-6: Reasons related to Length and Duration



The graph in figure 6 indicates that the course length was the biggest reason for this dimension, contributing to dropout. Nearly 46 percent of learners have cited this reason, though 33.15 percent did not consider length or duration of the course as a reason to drop out from the system. 14.53 percent of learners have cited the lack of sufficient time to study as a reason for dropping out. This finding supports the argument that MOOCs should not be of longer duration.

- **Personal Reasons:** Despite the reasons enlisted in sections 1-5, the researcher also collected personal reasons (if any), contributing to leaving the courses without completion. The distribution of learners' responses is shown in figure 7.

Figure-7: Personal Reasons contributed to Dropping-out



The chart in figure 7 indicates that 35 percent of learners cited their workload as a primary reason, contributing to their decision to drop. Still, researchers also found that lack of motivation is an important contributor to dropping out as well with 30 percent responses. 17 percent of learners have cited other commitments, whereas, for 10 percent of learners, family/work circumstances contributed to their decision to drop out from the course. This finding indicates that sustaining learners' motivation in a MOOC is still a challenge for course instructors.

- **Other reasons:** Apart from the listed grounds in the tool, learners were asked to cite any other reason they found a vital contributor to their decision to drop out of the course. Though, most learners have not cited any reason in this category, a few have mentioned the reasons like high examination fee for certification (62), non-availability of courses in Hindi/regional language (38), no approval of credit transfer at their institution (32), not matching with their curriculum (16), etc.

Major Findings and Discussion

- In the present study, it was found that there is no single reason, which can be pointed out as a contributor to the decision of learners for dropping out from the course. But, the analysis of their responses has indicated a few important points.
- Most of the learners joined the courses, as they were part of their formal teacher training programme (37.43 percent) or were preparing for competitive examinations (26.63 percent). Only 2.23 percent have said that they have joined the course for certification purposes. This finding indicates that viewing the success of a MOOC with a viewpoint of completion rate or certification rate cannot be the sole criteria. Most learners join such learning courses and not for certification purposes.
- The rate of dropping out from the course is higher in the middle of the course. This reflects that course instructors fail to sustain learners' interest and engage them in the course after a course of time. The study found that most learners have dropped out of the course between 5-12 weeks.
- The most important reason for the course design-related aspects was the non-availability of all modules simultaneously (32.4 percent). This also supports the study's first finding, as many learners join the courses for competitive examination/self-study purposes; they look for all the content of courses at the same time.
- On the language-related aspect, the study has indicated that availability of the content of the courses in only English language (31.28 percent), language used by experts not easily understandable (27.75 percent), and monotonous videos (24.58 percent) are found to be the most important reasons. This finding reflects in a multilingual country like India; courses are needed in Hindi and other regional languages. There are not many takers for the courses in the English language.
- Though there was no important reason highlighted by the learners related to quiz and discussion forum, few have hinted that these were not giving the feedback on the forum posts (15 percent), only one attempt for the quiz (13 percent) and making discussion forum compulsory (10 percent) are some of the reasons. This finding shows the ways to improve the practices while running the course. The course instructors' more meaningful and continuous

involvement can improve on all such aspects.

- On the aspect of communication, the research has indicated that reasons like lack of clarity in announcements (32.03 percent), controlled release of the information (26.44 percent) and too much gap between the course announcement and course start (13.41 percent) are some areas of concern. These sometimes contribute to the dropout of learners from the MOOC. This also demands continuous communication and interaction between the course instructor and learners.

- A very important finding from the study is that learners do not prefer a lengthy MOOC. Longer duration courses attract a higher dropout rate; nearly 46 percent of learners have confirmed this assumption in the survey.

- Longer duration courses demand more time for learning engagement, which many learners find difficult. The finding also confirms that 35 percent of learners cited their workload as a reason for dropping out and lacking motivation (30 percent). Sustaining learners' motivation in longer duration courses is always a challenge for the course coordinators. Course instructors need to find the ways and means to sustain learners' interest and motivation. There are some strategies suggested by researchers like Ahearn (2019), including making students complete an application, imposing a final deadline, the learning materials available only for specific intervals, a series of "live" or synchronous events, integrating Platforms like Facebook Live, Zoom, Slack, and WhatsApp for continuous engagement, etc., which the course instructors can practice in future cycles.

- The study also highlighted a few other important reasons like high examination fee for certification, non-availability of courses in Hindi/ regional language, no approval of credit transfer at their institution, not matching with the curriculum, etc. about which course instructors have to think and find a solution. If there is nothing new in the MOOC, very few takers will sustain themselves in the course.

Educational Implications

Though this study is delimited to only two SWAYAM courses, which were offered in the first cycle, the study's findings have broader implications. The educational implications of the study can be categorized as below:

- **Implications for the Course-instructors**

  The study suggests that course instructors need to find a solution for sustaining learners' interest and motivation. Various strategies indicated by many researchers need to be incorporated or new strategies can be identified, practised, studied, and shared. Linguistic aspects in videos and interactivity need to be looked upon—continuous and precise communication with learners is very important. Discussion forums should be replied to continuously, and learners should be engaged through announcements.

- **Implications for Host-institutions**

  The institutions offering MOOCs should ensure the updated curriculum, preferably the model curriculum, to match most institutions/universities. Institutions should encourage MOOCs in Hindi and other Indian regional languages. If possible, bi-lingual MOOCs can be experimented with to some extent.

- **Implications for Policy-makers**
  The monotonous structure of SWAYAM MOOC needs to be revisited. It will be better if freedom is given to the course instructor to decide the number and length of videos and not a fixed duration imposed based on credits. SWAYAM platform requires a user-friendly interface with attractive templates. A single template is not fit for all types of courses. At present, learner analytics is not given to course coordinators, due to which they are unable to track the progress and engagement of learners in the course. More learner analytics should be at the disposal of the course coordinators, which will help them, strategize the inputs to be added for engagement and sustainability of learners in the courses.

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Research article

Attitude of Students towards the Use of Interactive Whiteboard in Higher Education

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Abstract

The present study aimed to examine the attitude of university students towards the use of Interactive Whiteboard (IWB) in higher education along with differences in attitude resulting from some demographic variables. 129 University students, age ranged from 19-25 years who actively used IWBs in the classroom for instruction, were selected purposively in the sample. A self-developed tool based on a five-point Likert scale followed by three open-ended items was used to collect the data. Mann-Whitney U test, Kruskal Wallis H test and percentage analysis were used to analyze the data. The results showed that students have a positive attitude towards the use of IWB in higher education. The results further revealed the significant differences in the attitude of students towards IWB based on gender, types of discipline and basic knowledge of computers. However, the gender difference was found only in one dimension i.e., perceived teaching effectiveness. Furthermore, the students of education discipline showed higher scores on the attitude towards IWB than their counterparts. Students with high basic knowledge of computers were found to be higher in attitude towards IWB than the students of science and social science discipline. Students agreed that IWB is more effective than traditional boards in terms of accuracy, drawing the multidimensional figures and shape perfectly and its movement from different angles effectively, increasing interaction, making the teaching-learning process more enjoyable and providing facilities to use the stored learning material. Nevertheless, students have highlighted the major problems like- lack of trained ICT teachers, lack of technical support and internet access. Possible education and policy implications are outlined.

Keywords: Students' attitude, interactive whiteboard, higher education

Introduction

Due to technological and scientific advancement, the world is transforming into a digital world that comprises real and digital worlds (Zhu, et al. 2016). Undoubtedly, the advancement of ICT has brought drastic changes not only in industry, business, and other sectors but also into the entire spectrum of the education system across the world (Murcia, 2014). Ergo, the traditional pedagogical practices are replaced by the ICT based pedagogical practices. As a result, Interactive whiteboard (IWB) is one of the latest examples of technological developments in the field of the education system. However, initially, it was developed for other sectors, but over the last decade, it has begun in the education system also. The use of IWBs makes the teaching and learning atmosphere more enjoyable, creative, and interesting (Elaziz, 2008) by integrating different pedagogical strategies (Serdyukov, 2017). The earlier context of the learning process has been morphed to a new sight, which harmonizes hi-tech as a tool for teaching-learning processes. Hence, the

students enhance their knowledge in different fields beyond the classrooms and create a metamorphosing learning environment. For the significant use of digital technologies in Indian classrooms, Govt. of India, and various organizations have taken positive steps to make the education system dynamic and extravagant. Despite efforts, however, all education institutions at higher levels are not well-equipped with smart boards and projectors. But a road map may be outlined for the developing countries like India that are in the process of ameliorating their education system by orienting them with technological advancement and innovation. It plays a pivotal role to resolve different issues like access, equity, and quality.

An IWB is also known as an electronic board, touch-sensitive board, digital whiteboard, smartboard. It has taken the place of a blackboard or green board for offering an attraction through different colours of pictures and to be able to manipulate, save texts, objects, pictures, voice, etc., as per the requirement of the teaching-learning process. Due to the indispensable role of IWB in the digital world, it is also described as a 'digital hub through which other technologies can be channelized' (Warwick, Mercer, Kershner & Staarman, 2010).

Rationale of the Study

Several research studies paid scholarly attention to the use of IWB in English language learning (Shams & Ketabi, 2015), Mathematics learning (Vita, Verschaffel & Elen, 2014) and the attitude of students and teachers towards the use of interactive whiteboards in particular (Elaziz, 2008). Research studies demonstrated that the average level of ICT awareness of teachers is influenced by their gender and age (Bindu, 2017). Singaravelu (2017) reported that the student-teachers have favourable attitudes towards the use of IWB and are more comfortable in using IWB instead of a traditional blackboard. In support, Balta and Duran (2015) also reported similar findings and concluded that the students and teachers both have positive attitudes towards using IWB, but their attitudes differ across their genders at the school level. In contrast, the gender difference was not reported by Bindu (2017) and Mahajan (2016). Gashan and Alshumaimeri (2015) studied the analysis of the teachers' responses and revealed negative opinions toward the IWB. Most of the teachers agreed positively that they were not scared to use IEB in the class as it makes them comfortable in the teaching-learning process. The major challenges that they faced were: the lack of sufficient training and the non-appropriate curriculum content for the application of the IWB. It has been demonstrated through research studies that due to lack of ICT competency, teachers face challenges, while using IWB in their classrooms (Al-Faki & Khamis, 2014) therefore, training is required to support teachers (Akkoyunlu & Erkan, 2013). Elaziz (2008) reported the positive attitude of student teachers towards IWB and highlighted IWBs as useful devices for ameliorating the standard of the teaching-learning process. It increases their interest, motivation and draws their attention for effective learning (Tataroglu & Erduran, 2010). The lack of teacher involvement in technology-based instruction is primarily due to a lack of training, support, time, and resources. Therefore, as new technology continues to evolve, educators must challenge themselves to become technologically savvy in today's digital world (Williams, 2017). Based on the analysis of the previous research findings from India and overseas, it is realized that in the developing country the biggest challenge in front of the education system is to modernize the classroom environment and to equip well-trained teachers for developing a

positive attitude towards the use of ICT in education. Due to the importance of IWB in education, the majority of students and teachers showed a favourable attitude towards the use of ICT like the use of an interactive whiteboard in the classroom (Singaravelu, 2017; Gashan & Alshumaimeri, 2015; Balta, 2015; Elaziz, 2008). In contrast, less effective learning through smart classrooms was reported (Yang, Zhou & Huang, 2018). There are different barriers in the willing to use ICT in the teaching-learning process (Singhavi & Basargekar, 2019; Gashan & Alshumaimeri, 2015) namely lack of interest, not having proper training and facilities in the classroom (Ghavifekr & Rosdy, 2015).

After analysis of the research findings, first and foremost, it was found that State-of-the-art literature is deficient to address the transformation of cutting-edge technology like the use of IWB especially in the higher classrooms of the Indian context. In India, IWB technology has been recently introduced in the field of education. However, it has not yet reached use in the entire spectrum of education, i.e. higher to pre-primary level. Besides this, it was also found that there is no standardized certified tool to measure attitude towards IWB at the level of higher education. The development of the certified tools for investigating the students' attitude towards IWB in Indian higher education represents the novelty of this study. With all claimed benefits and possible disadvantages of IWBs, and to add additional knowledge in the area of possible differences based on demographic variables, the study may be helpful to teacher educators, teachers, and prospective teachers. In the light of the above-mentioned discussion, the present study has been conducted to address the following research questions:

1. What is the attitude of university students towards the use of IWB in higher education?
2. Do the differences based on gender, discipline, level of education (UG/PG), and basic knowledge of computers exist in students' attitudes towards the use of IWB in higher education?
3. What are the views of university students towards the use of IWB in higher education?

Objectives of the Study

The following objectives of the present study were:

1. To study the attitude of students towards the use of an interactive whiteboards in higher education.
2. To compare the attitude of students towards the use of interactive whiteboard in higher education for (i) Gender (ii) Locality (iii) Level of programme (iv) Discipline

Hypotheses of the Study

The following null hypotheses were formulated to achieve the objectives of the study:

There is no significant difference in the attitude of students towards the use of an interactive whiteboard in higher education with respect to (i) Gender (ii) Locality (iii) Level of programme (iv) Discipline

Research Methodology

Method: Descriptive survey method was used to achieve the objectives of the study.

Participants: 129 University students were selected through a purposive sampling technique from three schools of central institution namely science, social science, and education discipline. The age group of the selected sample was from 19-25 years.

Instrument: The tool consists of three sections A, B, & C. In the first section, demographic information was asked by the participants. In the second section, 39 items (positive and negative*) based on the five-point Likert's scale and in the third section three open-ended questions were asked to collect the data from participants. The "Attitude Scale towards the Use of Interactive Whiteboard" (ASTUIWB) is based on a five-point Likert's scale (from strongly agree=5 to strongly disagree=1 for positive items and reverse for negative items/Statements) was developed by the investigators. However, after receiving the feedback of the expert, 40 items out of 50 items and three open-ended questions were finalized for the tryout phase of the test construction. After an item analysis procedure, one item was rejected. However, one item was modified and included in the test. Ergo, 39 items out of 50 items were finally included in the scale. Thus, the tool consisted of two measuring instruments in which one is based on the five-point Likert's scale with 39 items and the second is questionnaire type with three open-ended questions. The scale has four dimensions namely Perceived Learning Experience (PLE), Perceived Teaching Experience (PTE), Basic Knowledge (BK), and Usability (U). Reliability of the tool

Cronbach's alpha (coefficient alpha) is used to calculate the reliability coefficient of the tool along with dimensions. The reliability coefficients of the four dimensions namely PLE, PTE, BK, and U were found to be 0.80, 0.77, 0.51, and 0.84, respectively. Based on internal consistency analysis, the reliability coefficient of the entire scale was found to be 0.91. This value indicates good internal consistency of the items in the attitude scale towards the use of IWBs. Hence, the scale was considered to be highly reliable.

Validity of the tool: The content validity of the tool was established through the experts' judgement. Three experts from the University: one a psychologist, second an ICT Expert and language expert reviewed all items of the tool by considering the fundamental aspects like content, items, language, vagueness, length, dimensions etc. After receiving the experts' feedback and using item analysis, a minor revision was applied to the tool for improving its validity to the research questions of the study. Thus, 39 items and three open-ended items were found to be appropriate for the final draft of the tool.

Procedure of data collection: First, permission was taken from the concerned authorities of the concerned schools; thereafter the investigator administered the tool through online mode to collect the data from the concerned participants. Participants were fully informed about the purpose of the study before the distribution of the tool. Besides this, they were invited to participate in this study voluntarily and were allowed to withdraw from the study at any time. After establishing a rapport with the participants, all required instructions were given very clearly in the tool. All the procedure of data collection was completed in seven days in September 2020. After the collection of the data, the scoring procedure was done.

Statistical analysis: Descriptive statistics like mean, SD, kurtosis, skewness and the sampling procedure both are required to choose the appropriate statistical procedure for analysing data. Table 1 shows the basic statistics of the group of the participants' age ranging from 19-25 years. It is apparent from Table 1 that the SD value of attitude towards IWB is 16.90 for mean 147.88 which is approximately one-ninth to mean and even skewness (- 0.18) and kurtosis (0.03) values are not close to the ideal values of Normal Probability Curve (NPC).

Table-1: Details of Participants

Variable	N	Min	Max	Mean	SD	Skewness	Kurtosis
Attitude towards IWB	129	99	187	147.88	16.90	- 0.18	0.03

As can be seen from Table 1, the nature of data is non-normal due to the positively skewed and not mesokurtic nature of data. Because of not showing the Gaussian distribution of data, the best alternatives of t-test and F-test in nonparametric statistics are the Mann-Whitney U test and the Kruskal Wallis H test respectively. Statistical Package for Social Sciences (SPSS-20) was used to analyze the data except for the three open-ended items of the questionnaire. Furthermore, percentage analysis was used to analyse the data in the case of three open-ended items of the tool.

Results

Table-2: Result of Mann Whitney U Test for Attitude towards IWB (Gender)

S No.	Areas	Gender	N	Mean Rank	Rank sum	U	z	p value	Decision
1.	Perceived Learning Effectiveness	Male	70	67.85	4749.50	1865.50	-0.94	p > .05	NS
		Female	59	61.62	3635.50				
2.	Perceived Teaching Effectiveness	Male	70	72.54	5077.50	1537.50	- 2.50	p < .05	S
		Female	59	56.06	3307.50				
3.	Basic Knowledge	Male	70	65.24	4567.00	2048.00	- 0.81	p > .05	NS
		Female	59	64.71	3818.00				
4.	Usability	Male	70	68.63	4804.00	1811.00	- 1.21	p > .05	NS
		Female	59	60.69	3581.00				
5.	Attitude towards IWB	Male	70	69.68	4877.50	1745.00	-1.55	p > .05	NS
		Female	59	59.45	3507.50				

S-Significant; NS-Not Significant

As can be seen from Table 2 the obtained 'U' value (z = - 2.50; p<.05; df = 127) was found to be significant only in the case of the Perceived Teaching Effectiveness (PTE) dimension of attitude towards IWB. Hence, Ho is rejected and it indicates that male and female students were found to differ in the PTE dimension i.e., male students were significantly higher in PTE of attitude towards the IWB than their female students' counterparts.

Table-3: Result of Mann Whitney U Test for Attitude towards IWB (Locality)

S No	Areas	Locality	N	Mean Rank	Rank sum	U	z	p value	Decision
1.	Perceived Learning Effectiveness	Rural	62	67.76	4201.00	1906.00	- 0.81	p > .05	NS
		Urban	67	62.45	4184.00				
2.	Perceived Teaching Effectiveness	Rural	62	65.52	4062.00	2045.00	- 0.15	p > .05	NS
		Urban	67	64.52	4323.00				
3.	Basic Knowledge	Rural	62	66.67	4133.50	1973.50	- 0.49	p > .05	NS
		Urban	67	63.46	4251.50				
4.	Usability	Rural	62	66.57	4127.50	1979.50	- 0.46	p > .05	NS
		Urban	67	63.54	4257.50				
5.	Attitude towards IWB	Rural	62	67.00	4154.00	1953.00	- 0.56	p > .05	NS
		Urban	67	63.15	4231.00				

S-Significant; NS-Not Significant

It is evident from Table 3 that the obtained 'U' values (z = -0.81, -0.15, -0.49, -0.46, & -0.56; df = 127; p > .05) were found to be not significant in the scores of attitude towards the use of IWB along with its all dimensions with respect to locality. Hence, the decision failed to reject H_o in favour of H_1. It indicates that there is no statistically significant difference between the attitude of urban and rural students towards the use of the IWB i.e., both rural and urban students have a similar extent of attitude towards the use of IWB.

Table-4: Result of Mann Whitney U Test for Attitude towards IWB (Programme)

S No	Areas	Programme	N	Mean Rank	Rank sum	U	z	p value	Decision
1.	Perceived Learning Effectiveness	PG	68	61.40	4175.50	1829.50	-1.15	p > .05	NS
		UG	61	69.01	4209.50				
2.	Perceived Teaching Effectiveness	PG	68	64.60	4392.50	2046.50	-1.30	p > .05	NS
		UG	61	65.45	3992.50				
3.	Basic Knowledge	PG	68	66.67	4533.50	1960.50	-0.53	p > .05	NS
		UG	61	63.14	3851.50				
4.	Usability	PG	68	66.10	4494.50	1999.50	-0.35	p > .05	NS
		UG	61	63.78	3890.50				

5.	Attitude towards IWB	PG	68	64.47	4384.00	2038.50	-0.17	p > .05	NS
		UG	61	65.59	4001.00				

S-Significant; NS-Not Significant

Table 4 shows that the obtained 'U' values (z = -1.15, -1.30, -0.53, -0.35 & -0.17; df = 127; p>.05) were found to be not significant in attitude towards the use of IWB between UG and PG students respectively. Hence, the decision failed to reject H_o in favour of H_1. Therefore, it is concluded that both UG and PG students are having similar attitudes toward the use of IWB.

Table-5: Result of Kruskal Wallis H test for Attitude towards IWB (Discipline)

S No.	Areas	Variable (Disciplines)	N	Mean Rank	H value	p value	Decision
1.	Perceived Learning Effectiveness	Social Science	27	45.59	9.25	p < .05	S
		Education	73	70.38			
		Science	29	69.52			
2.	Perceived Teaching Effectiveness	Social Science	27	45.65	9.32	p < .05	S
		Education	73	70.99			
		Science	29	67.95			
3.	Basic Knowledge	Social Science	27	50.07	11.78	p < .05	S
		Education	73	74.77			
		Science	29	54.31			
4.	Usability	Social Science	27	47.80	8.87	p < .05	S
		Education	73	72.47			
		Science	29	62.22			
5.	Attitude towards IWB	Social Science	27	43.54	12.72	p < .05	S
		Education	73	73.50			
		Science	29	63.79			

S-Significant; NS-Not Significant

It is evident from Table 5 that the obtained Kruskal-Wallis H values (H = 9.25, 9.32, 11.78, 8.87, & 12.72; df =2; p < .05) were found to be statistically significant in attitude towards the use of IWB along with its all dimensions among the students of three disciplines namely, social science, education and science. Hence, H_o is rejected. Therefore, a post-hoc analysis was used to examine the differences between the mean ranks of two different groups.

Table-6: Procedure of Post-hoc Analysis (Disciplines)

Variable	Disciplines	N	Mean Rank	Sum of Ranks	U value	z value	p-value
Attitude towards IWB	Social Science	27	33.93	916.00	538.00	-3.48	p < .05
	Education	73	56.63	4134.00			
	Education	73	53.87	3932.50	885.50	-1.23	NS
	Science	29	45.53	1320.50			
	Science	29	33.05	637.50	259.50	-2.17	p < .05
	Social Science	27	23.61	958.50			

S-Significant; NS-Not Significant

Table 6 depicts that obtained z values (z = 3.48, & 2.17, p < .05, df = 98) were found to be significant in the scores of attitude towards IWB. Hence, Ho is rejected. Statistically, it indicates the significant difference in an attitude of students towards the use of IWB with respect to social science & education and similarly with social science and science discipline. Therefore, it is concluded that students of education discipline are having higher scores in attitude towards the use of IWB than their social science discipline. Furthermore, it is also concluded that students of science discipline are having a higher score on attitude towards IWB than their social science discipline.

Table-7: Result of Kruskal Wallis H test for Attitude towards IWB (Basic knowledge of computer)

S No	Areas	Knowledge of computer	N	Mean Rank	H value	p value	Decision
1.	Perceived Learning Effective-ness	High	30	83.35	24.68	p < .05	S
		Average	81	66.34			
		Low	18	28.39			
2.	Perceived Teaching Effective-ness	High	30	74.35	9.47	p < .05	S
		Average	81	66.85			
		Low	18	41.08			
3.	Basic Knowl-edge	High	30	76.65	17.42	p < .05	S
		Average	81	67.96			
		Low	18	32.25			
4.	Usability	High	30	76.73	14.01	p < .05	S
		Average	81	67.06			
		Low	18	36.19			
5.	Attitude towards IWB	High	30	79.33	20.96	p < .05	S
		Average	81	67.56			
		Low	18	29.58			

S-Significant; NS-Not Significant

As can be seen from Table 7, the obtained Kruskal-Wallis H values (H= 24.68, 9.47, 17.42, 14.01, & 20.96, df =2, $p < .05$) were found to be statistically significant in students' attitude towards the use of IWB along with its all dimensions for high, average, and low level of basic knowledge of computer. Hence, H_o is rejected. Ergo, post-hoc analysis was used to examine the differences between the mean ranks of two different groups.

Table-8: Procedure of Post-hoc Analysis (Basic knowledge of computer)

Variable	Level	N	Mean Rank	Sum of Ranks	U-value	z-value	p-value
Knowledge of Computer	High	30	64.08	1922.50	972.50	-1.16	NS
	Average	81	53.01	4293.50			
	Average	81	55.56	4500.00	279.00	-4.08	p < .05
	Low	18	25.00	450.00			
	Low	18	14.08	253.50	82.50	-3.99	p < .05
	High	30	30.75	922.50			

S-Significant; NS-Not Significant

It is evident from Table 8 that obtained z values (z = -4.08, p < .05, df =109; z = -3.99, p < .05, df = 97) were found to be statistically significant in students' attitude towards the use of IWB scores with respect to students' knowledge of computer. Hence, Ho is rejected. It indicates the statistically significant difference in attitude towards the use of IWB among the students having different degrees of computer knowledge. Furthermore, it is also concluded that students with high basic knowledge of computers were having a highly positive degree of attitude towards IWB along with its dimension than their counterparts.

Qualitative analysis

The first item asked from the participants was- How does IWB facilitate the teaching-learning environment?

After analysis of the comments of participants, the result revealed that 63 percent of the students accepted that IWB is more effective than traditional boards in terms of accuracy, drawing the multidimensional figures and shapes perfectly and their movement from different angles effectively and increasing interaction between students and teachers. 57 percent of students Stated that IWB contributes to enhancing motivation and making the T-L process more enjoyable and fetching maximum attention of learners for long term retention. 10 percent of students Stated that IWB is very helpful in reviewing and revising any lesion effectively. In addition, it enhances the level of engagement with the IWB that supports for a better learning environment.

The second item of the tool asked from the participants was- What are major problems faced by the students when teachers use IWB in the classroom?

The generic Statement of 53 percent of students pointed out the lack of training of teachers because most of the teachers failed to calibrate the IWB with the projector properly. In addition, 43 percent of the students faced technological and network problems that affected their teaching-learning process. 52 percent of students felt

that the teachers lack experience and confidence during the use of IWB in the classroom. If teachers do not have the confidence to use IWB effectively then it may be the cause of poor performance and lack of effective use of the technology in the classrooms.

The third item of the tool was- Provide your suggestions for the effective use of IWB in the teaching-learning process.

Participants have highlighted several problems, however, these are short-term in nature i.e. 'teething troubles' than long term difficulties. Apart from showing a favourable attitude towards IWB, students have also shared their views for the effective use of IWBs in the T-L process. It was highlighted by 64 percent of participants that training and refresher courses should be given to the in-service teachers and pre-service teachers too for enhancing their confidence and competence to work with IWB effectively. In addition, they Stated that technical support is considered to be a vital component in any ICT related tasks. 18 percent of students responded that the teacher should simultaneously use the traditional board and IWB for an effective teaching-learning process. At last, 17 percent of students Stated that teachers may conduct assessments and evaluations for the effective use of IWBs.

Discussion & Conclusions

The aim of the present study is to examine the students' attitude towards the use of IWB in higher education and also focus and ferret out the differences for the same based on gender, locality and level of education, discipline and basic knowledge of computers. The findings of this study revealed that students have a positive attitude towards the use of IWB in higher education. Similar findings are also supported by different research studies (Tataroglu & Erduran, 2010; Elaziz, 2008: Hall & Higgins, 2005). IWB based teaching-learning processes are perceived by university students as more effective and enjoyable because of fetching attention, increasing interest, motivation and classroom interaction, multiple dimension presentation, etc. and even facilities not only for saving the lectures and material but also using it simultaneously. However, despite having advantages of IWB in the teaching-learning process, it is also suggested by the students that the IWB tool may be used in specific lessons or topics, but for creating a natural environment, improving writing skills on a blackboard, green board, and drawing the figure and pictures manually as feasible for teachers by considering the time and appropriateness, it would be better to use the blackboard, green board by teachers and students.

Furthermore, the gender difference was not found with respect to attitude towards the use of IWBs in higher education except for only one dimension, i.e. perceived teaching effectiveness. Male students were found to be significantly higher than their female students' for the same. However, it is not supported by the several research studies (Singaravelu, 2017; Bindu, 2017; Mahajan, 2016, Balta & Duran, 2015) that have reported the gender differences in attitude towards IWB. It is the gender bias notion, that male students are technologically more adapted than girls. It will be a barrier to maximum utilization of human resources for national development because of ignoring half of the population's efforts. However, the role of family and other agencies also play an active role to encourage them by highlighting their achievements in different fields from time to time.

In addition, locality differences were also not found in the attitude of students towards the use of IWB in higher classrooms. However, the findings of the study were supported by Loong,

Doig, and Groves (2011) because they reported a little difference across most aspects of ICT use between rural and urban students. But in contrast, Unlu, Dokme and Sarikaya (2014) reported a significant difference in the use of the internet in favour of urban students than their counterparts. The reason for this could be that the urban people are more exposed not only towards the use of computers and English language but also other aspects as they have better socioeconomic status and other facilities than rural background students. Rural Indian students face a more challenging situation for the effective use of ICT in education, because of the lack of technology, internet access, and qualified trainers. And this study suggested that in this situation ICT enabled education in rural schools can be an innovative step to fill this literacy gap and to uproot the teaching-learning process. In addition to the level of education, wise differences were also not found among the students of UG and PG programmes. Nevertheless, disciplinary differences were found. The students of education discipline were having a higher positive attitude towards the use of IWB than social science students. However, similar findings were reported by Balta & Duran (2015). The possible explanation of the result may be due to the training of the students of Education discipline.

At last, the difference based on the basic knowledge of computers was also found in the attitude of students towards the use of IWB along with its all dimensions. Students with high and average basic knowledge of computers showed a higher attitude towards IWB than the students having less basic knowledge of computers. This result may be due to one possible factor, i.e. the positive relationship between ICT knowledge and effective use of IWB. Therefore, the findings of this study suggested that a support system (learning material) may be provided to the students to enhance their competencies like including the course of ICT in education, orienting the students and faculty members for the effective use of IWB in their teaching-learning process.

The technology shifts the paradigm from the traditional system of learning to ICT enabled learning which helps to improve the learners' skills and promote active learning and interaction in the classroom (Aflalo, Zana, & Huri, 2018; Hall & Higgins, 2005). Most of the students agreed that IWB is helpful in making the teaching-learning process more interesting and effective (Mata, Lazar & Lazar, 2016; Hall & Higgins, 2005). In addition, it helps to increase motivation, level of engagement, and retention levels of the learners. IWB is also very useful for better understanding of content using cognitive, affective, and psychomotor domains of the learners. The important issue raised through the findings of the study is that there is a great need for adequate training to increase the maximum utilization of the IWB in the teaching-learning process (Hall & Higgins, 2005; Elaziz, 2008). Despite having a larger population in India, the Govt. initiatives are being incorporated to provide the IWBs facilities at the entire spectrum of education across the country. But several reasons may cause the ineffective implementation of IWB in the teaching-learning processes like (i) untrained teachers at the elementary level, secondary level and higher level too; (ii) no internet facilities, technological assistance and maintenance in remote areas and village schools (iii) unavailability of ICT expert teacher to assist other teachers for the use of IWBs by using update ICT knowledge. Although, the study suggests that the policymaker and administrator should observe such difficulties faced by the teachers and learners' practices with the IWB and initiate important

steps to remove the problems.

Despite the methodological strength, the present study has some limitations. One concern related to this study has been claimed to have a positive attitude of students towards the use of IWB in higher education, but with some limitations like a small sample, selection of only one institution and not using triangulations (interview, observation). Therefore, the findings of the study may be less valid to generalize the population. Secondly, teachers' views should be involved to validate the findings of the study in terms of the advantages and disadvantages of the use of IWB in the classroom. Even in most cases, teachers are not having a great deal of exposure to lessons or limited exposure with IWBs; therefore, it may be the reason for not capturing the true extent of the attitude of the students towards the use of IWB. Third, the content validity of the tool was only established.

Although this study includes both qualitative and quantitative data, classroom observations are missing to explore to what extent students and teachers will be benefitted from the potential use of this technological device as claimed in literature? Therefore, a longitudinal study may be conducted to confirm the findings of the study as required correlating the greater use of IWB and more positive attitude of students towards IWBs (Elaziz, 2008). Future research may be conducted at the primary and secondary levels to study the effectiveness of the use of IWB in the classroom in terms of learners' performance and teaching effectiveness. It could be extended for the subject-specific domain like social science and language. Past and present studies have not yet addressed the concerning issues such as how can we foster students' creative thinking by using IWB? Ergo, longitudinal and experimental research may be conducted to look at other issues and for a better understanding of the effectiveness of IWB.

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Research Article

Effectiveness of Informational Communication Technology Instructional Package (ICTIP) on English Language Learning among Secondary School Students: An intervention study during Covid-19

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Abstract

Information and Communication Technology (ICT) is dominating the world in general and equally imparting the best of the resources in quality education, hence, 21st century is considered an era of ICT in education (Mayer, 2014). This present unprecedented Covid-19 pandemic created a wide range of gaps in physical classroom practices in most of the world and it is also evident that the whole world solely depends on the best ICT resources for instruction to support the teaching-learning process for which an experimental study administered to evaluate the relative effect of Informational Communication Technology Instructional Package (ICTIP) in teaching the English Language. The sampling of the study consists of 61 students of the 10th class aged 15 to 17 years from Jawahar Navodaya Vidyalaya students of the Pondicherry region. The ICTIP consists of various instructional interventions on content and pedagogical inputs to improve the academic performance in English Language learning between the control and experimental group before and after intervention respectively. The mean scores of the experimental group were found statistically significant when compared to that of the control group after the intervention of English language skills and invariably increased the mean scores of listening, speaking, reading and writing skills. Hence, this study reveals that ICT instructional package is effective and shall always bring desirable changes in any content teaching especially during this COVID pandemic which helps teachers to use it day to day classroom practices and other stakeholders to encourage the same.

Key Words: ICT, Instructional Package, English Language skills, School students.

Introduction

Shaping India's future to achieve social and educational goals is a fundamental challenge for Mankind and India, being a progressing society trying hard to become a superpower by converting its demographic advantage into a knowledge powerhouse in every possible area of concern, including education pre-school to higher education, the twenty-first century is referred to as the Era of ICT.

Information and communication technology (ICT) has become one of the most important tools in the learning process. The purpose of this study is to evaluate how well the intended and constructed instruction can improve

English Language Teaching (ELT) skills, such as listening, speaking, reading, and writing. Various studies have found that educational materials that are embedded with instructional information and given in the form of text, pictures, voices, and so on are better than words alone. In view of Mayer (2014) written and spoken text are examples of words, while static graphic images, animation, and video are examples of pictures. According to Kanellopoulou et al. (2019) using both words and pictures allows the brain to process more information in working memory. Mohseni (2014) investigated the impact of chunk learning on listening comprehension and discovered that chunk learning, which includes multi-words, verb idioms, and collocations, had a significant impact on listening comprehension ability. According to Gilakjani et al. (2011), a video instructional package improves students' grasp of physics topics, skill acquisition, and performance. The use of video in listening and grammar, as well as enhanced pronunciation of English words, demonstrated that the learner became more engaged and spontaneous in the acquisition of new words (Spector et al., 2014). According to Gilakjani et al. (2011), the usage of multimedia can increase learners' intrinsic motivation.

Schools of today are looking at opportunities to strengthen their structure become more competitive, adopt new technology in communication and information that are also affordable, which will aid in getting over competition and sustaining in the long run (Spector et al., 2014). The education sector is not uniform in developing countries like India. Schools have diversified status in their infrastructure. In India, Public schools are funded by the Government at the third level, followed by Aided schools and Private schools which are at the top in terms of technology and infrastructure. The era is Multimedia, Video Conferencing Information technology communication which pushes schools to Adopt ICT in their curriculum and mode of teaching largely to sustain the field of education (Fishman et al., 2004). ICT enabled learning gives students access to the latest information and technology, talented mentors, and international teachers' expertise, which otherwise is almost impossible for many. ICT enables the easy adoption of different approaches and enhances teaching and learning (Shirley Ayonmike, 2020).

Need and importance of the Study

In the teacher training institutes sector, information and communication technology (ICT) is employed as a communication tool to improve student teachers' learning and teaching techniques. Training institutions use communication software to send, save, share, and exchange information as technology advances in education and training. ICT in education has driven many teacher training institutions to become acquainted with smart technology in this technological era. The Government of India, as per the revised scheme of Information and Communication. For this reason, many programs have been taken by the Government.

Research in education has been established that language fluency improves the achievement of the students that become joyful learning at the same time. Language helps the students to understand the content and they can study in-depth when the content is understood literally. Students become restless when the language of the content is not understandable to them. However, the understanding ability enhances the learning ability and increases the rapidity of understanding. As Rashtriya Madhyamik Shiksha Abhiyan (RMSA) emphasizes the learning

should be meaningful and joyful and thus the students take part in learning with a creative activity, which leads to their best academic achievement and creative learning as well.

Learning the English language can be boosted with innovative methods of teaching. ICT has such a great scope of involvement embedded with varieties of verbal and visual presentations that support and enhance meaningful learning. It is an innovative attempt since its great network and versatility helps one to create many innovations in the field of education. Hence, there exists a great need for worthy research in this domain to find out the suitable or appropriate techniques and methods, including integration of the use of adequate ICT gadgets in teaching and learning which has made the teaching-learning process more meaningful. Hence, the investigator attempted to design and develop an ICT-based instructional Package (ICTIP) to impart English Language Teaching (ELT) to enhance the basic skills of listening, speaking, reading and writing (LSRW) through experimental method using Pre-test and Post-test equivalent group design at Jawahar Navodaya Vidhyalaya at Pondicherry region.

Review of Related Literature

Educational research studies have established that the positive outcomes evolved using varieties of ICT resources that were experimented with in the education sector especially on the Teaching-Learning process. ICT became popular and has been introduced in many schools and various subjects. Teachers often consider ICT as an appropriate resource that is standardized and assists them to teach the school curriculum. However, the education sector has started working on the practical domain using Information Technology. It is a great transformation that helps teachers in improving and making teaching easy and enjoyable even for complex and abstract tasks.

Barış (2016), students who were taught using a video instructional package or an audio instructional package did better than students who were taught using standard classroom instruction. Alpaslan (2016), the influence of video projection and a power-point educational package resulted in better performance than the traditional technique of teaching. Shirley Ayonmike (2020) discovered that the influence of the online mode of instruction was more successful in the learning of motor skills and recommended that teachers incorporate the same online mode of education. According to Mohsen & Shafeeq (2014), instructors have a good attitude toward adopting new technologies, such as Blackboard, which acts as a structured E-Learning Platform for teachers who can study English or a foreign language (EFL). Oyeyemi & Daniel (2016) studied the impact of interactive multimedia on students' English language pronunciation skills.

The world of education is changing and it is towards the use of ICT. Teachers of English as a Foreign Language used ICT to enhance their teaching in a variety of ways, including PowerPoint and word processing, as well as language dictionaries and internet films (Sabiri, 2020).

Education has moved from just theoretical learning to creating information technology if not least knowing how to use them. Other teachers view ICT as a tool to handle complex tasks and with performance-based assessment. At present, it is visible that there is a strong relationship between the belief of a teacher and the use of ICT in the classroom. It is also opined that ICT helps students learn skills like communication, problem-solving and handling information better which have become essentiality of

today's age (Kozma, 2003).

The recent Covid-19 pandemic has revealed that many teachers opposed the usage of ICT in teaching and working with ICT. Literally, ICT is the only source that is communicating all kinds of information. Minimum use of ICT to get done with our work has become essential today. The role or responsibility of a teacher in the class is shifted or changed after the introduction of ICT in class (Kozma, 2003). Integration of ICT is made possible when students select the right technology and tools for getting information.

There is a huge demand from students for the integration of ICT in their classrooms. Students of today are smart enough; they understand the need and importance of ICT and want to be technology literate if not computer scientists. There is a huge gap in the usage of ICT between students and teachers. A student's thinking pattern when exposed to ICT changes and so, should be the mindset of the teachers of today.

Students all over the world have experienced the benefits of proper usage of ICT. Online classes have shown them a new dimension of using ICT. Earlier, limited children, as well as teachers were aware of the educational apps, but today both the teacher and student community are working smartly with these apps. On the other way, according to Kim, students who are exposed to ICT have a better ability to explore, identify and generate new ideas and acquire new skills. As the pragmatists opine, a student can learn concepts better when he/she practically does. It is the right of every student no matter where in the world to learn techniques which is the need of the 21st century and it is no longer acceptable for teachers to not implement ICT in education or shy away from it.

The future of a country is in the hands of its youth is a very famous saying, but it depends more on the training and education are given to youth in information and technology. The majority of the researchers noted that various governments and departments of education and educators are for the implementation of ICT in education and more in school education. There is a global need for children of the world to have access to computers and technology. ICT creates an open learning environment that is no longer restricted to the four walls of the classroom.

The impact of ICT on education, particularly on the teaching-learning process, is crucial and crucial to teach abstract ideas in all school subjects, including English Language Teaching, as evidenced by the research reviews. Teachers need to develop into educators of today by integrating ICT in their teaching.

Methodology

Objectives

1. To evaluate the effectiveness of the ICT Instructional Package (ICTIP) on teaching the English language among secondary school students.
2. To analyze the effectiveness ICT Instructional Package among secondary school students
3. To examine the effect of intervention after controlling the Pre-test scores of the Experimental and Control groups.

Hypotheses

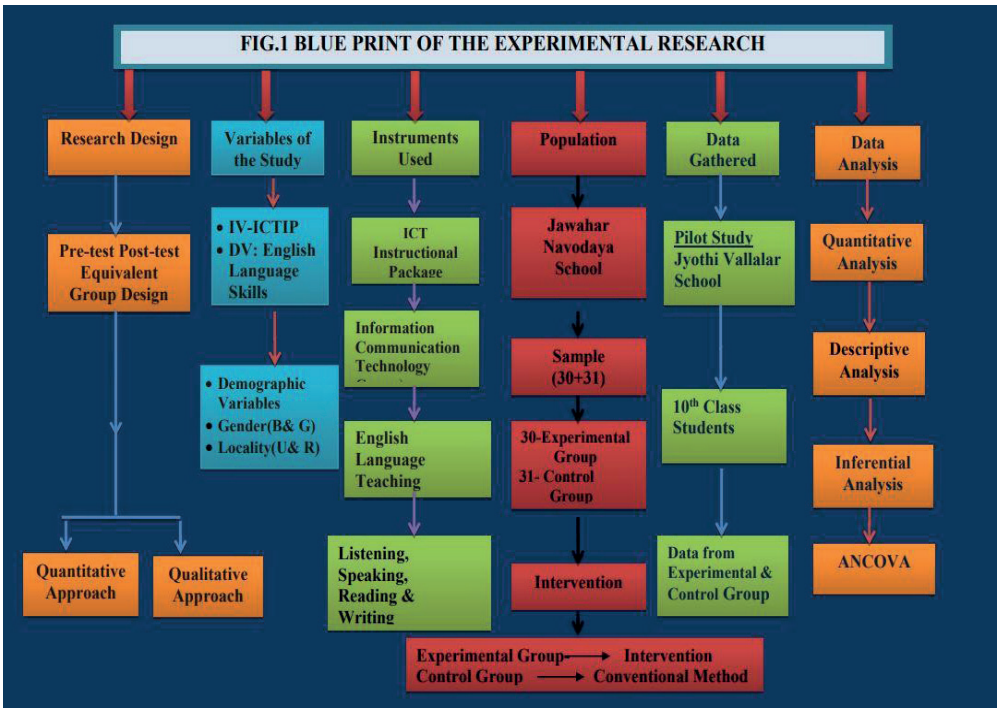
1. There is no significant difference between the pre-test scores of control a group and the experimental group with respect to LSRW skills.

2. There is a significant difference between pre-test and post-test scores of the control group and experimental group with ICTIP with respect to LSRW skills.

3. There is no significant effect of intervention after controlling the Pre-test scores of the Experimental and Control group.

Research Design

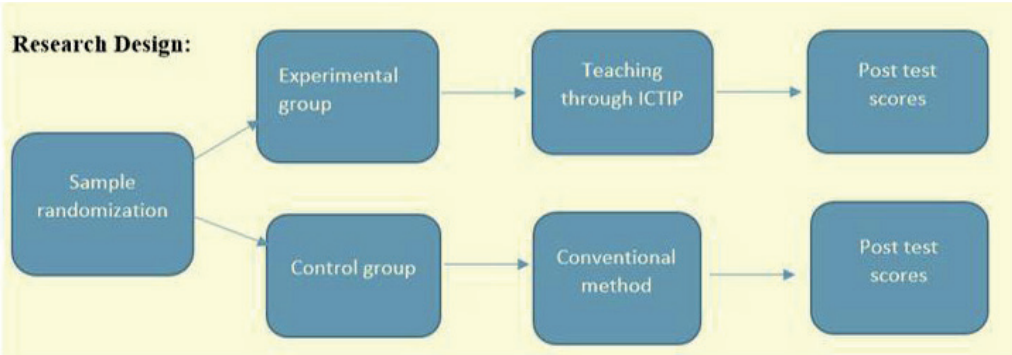
Figure-1: Blueprint of the Experimental Research



Experimental Research Design

The intervention started with developing an ICT Instructional Package (ICTIP) in the form of activities covering verbal and visual, audio, video has been designed and developed for English language teaching (ELT) of 10th Class students, to improve the English language skills like especially listening, speaking, reading and writing (LSRW) which has been measured before and after the intervention. ICT Instructional Package developed was administered in Jawahar Navodhaya Vidhyalaya residential School, Pondicherry Region using pre-test and post-test equivalent group experimental research design.

Figure-2: Pre-test and Post-test equivalent group experimental design



The present research studies conducted based on two groups were formed one experimental and one control group and the participants were 9th students. Raven has created a non-verbal culture-free group exam that is commonly used in educational settings to assess the non-verbal intelligence of literate and illiterate people in groups. It assesses a person's ability to comprehend meaningless data presented to him. The exam allows for the evaluation of a person's ability to engage in intellectual activities. This examination was created for people of all ages, regardless of their education, nationality, or physical education.

ICTIP Intervention and Treatment

Stage 1: Raven's Progressive Matrix (RPMs) measures non-verbal intelligence. Investigators used this nonverbal standardized test to divide the two groups to ensure the homogeneity of the sample. Students were separated into experiment and control groups based on their performance, with odd numbers in one group and even numbers in the other, resulting in homogeneity. The ICT English Language teaching module was implemented in the experimental group and the control group was not administered the module but taught through conventional teaching by the regular teacher. However, after the intervention, the control group was also administered the same ICTIP module as an ethical standard.

Stage 2: The two groups were tested for homogeneity before the experiment to prove that both experiment and control groups are in the same standard. An English proficiency (LSRW listening, speaking, reading and writing) test was administered before the Intervention for both the groups and the intervention was planned for 40 days and the same LSRW test was administered after the intervention for both the groups. Both experimental and control groups were tested after the intervention to study the effectiveness of the intervention (ICTIP) on English Language Teaching. The instrument used for data collection is a questionnaire consisting of profiling questions and English proficiency based on LSRW skills.

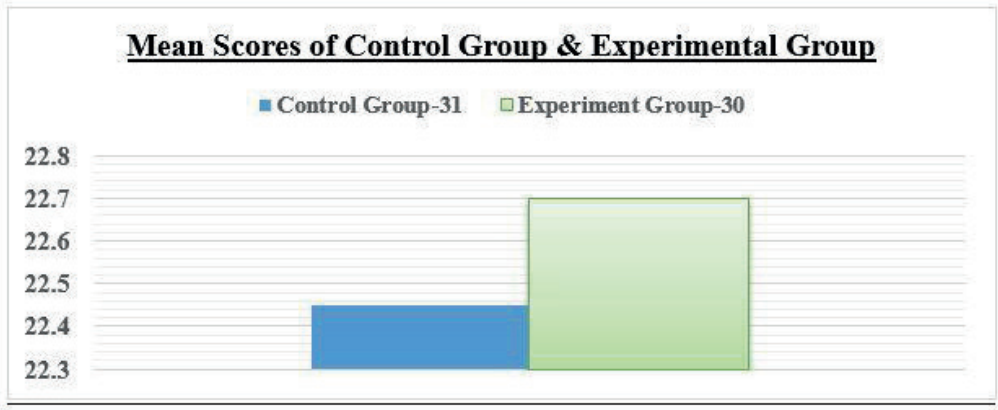
Analysis and Interpretation of the results

H1: There is no significant difference between pre-test and post- test scores of Control group and Experimental group.

Table-1: Results of Control and Experimental Group in Pre-test and Post-test on ELT

Particulars	Group	N	Mean	t	Sig.
Pre-test-Listening	Control Group	31	7.10	0.22	0.83
	Experiment Group	30	7.17		
Pre-test: Speaking	Control Group	31	4.03	1.10	0.28
	Experiment Group	30	4.37		
Pre-test: Reading	Control Group	31	7.03	0.93	0.36
	Experiment Group	30	6.80		
Pre-Writing	Control Group	31	4.29	0.25	0.81
	Experiment Group	30	4.37		
Pre-test Total	Control Group	31	22.45	0.35	0.73
	Experiment Group	30	22.70		

Figure-3: Results of Control and Experimental Group in Pre-test and ost-test on ELT



The data of Table 1 reveals, there is no significant difference between the pre-test scores of the control and experimental group on English Language Learning (ELT), including the LSRW listening (t=0.22), speaking (t=1.10), reading (t=0.93), and writing (t=0.25). The mean scores of the pre-test of the control group is 22.45, the Experimental group is 30.16 and the obtained t value of post-test scores of the Control group and Experimental group is 0.35 at 0.01 level of significance. Hence, the null hypothesis is accepted and it is concluded that there is no significant difference between pre-test scores of the control and experimental group.

H2: **There is no significant difference between the Post-test of the Control group and Experimental group.**

Table-2: Results of Post-test on ELT of both Control and Experimental Group

Dimension	Group	N	Mean	t	Sig.
Post-test: Listening	Control Group	31	6.97	2.22	*0.03*
	Experiment Group	30	7.83		
Post-test: Speaking	Control Group	31	4.81	2.63	*0.01*
	Experiment Group	30	6.10		
Post-test Reading	Control Group	31	7.03	2.18	*0.04*
	Experiment Group	30	7.87		
Post-test Writing	Control Group	31	6.06	8.45	*0 .00*
	Experiment Group	30	8.37		
ELT Post-Test Total	Control	31	24.87	4.88	*0.00*
	Experiment	30	30.17		

Figure-4: Results of the Post-test on ELT of both the Control and Experimental Group

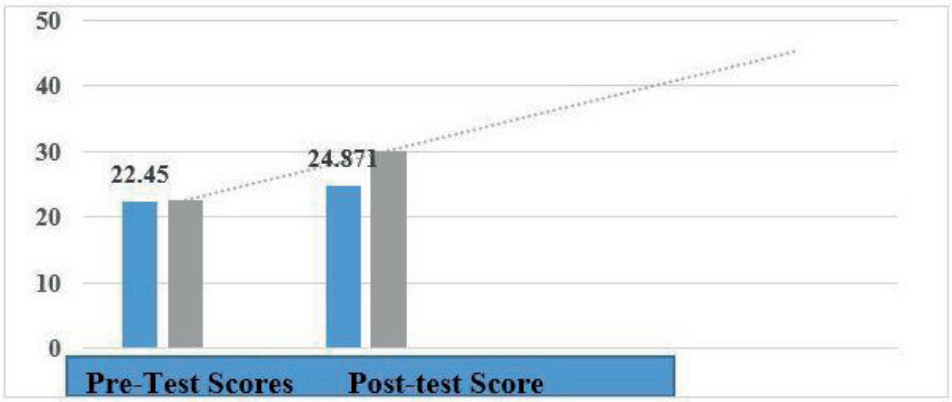


Table 2 reveals that there is a significant difference between post-test scores of control and experimental groups on English Language Learning (ELT) including the LSRW listening (t=2.22) speaking (t=2.63), reading (t=2.18) and writing (t=8.45). The mean scores of post-tests of the control group are 24.87, the Experimental group is 30.16 and the obtained t value of post test scores of Control group and Experimental group is 4.88 at 0.01 level of significance. Hence, the null hypothesis is rejected and it is concluded that there is an increase in the total performance of the experimental group after teaching through ICT Instructional Package.

H3: There is no significant effect of intervention after controlling the Pre-test scores of the Experimental and Control groups.

Table-3: Controlling the Pre-test scores of Experimental and Control groups using ANCOVA test

Categories	Listening		Speaking		Reading		Writing		Total	
	F	Sig.	F	Sig.	F	Sig.	F	Sig.	F	Sig.
Corrected Model	3.59	0.03	3.67	0.03	3.08	0.05	35.06	0.00	12.52	0.00
Intercept	24.39	0.00	27.11	0.00	17.36	0.00	190.49	0.00	24.54	0.00
Pre-test Score (Co-variate)	2.16	0.15	0.48	0.49	1.39	0.24	0.00	0.97	1.17	0.29
Post-test Control and Experimental group	4.82	0.03	6.22	0.02	5.33	0.03	70.03	0.00	23.34	0.00

The difference of post-test scores of the control and experimental group was re-examined after controlling for the effect of pre-test scores or prior proficiency in order to cross-validate the results. From table 3, it can be inferred that there is no main and interactive effect of pre-test scores of English Language Learning treated as a covariate and as the significance for all the F statistics are above 0.01. This proves that there is no prior English Language learning that affected further obtained results. However, the significant difference observed in the post-test was essentially due to the effect of the intervention of the ICTIP module. The total 'F' value revealed at 0.05 level of significance shows that there is a clear difference between the post-test scores of the control group and post-test of the experimental group.

Results and Discussion

Finding-1: There is no significant difference between the pre-test scores of the control and experimental group on English Language Learning (ELT), including the LSRW listening (t=0.22), speaking (t=1.10), reading (t=0.93), and writing (t=0.25). The mean scores of pre-tests of the control group are 22.45 and the Experimental group is 30.16 and the obtained t value of post test scores of Control group and Experimental group is 0.35 at 0.01 level of significance.

Finding-2: There is a significant difference between post-test scores of the control and experimental group on English Language Learning (ELT), including the LSRW listening (t=2.22), speaking (t=2.63), reading (t=2.18), and writing (t=8.45). The mean scores of post-tests of the control group is 24.87, the Experimental group is 30.16 and the obtained t value of post-test scores of the Control group and Experimental group is 4.88 at 0.01 level of significance which infers the intervention has greatly influenced the scores of post-test of the experimental group. Students' academic achievement scores improved after teaching through the ICT Instructional Package in all dimensions of Listening, Speaking, Reading, and Writing.

Finding-3: The difference of post-test scores of control and experimental group was re-examined after controlling for the effect of pre-test scores or prior proficiency in order to cross-validate the results inferred that there is no main and interactive effect of pre-test scores of English Language Learning treating as a covariate and as the significance for all the F statistics are above 0.01. This proves that there is no prior English Language Learning that affected further obtained results.

Educational Implications

The world sensitized the importance of ICT in teaching and learning. ICT was treated as a supporting aid. Schools are far from ICT implementation and effective use the world over and mostly in developing and underdeveloped countries (Kozma, 2003). Addressing ICT integration in education is vital. Studies have shown that students who have access to computers at home perform much better in academics than those who do not have access to it. In the present time, it is playing an important role in all the levels and streams of Education. The present experiment is valid in the present Covid scenario. The study gives a positive motivation with a valid statistical analysis. Based on the study, it is derived that ICTIP has helped to improve academic performance and it is also proved that all four language skills listening, speaking, reading, and writing have a significant improvement in the experimental group than the control group. Studies conducted in different parts of the world have opined that it takes a long way to achieve ICT integration in education. The use of Technology in schools is more for personal than learning in schools both by teachers and students. Integration of ICT in school education needs a long time and sustained development. ICT integration has been the primary goal of many educators the world over with a long-term goal of creating students who are lifelong. The necessity created since the pandemic has created a deadly environment and it has become risky to step out. In these conditions present study strengthens the usage of ICT for teaching and learning. The saying is true; necessity is the mother of invention. Teachers of older generations who were not having expertise also started learning and using the ICT in teaching. It is believed that the confusion arising regarding the effectiveness of ICT on teaching and learning the English language will be clarified with this study. Hence, the study is significant in teaching and learning in present days and strengthens online teaching. The objectives of teaching the English language are achieved through ICTIP.

Conclusion

National Mission for Education through Information Communication Technology is serving to leverage ICT potential in the Teaching-Learning process which invariably benefits all the stakeholders of the educational system breaking the border and boundaries, especially during this unprecedented Covid-19 pandemic. This experiment was carried out during July-2020 when the Covid pandemic was not affected as it was in the second wave. Based on experiments conducted and the statistical analysis, it is observed by the researcher that teaching through ICTIP has a significantly positive effect in the English language teaching and learning. Education is being shaped in a novel way by a technology-driven approach. Language teaching & learning have been made incomparably easier with the help of various software and programmes. Teachers no longer have control over the classroom; instead, the focus has shifted to the students (Sabiri, 2020). Teachers shall always integrate the ICT-based resources to improve the language skills, especially at school levels.

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Research Article

Paradigm Shift in Learning and Teaching: Problems Faced by the Students to Attend Online Classes during Covid-19 Pandemic

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Abstract

Covid-19 is the global crisis with the wide spreading and creating chaos on the health of people, economy and also tremendous impact on education due to the sudden closure of universities, colleges, and schools. It is an unexpected pandemic to the world. India is the second highest infected country. The education system is adversely affected by this pandemic and disrupted the routine in India. During this pandemic, the universities and the colleges shifted their mode of delivery to the online education system to save the academic year of the students. It is a new system for Indian students, particularly for rural and tribal students. The aim of the present study is to understand the problems faced by the students to attend the online classes. It covered three State students via Andhra Pradesh, Assam and Mizoram pursuing their graduate and postgraduate courses. It is found that 79.8 percent of the respondents faced problems attending online classes. The major problem reported 40.7 percent is accessibility and internet speed. 56.5 percent reported that there is very little student-teacher interaction in online classes. Further, 43.1 percent of respondents Stated that their teachers used the power-point presentation method and 38.1 percent of respondents reported that their teachers used the lecture method. It is suggested that the universities and colleges should be provided with the technical skills to attend online learning classes on different devices like mobiles, laptops, and tablets. Governments should take initiative with telephone network companies to bring new schemes to provide free internet data and free smartphones to the students based on their course of study.

Keywords: Covid-19, online education, learning and teaching

Introduction

The present study focuses on the problems faced by the students who attend the online classes and also presents the teaching performance of the teachers through online mode. It also studied the government's support in the promotion of online mode teaching in India. Before this pandemic, students' participation through online education was very less. But, during this pandemic, to save the academic year of the students, the universities and the colleges started an online education. It is a new paradigm for students and teachers. The students have to attend the online classes regularly from their homes. While attending the classes, the students have faced many challenges. Based on the above circumstances the present study is conducted to understand the problems faced by the students to attend the online classes during the Covid-19 pandemic in India.

Covid-19 is the global crisis with wide-spreading of this disease that is not only creating chaos on the health of people, economy, but also has a tremendous impact on education due to the sudden closure of educational institutions, universities, colleges, and schools. It is an unexpected pandemic to the world. India is the second highly infected country worst affected by this pandemic. The first patient of Covid-19 was identified in Wuhan city, China in late 2019. Then, it was spread to many countries in the world. India identified the first Covid-19 positive patient in Kerala on January 31, 2020. The first patient in India is a 20 years old female student who returned to Kerala from Wuhan city, China (Bindu, 2020). In continuation to that few incidents, such as Tablighi Jamaat meet in New Delhi, Dharavi slum in Mumbai, Koyambedu Market in Tamil Nadu became hotspots to spread this virus in India in the first wave of Covid-19. Very sharply, the government of India introduced different remedial measures of phases of the lockdown system to reduce the severity of Covid-19 in India. It succeeded and the administrators of the government of India earned a good name and fame from the Indians. After a year, in March 2021, the second wave of Covid-19 was started faster than the first wave.

Covid-19 is a disease that is caused by the 'novel coronavirus' and the common symptoms are fever, dry cough, difficulty in breathing, body pains, nasal congestion, runny nose, sore throat or diarrhoea. The symptoms may be changed from patient to patient and we may not find all the symptoms in one patient (Sucharita, 2020). The impact of Covid-19 is very high on various development and service sectors in India. Among them, the education sector is one which faced many struggles during the first wave and second wave.

Review of Literature

Adnan and Anwar (2020) found that online learning cannot produce desired results in underdeveloped countries, where most of the students are unable to access the internet due to technical as well as financial issues. There is no face-face interaction between the students and the teachers' leads to a lack of socialisation. Shetty Sandeep et al. (2020) found that 52 percent of the students used mobile, 36 percent used laptops to attend online classes. And 57 percent of the students predominantly favoured online classes for doubt clarification. The majority 89 percent of the students preferred online teaching for their learning. Rayhanul (2020) found that 68.9 percent of respondents are using mobile data to attend online classes. The study observed that the majority of the students participated from cities and towns. The majority of them Stated that they do not have any technical issues with attending online classes because they live in urban areas. But the respondents who attended from rural areas faced technical issues like, poor network, internet balance is not enough. Abaid (2020) found that 88 percent of students had no proper internet facility and they faced lots of network issues. And 65 percent of students were not satisfied with online learning, 85 percent of students complained about eyesight issues by attending online classes on devices, and 50 percent of students were unable to manage the university affairs. Mahyoob (2020) revealed that most English language learners are not satisfied with continuing online learning, as they could not fulfil the expected progress in language learning performance. Overall, in the review of literature, it is understood that online teaching is new to developing countries like India. The majority of the students are from low-income families, most of the students do not have laptops or

personal computers. They attended online classes through mobile phones. The students from rural areas faced many more problems than urban ones. This is a new paradigm for the students and teachers of developing countries, but not new for the developed countries because they practiced online teaching for many years. A few studies have been conducted on this topic in foreign countries, developed countries and the forward States of India.

Scope of the Study

India is a developing country. Before this pandemic, students' participation in the online education system was very less. During this pandemic, to save the academic year of the students, the universities and the colleges started an online education system. It is a new paradigm for teachers and students. The students have to attend the online classes regularly from their homes. While attending the classes, the students have faced many challenges. It is a new system for the students in general, rural and tribal in particular. Poor internet connectivity, internet speed is very slow, power-cuts or lack of electricity, household responsibilities, peer pressure and cultural barriers are the major problems for the students. Based on the above circumstances the present study is conducted to understand the problems faced by the students to attend online classes during the Covid-19 pandemic in India.

Objectives of the study

1. To study the socio-economic, educational and demographic profile of the students.
2. To know the problems and difficulties faced by the students to attend the online classes during the COVID -19 pandemic.
3. To study the perceptions of the students on the teaching performance of their teachers in online mode.
4. To study the government schemes and support the students in the promotion of online mode teaching.

Research Methodology

This study is conducted in three different States of India viz. Andhra Pradesh, Assam and Mizoram. Andhra Pradesh is from the South, Assam is from the East and Mizoram is from the Northeast States of India. It is a quantitative study in nature. A descriptive research design was formulated for the present study to describe, compare and analyse the perceptions of the students on their problems faced to attend the online classes. This study has adopted the purposive sampling method and selected the students and the colleges purposively in the States of Andhra Pradesh, Assam and Mizoram. The sample of the present study is 263 students pursuing their graduation and post-graduation. The data were collected from science, engineering, arts and commerce streams pursuing their graduation and post-graduation. Both male and female students participated in this study. The data were collected through a structured questionnaire shared by Google forms. The questionnaire was prepared in English language with 22 variables on socio-economic profile, problems faced by students and teaching methods adopted by their teachers. This study was conducted in May 2021. And the collected data were analysed through MS-Excel 2010 and SPSS 17th version.

Results and Discussions

The below table presents the State-wise classification of the respondents

Table-1: Distribution of the respondents by their State

State	Frequency	Percentage
Andhra Pradesh	81	30.8
Assam	128	48.7
Mizoram	54	20.5
Total	263	100.0

The data in the above table 1 revealed that 48.7 percent of the respondents are from Assam State, 30.8 percent of respondents from Andhra Pradesh State and the remaining 20.5 percent of the respondents are from Mizoram State. The respondents in the present study are graduation and post-graduation students. The students of Assam State actively participated in online data collection and provided the information. The following table presents the information about the gender of the respondents.

Table-2: Distribution of the respondents by their gender

Gender	Frequency	Percentage
Male	87	33.1
Female	176	66.9
Total	263	100.0

The data in the above table 2 revealed that the majority of the respondents 66.9 percent are female, followed by 33.1 percent of the respondents are male. This study is in line with the study of Keerthi (2018), who reported that the numbers of female students are high in the government institutions. The following table presents the information about the educational qualifications of the respondents

Table-3: Distribution of the respondents by their education

Education	Frequency	Percentage
Graduation	122	46.4
Post-Graduation	141	53.6
Total	263	100.0

The data in the above table 3 revealed that the majority of the respondents are 53.6 percent who are pursuing post-graduation and the remaining 46.4 percent of the respondents are pursuing their graduation. The following table presents the information about the stream of the study.

Table-4: Distribution of the respondents by their stream of Study

Stream of Study	Frequency	Percentage
Arts and Commerce	217	82.5
Science and Technology	39	14.8
Engineering	7	2.7
Total	263	100.0

The data in the above table 4 revealed that the majority of the respondents 82.5 percent are from the arts and commerce stream, while 14.8 percent of respondents are from the science and technology stream and 2.7 percent of respondents are from the engineering stream. It is observed that in the review of literature, a few studies conducted on this topic, with more doctor students and engineering students. But in this study the majority of students are from arts and commerce background. Basically, the students from the arts and commerce have less technical skills and face many problems attending online classes. Based on this background, the researchers purposely selected more students from the arts and commerce stream. It may be a reason that the student representation from the arts and commerce is high in this study. The following table presents the information about the parent's income.

Table-5: Distribution of the respondents by their parents' income

Parents' Income	Frequency	Percentage
Above Poverty Line	84	31.9
Below Poverty Line	179	68.1
Total	263	100.0

The data in the above table 5 revealed that the majority of the respondents are 68.1 percent from 'below poverty line' families and the remaining 31.9 percent of the respondents are from 'above poverty line' families. In India, the people who have less than Rs.180, 000/- income will be called 'below poverty line' families. And the people who have more than Rs.180, 000/- income will be called 'above poverty line' families (Khattar, 2021). The following table presents the information about the living area of respondents.

Table-6: Distribution of the respondents by their living area

Area of living	Frequency	Percentage
Urban	96	36.5
Rural	142	54.0
Tribal	25	9.5
Total	263	100.0

The data in the above table 6 revealed that the majority of the respondents are 54.0 percent living in the rural area, followed by 36.5 percent of the respondents are living in urban areas. Only 9.5 percent of the respondents are living in the tribal area. This study is in line with the national average of the population in India. The following table presents the information about the device used by the respondents to attend the online classes.

Table-7: Distribution of the respondents by the device used to attend the online classes

Device used	Frequency	Percentage
Laptop	13	4.9
Smartphone	249	94.7
Tablet	1	0.4
Total	263	100.0

The data in the above table 7 revealed that the majority of the respondents 94.7 percent used smartphone devices and only 4.9 percent of the respondents used laptop devices to attend online classes during the Covid-19 pandemic. The study is in line with the study of Ally who Stated that 79 percent of the students in his study used smartphone devices to attend the online classes (Ally and Wark, 2019). The study is also in line with the study of Rahman (2021) who reported that 81.82 percent of the respondents in his study used smartphones, 7.58 percent used computers to attend the online classes. The following table presents the information about the learning platform of the respondents.

Table-8: Distribution of the respondents by the learning online platform

Learning online platform	Frequency	Percentage
Google Meet	126	47.9
Zoom	126	47.9
Microsoft Teams	11	4.2
Total	263	100.0

The data in the above table 8 revealed that 47.9 percent of the respondents used Google Meet and equally 47.9 percent of the respondents used the Zoom meeting link and only 4.2 percent of the respondents used Microsoft Themes to attend the online classes. The study is in contrast with the study of Thakker et al. (2021) who reported that Microsoft Teams is the best platform followed by Google Meet, Zoom. This study in contrast with the study of Naik who reported that 81.7 percent of the respondents attended online classes through the Zoom meeting link and only 12 percent of the respondents used Google meet (Nail et al., 2021). It may be a reason that these institutions adopted and bought time in Google Meet and Zoom. Learning is an important aspect of every human being's life. Every day we learn new things. The respondents in the present study learned the techniques to participate in online classes by different types. The following table presents the learning type of the respondents to attend the online classes.

Table-9: Respondents by their learning type to attend the online classes

Learning type	Frequency	Percentage
Self-learning	170	64.6
Trial and error	18	6.8
Guidance from staff	28	10.6
Guidance from students	47	17.9
Total	263	100.0

The data in the above table 9 revealed that the majority of the respondents 64.6 percent have learned techniques by self to participate in the online classes, followed by 17.9 percent of the respondents got guidance from fellow students, and the remaining 10.6 percent learned techniques by attending the training programmes organised by their respective universities and get guidance from the technical staff. It is observed that 6.8 percent of the respondents

had learned the techniques by trial and error approach to attending the online classes. It is observed that many universities conducted training for teachers, but not conducted capacity building programmes for students. The data about students' education and learning technique was cross-tabulated and presented in the below table.

Table-10: Respondents by their education and type of learning techniques to attend the online classes

Education	Learning type				
	Self-learning	Trial and error	Guidance from staff	Guidance from students	Total
Graduation	89 (52.4) (72.9%)	8 (44.4) (6.6%)	12 (42.9) (9.9%)	13 (27.7) (10.6%)	122 (46.4%) (100%)
Post-Graduation	81 (47.6) (57.4%)	10 (55.6) (7.1%)	16 (57.1%) (11.3%)	34 (72.3) (24.2%)	141(53.6%) (100%)
Total	170 (100%) (64.7%)	18 (100%) (6.8%)	28 (100%) (10.6%)	47 (100%) (17.9%)	263 (100%) (100%)
Pearson Chi-Square: 9.229(a)			**df. 3**	**Significance: 0.05**	

Analysis of the data on education and type of learning techniques are cross-tabulated and the result shows that there is an association between two variables as it is evident that the more post-graduation respondents have done trial and error method to learn the techniques to attend the online classes and it is proved with the significance at 0.05. The following table presents the information about the problems faced by the students who attend the online classes.

Table -11: Respondents whether they faced problems to attend the online class

Problems faced	Frequency	Percentage
Yes	210	79.8
No	53	20.2
Total	263	100.0

The data in the above table 11 revealed that the majority of the respondents 79.8 percent faced problems, while 20.2 percent of respondents did not face any problems attending the online classes. It may be a reason that online learning is a new concept for students, particularly for rural and tribal students. The study is in line with the study of Gaur et al. (2020) which reported that 61 percent of the respondents perceived barriers while participating in online classes. The below cross table presents the information on an area of living and problems faced by the students.

Table -12: Respondent's area of living and problems faced to attend the online classes

	Problems faced		
Area	**Yes**	**No**	**Total**
Urban	69 (32.9%) (71.9%)	27 (50.9%) (28.1%)	96 (36.5%) (100%)
Rural	118 (56.2%) (83.1%)	24 (45.3%) (16.9%)	142 (54%) (100%)
Tribal	23 (10.9) (92%)	2 (3.78%) (8%)	25 (9.5%) (100%)
Total	210 (100%) (79.8%)	53 (100%) (20.2%)	263 (100%) (100%)
Pearson Chi-Square: 7.019(a)		**df.2**	**Significance: 0.05**

Analysis of the data on the area of living and problems faced by the students to attend online classes are cross-tabulated and the result shows that there is an association between two variables, as it is evident that more tribal and rural respondents have faced problems than urban students to attend the online classes and it is proved with the significance at 0.05. This finding is in line with the finding of Islam who reported that the respondents who attended from rural areas are faced technical issues like, poor network, internet balance is not enough (Islam et al., 2020). The following table presents the information about the type of problems faced by the students to attend the online classes.

Table-13: Respondents by type of problems faced to attend the online classes

Type of Problems faced	Frequency	Percentage
Internet speed and accessibility	107	40.7
Insufficient and limited internet balance	53	20.2
Disturbance from family and more household work	79	30.1
Frequent power cuts	13	4.9
No smartphone	11	4.2
Total	263	100.0

The data in the above table 13 revealed that 40.7 percent of the respondents Stated that internet speed and accessibility in their locality is a problem, while 30.1 percent Stated that disturbance from the family members and more household work on them at their houses, and 20.2 percent Stated that the internet balance is limited and not sufficient to attend all the classes.

Some of them are also reported that there is a frequent power-cut in their locality, and some students not having a smartphone to attend the classes. It is observed that the tribal and rural students attended daily wage work, MGNREGS work during the period of online classes to earn money for their family livelihood. The study is in line with the study of Muthuprasad et al. (2021) who reported that 53.58 percent of respondents faced problems in internet speed and accessibility. Mahyoob (2020) also reported that 48 percent of the respondents in his study faced problems with the low speed of the internet. Strategies of the students to overcome the problems are discussed in the following table.

Table-14: Respondents by their strategies to overcome the problems to attend the online classes

Strategies	Frequency	Percentage
Travelled to network place	69	32.9
Spent more money for internet	56	26.7
Buy a smartphone	23	10.9
Not attended the class	28	13.3
Attended class at last minutes	11	5.3
Buy a power bank	23	10.9
Total	210	100.0

The data in the above table 14 revealed that 32.9 percent of the respondents travelled to the places where internet networks are available, followed by 26.7 percent reported that they buy more internet data and spend more money on the internet and 10.9 percent of the respondents buy a smartphone and power bank. It is observed that 13.3 percent of the respondents have not attended the classes, and 4.2 percent of the respondents attended the classes at the last minute. This study is in line with the study of Sethy (2020) who reported that the students walked for 5 km for the online study in one of the tribal-dominated Khajuripada blocks under Kandamala District of Odisha. The following table presents the information about the support of caregivers to attend the online classes.

Table-15: Respondents by their caregivers support to attend online classes

Caregivers support	Frequency	Percentage
Yes	150	57.0
No	113	43.0
Total	263	100.0

The data in the above table 15 revealed that the majority of the respondents 57.0 percent got support from their caregivers to attend the online classes while 43.0 percent of the respondents did not get support from their caregivers. The following table presents the information about the cultural barriers faced by the students to attend the online classes.

Table-16: Distribution of the respondents' whether they faced any cultural barriers

Cultural barriers	Frequency	Percentage
Yes	65	24.7
No	198	75.3
Total	263	100.0

The data in the above table 16 revealed that the majority of the respondents 75.3 percent have not faced any cultural barriers to attending the online classes, while 24.7 percent of the respondents faced cultural barriers, i.e. puja in the class time, local festivals, at the time of reproductive cycle etc. The study is in line with the study of Baticulon (2021) who reported that the students of the Philippines faced socioeconomic and cultural barriers to access the technological resources. The following cross-table presents the information on parents' income and cultural barriers.

Table-17: Respondents by their parent's income and cultural barriers faced to attend the online classes

	Cultural barriers		
Parents Income	**Yes**	**No**	**Total**
Above Poverty Line	13(20%) (15.5%)	71(35.9%) (84.5%)	84(31.9%) (100%)
Below Poverty Line	52(80%) (29.1%)	127(64.1%) (70.9%)	179(68.1%) (100%)
Total	65(100%) (24.7%)	198(100%) (75.3%)	263(100%) (100%)
Pearson Chi-Square: 5.661(b)		**df.1**	**Not Significance: 0.05**

Analysis of the data on parent's income and cultural barriers faced by the students to attend online classes are cross-tabulated and the result shows that there is an association between two variables as it is evident that the students in below poverty line families have faced more cultural barriers to attending the online classes and it is proved with the not significance at 0.05. The following table presents the support and encouragement of the government to the students to encourage online classes.

Table-18: Respondents by receiving government support to attend the online classes

Government support	Frequency	Percentage
Yes	40	15.2
No	223	84.8
Total	263	100.0

The data in the above table 18 revealed that the majority of the respondents 84.8 percent reported that they have not received any support from the government to attend the online classes, while 15.2 percent of the respondents reported that they received support from the government to attend the online classes. They Stated that they received laptops and mobile phones from the government and politicians. The Government of Andhra Pradesh introduced a scheme titled 'ammavodi', which provides Rs.15000/- every year to the mothers of students up to class 12. From the year 2021, the government is ready to provide the laptop or mobile phone under this scheme to the interested students. This initiative helps the students to attend the online classes easily. The following table presents the information about the favourite online teaching methods of the students.

Table-19: Distribution of the respondents by their interesting teaching method

Teaching method you like	Frequency	Percentage
Offline	210	79.8
Online	49	18.6
Both	4	1.5
Total	263	100.0

The data in the above table 19 revealed that the majority of the respondents 79.8 percent interested in offline classroom teaching methods, whereas 18.6 percent of respondents Stated that they are interested in online teaching methods because it saves time and helps to learn new technologies. Only 1.5 percent of the respondents Stated that they are interested in both methods. This study is in contrast with the study of Mutuprasad (2020) who reported that 57.75 percent of respondents in his study reported that online teaching is flexible and comfortable. It may be a reason that the study was conducted in urban areas. This study is in line with the study of Chakraborty who reported that 65.9 percent of the respondents in his study felt that offline classes are better for learning than online classes (Chakraborty et al., 2020). And Naik et al. (2021) also reported in his study that 86.3 percent of the respondents are interested in offline teaching methods. Overall, classroom teaching is a better method for learning and teaching. The following table presents the information about how many teachers taught the classes online regularly.

Table-20: Distribution of the respondents by how many teachers taught in their class

How many teachers taught	Frequency	Percentage
No teacher	3	1.2
20 percent teachers	58	22.1
40 percent teachers	55	20.9
60 percent teachers	45	17.1
80 percent teachers	48	18.2
100 percent teachers	54	20.5
Total	263	100.0

The data in the above table 20 revealed that 22.1 percent of the respondents Stated that only 20 percent of the teachers taught online classes, while 20.9 percent of the respondents Stated that only 40 percent reached the online classes, and 20.5 percent respondents Stated that 100 percent of the teachers taught online classes. It is observed that only a few percent of the teachers have taught online classes regularly. The remaining teachers have not done their duties properly. The following table presents information about the satisfaction of the respondents in online classes.

Table-21: Respondents by their satisfaction on the teaching of teachers

Satisfaction on online classes	Frequency	Percentage
Not satisfied	87	33.5
Average	81	31.1
Good	68	26.2
Very good	21	8.0
Not applicable	3	1.2
Total	260	100.0

The data in the above table 21 revealed that 33.5 percent of the respondents are not satisfied with online teaching, while 31.1 percent Stated that their satisfaction with online teaching is average. And 26.2 percent of the respondents reported that their satisfaction with online teaching is good and only 8.0 per cent of the respondents Stated that online teaching is excellent. The study is in contrast with the study of Naik et al. (2021) who reported that 70 percent of the respondents in his study are not completely satisfied with the online teaching method. The following table presents the information about the teacher-student interaction in online classes.

Table-22: Respondents by their opinion of teacher-student interaction

Teacher student interaction	Frequency	Percentage
No interaction	57	21.9
Very less interaction	147	56.5
More interaction	53	20.4
Not applicable	3	1.2
Total	260	100.0

The data in the above table 22 revealed that the majority of the respondents 56.5 percent Stated that there is very little teacher-student interaction in online teaching, while 21.9 percent of the respondents Stated that there is no interaction, and 20.4 percent of the respondents Stated that there is more student-teacher interaction in online teaching. This study is in line with the study of Gaur et al. (2020), who reported that 40.4 percent of the respondents in his study strongly agreed that online classes have lacked student-teacher interaction. The following table presents the information about the student-student interaction in online classes.

Table-23: Respondents by their opinion on student-student interaction

Student-student interaction	Frequency	Percentage
No interaction	86	33.1
Very less interaction	121	46.5
More interaction	53	20.4
Total	260	100.0

The data in the above table 23 revealed that the majority of the respondents 46.5 percent Stated that there is a small student-student interaction in online classes, while 33.1 percent of the respondents reported that there is no student-student interaction in online classes. And 20.4 percent of the respondents Stated that there is more student-student interaction in online teaching. The study is in line with the study of Ali Sher (2009) who reported that there is a Student-instructor interaction and student-student interactions were found to be significant contributors of student learning and satisfaction. The data in the below table presents information about the teaching techniques used by the faculty members in online teaching.

Table-24: Teaching techniques used by the faculty members during the online classes

Teaching techniques	Frequency	Percentage
Lecture	99	38.1
PPT	112	43.1
Assignments	29	11.2
Brainstorming	5	1.8
Story telling	12	4.6
No teaching, only attendance	3	1.2
Total	260	100.0

The data in the above table 24 revealed that the majority of the respondents 43.1 percent Stated that their teachers used the power-point presentation to teach in online classes, while 38.1 percent of the respondents Stated that their teachers used the lecture method in online mode teaching. And 11.2 percent of respondents Stated that their teachers were given the assignments, 4.6 percent of respondents Stated that their teachers used the storytelling method and 1.8 percent of respondents Stated that their teachers used the brainstorming method. It is observed that 1.1 percent of the respondents Stated that their teachers have not taught anything, they have just taken an attendance in the online mode teaching. The study is in contract with the study of Rahman (2021) who reported that 57.5 percent of the teachers in his study used the power-point presentation method.

Suggestions and Recommendations

1. Universities and colleges should provide training to students, particularly rural and tribal students on technical skills to attend online

learning classes on different devices like mobiles, laptops and tablets.

2. Governments should talk with telephone network companies to bring new schemes to provide internet data at low price and also provide the free smartphones to the students based on their course of study. It may reduce the financial burden to the students and their parents to attend the online classes during the Covid-19 pandemic.

3. Government should reduce (at least 20 per cent) the syllabus of the subjects, because it is very difficult to cover and read all the topics of the subjects in online mode

4. After completion of the online classes, the colleges and universities should upload the recorded videos of the class teachers in the websites of the colleges or universities. These are helpful to the students to re-watch the class to clarify their doubts.

5. Teacher is an important person in online teaching and learning. The teachers should be provided with well-organized teaching and study materials for examinations. Classes should be more interactive and flexible. Group discussions and group projects may be assigned to the students with the creation of a separate classroom.

6. Teachers should be provided psychological, motivational support to the students. Providing career counselling is also an important activity for the students.

7. Universities and colleges should be provided with continuous capacity building programmes for teachers to update their knowledge on online techniques and online teaching skills.

8. Power-point presentation is one of the best methods for online teaching because the students have a chance to read the content during the session. All teachers should use power-point presentations in their online classes.

9. The teachers, universities and colleges should organize guidance and career counselling programmes online to improve the attendance of the students in regular classes.

10. The universities and the colleges should develop a separate teaching room with computers and the internet in every department; it will be helpful to the teachers who do not have a laptop and smartphone. It will be helpful to the teachers who do not have technical skills to operate the online classes.

11. The teachers should avoid the teaching method of 'giving notes and explanation' in online teaching because we don't know whether the students are writing or not.

12. The students should be asked questions to clarify their doubts in online classes. It observed that some students are attending the classes at the last minute. These students should change their mind-set, and have to participate in online classes actively.

13. The students should adopt the learning habit and increase the regular reading habits on their subjects. It helps to increase the interest to attend the online classes.

Limitations and Scope of further research

Adequate care has been taken to make this study more comprehensive. However, it was not free from some limitations. The data collected only from 263 students pursuing their graduation

and post-graduation in three Indian States only. Due to the Covid-19 pandemic, the researcher prepared a questionnaire in English language and shared via Google forms. The students who have knowledge in the English language and have a smart phone with internet are actively participating in this study. The results are more suitable to them. The data collected in May 2021 and the findings of the study relevant to that period. The findings cannot be generalized and they are applicable to the present study only.

There are 29 States in India, the present study conducted in three States only, further it can be conducted at a broader level in all the States of India. There is a scope to conduct a study on problems faced by the teachers to teach in online classes, and the teacher-student behaviour in the online classes and their perceptions not studied in the present study. Further, a study also can conduct knowledge of the students-teachers on the features available in online education.

Conclusion

Covid-19 is an unexpected pandemic to the world. The first wave and second wage have created a lot of difficulties in many sectors. Among them, higher education is one. The higher education sector adopted the online education system in teaching and learning and saved the academic years of the students. This study presented the problems faced by the students to attend the online classes and the teaching performance of the teachers in online mode. The government should provide support to the students of 'below poverty line' to participate in online classes. The universities and the colleges should monitor the performance of the teachers in online teaching. Overall, the online education system in India succeeded in increasing the participation of the students.

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Research Article

How Does Socio-Educational and Family Factors Predict Internet Usage in Higher Education?

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Abstract

This study aims to identify the socio-educational and family factors that predict internet usage by analyzing a sample of 910 college students selected from four districts of Himachal Pradesh using a self-prepared internet usage scale. This scale has 33 items in total which are classified into four dimensions namely educational, social, and online as well as entertainment purposes using factor analysis. High and low internet users are classified based on the Mean +_ SD criteria. Multinomial logistic regression is performed both for the direction of variable association as well as magnitude among variables. A multinomial logistic regression model was performed to evaluate the impact of gender, residential background, type of family, parental education and employment and family income on the likelihood of students using the internet in which a low internet usage group is entered as a reference group. From the regression analysis, it is found that type of family, stream of study, parental educational level along parental employment significantly predict usage of the internet among college students.

Keywords: Internet usage, college students, multinomial logistic regression

Introduction

According to the 'Digital India' report by the Internet and Mobile Association of India (2019) India has 504 million internet active users, and the internet penetration rate will stand at around 50 percent in 2020 (34 percent in 2017). Hence, India has become the second-largest online market in the world ranked only behind China. It depicts that the internet has become an essential part of the lives of Indians and its usage is shaping the habits and attitudes of the masses. Everyone in society uses it for a multitude of purposes, such as information, connectivity, entertainment and online transactions. The Digital India Campaign is also launched to transform the entire nation into a digitally empowered society and knowledge economy. While education plays a critical role in this transformation, technology itself plays an important role in the improvement of educational processes and outcomes. Thus, the relationship between technology and education (at all levels) is bi-directional (Government of India, 2020). In the field of higher education, the internet is serving dual purposes from information sharing to as a learning aid. Higher education of India is also undergoing such technological and mass media revolutions, therefore higher educational institutions have been shaping their educational system according to the needs of learners as they try to integrate technology in the teaching-learning process. The Internet is making it easier for students to learn when, how, and where they

want. It is not only an assistive device now, but also in the current COVID-19 period, physical classes at schools and colleges have been replaced by online teaching. Classroom teaching has been converted fully into digital format in the current scenario. College students are now over- surrounded by the digital world, and they appear to be more vulnerable to developing internet dependency than any other group in society (Kandell, 1998). Owing to this reason, this generation is named as 'net generation' or 'digital natives' as their personality is being shaped under the influence of the internet. Naturally, their habit of internet usage is affected by several factors. Thus, through this study, an attempt has been made to locate different factors affecting the internet usage of students who are getting higher education. Findings of this study would be helpful to make a judicious blend of human resources and technology which will facilitate all-round development of the learner and ultimately will result in a sea change in the field of higher education.

Review of Related Literature

Internet usage has been explored under the name of different variables, such as excessive usage, dependency, addiction, problematic internet usage as well as social networking sites usage and all these variables studies on different samples along with a stream of study (Chandran, 2010; Loan, 2011; Amutha & Kennedy, 2015; Prabhu, 2016; Kaur, 2017), gender (Beranuy et al. 2009; Flad, 2010; Varaghese et al., 2013; Sharma et al., 2014; Thakur, 2014; Amutha & Kennedy, 2015; Krishnamurthy & Chetlapalli, 2015; Yosi et al., 2015; Arjunan & Edward, 2016; Sattari et al.,2016; Kaur,2017, Sharma & Shrama,2017), residential background (Loan,2011), socio-economic status (Prezza et al., 2004; Singh,2018; Ghosh et al,2019), family functionality (Satan,2013), parenting approaches (Wu et al,2016), parental education and employment (Praveen & Krishnaleela,2018). Most of these studies have explored intensity/ prevalence estimates of the internet in different groups and reported varying results depending on the criteria used and sample studied. From the review of related literature, it is also clear that even though there are certain studies that have explored the impact of a stream of study, gender on internet usage patterns still these studies do not give a clear picture of prediction of which group among demographic and socio-economic factors has higher tendency to use the internet in Indian population more specifically college students. The age of a particular group plays a substantial role in influencing internet usage (Eitel et al, 1998; Teo et al., 1999; Taylor et al.,2003; Yi, 2008; Berner et al., 2014; Rahman et al. 2020) therefore, age-wise majority of college students are in the age group of 20 to 21 years and this particular group has its factors that would be explored through this study. No studies available in the literature have explored factors of essential internet usage among Indian populations as most studies focus on internet addiction, problematic internet usage and social networking sites. These studies have reported huge variations in prevalence rates due to difficulty in the conceptualization of internet addiction, heterogeneity of population, lack of standard diagnostic criteria and difficulty in differentiating essential and non-essential internet use. Therefore, this study is unique which tries to investigate factors exploring essential usages of the internet through a self-developed research tool among college students because most research studies in literature have analysed internet usage patterns and determinants of internet usage of the general population like the internet banking, e-shopping, e-government

services. Hence, the nature of this study is not a prevalence study of internet usage both due to sample as well as measurement criteria. The researchers have viewed internet usage from different theoretical perspectives, such as the internet as an assistive tool that is used for a multitude of essential purposes like getting knowledge (education), watching movies/listening to music (entertainment), making new relationships through various social media platforms (social) and usage of internet for digital payments (online). In all these manners, this study is a novel initiative which focuses on undergraduate students who are getting an education in one of the States of India and to identify predictors of both levels of internet usage (high and low) and analysis includes socio-educational aspects, such as gender, stream of study, residential background along with home-related variables, such as type of family, parental education and employment and annual income.

Material and Methods

Research Methodology: Descriptive method of research that includes a correlational study is followed to examine the predictive efficacy of socio-educational and family factors in the internet usage of college students.

Research Tool: Data of this paper is obtained through a self-constructed internet usage scale that consists of 33 items which are classified into four dimensions namely educational, social, and online as well as entertainment purposes using factor analysis. The scoring for Statements is made by giving weightage of "1, 2, 3, 4 and 5" for endorsement in terms of being "Never, Rarely, Sometimes, Often and Always". The score range of the scale is 33 to 165 and a higher score indicates the high level of internet usage. The reliability of this scale was calculated by test-retest method (0.95) and internal consistency reliability was tested by calculating Cronbach Alpha (0.83). Content validation of the scale is achieved by showing the preliminary draft to experts in the field of psychology, education and language and construct validity established by confirmatory factor analysis.

Sample of the Study: The target population of this study is undergraduate students who are studying in 118 colleges of 12 districts of Himachal Pradesh which were affiliated to Himachal Pradesh University, Shimla during the academic session of 2019-20. From a total of twelve districts of the State, only ten districts are included in the sample as two districts namely Kinnaur and Lahaul-Spiti are excluded due to their Schedule Tribe population representation. Firstly, for the selection of districts due weightage is given to their parliament constituencies and districts are classified into four clusters and from each cluster one district namely Una, Kangra, Shimla, Mandi are selected randomly. Secondly, two colleges from each district are selected based on the geographical location of the colleges. Lastly, 910 students from total of eight colleges by giving due weightage to the stream of study (Arts, Commerce, Science) who are studying in the final year of their bachelor classes are taken as a sample of the study.

Classification of sample based on predictor/explanatory variables: Out of the total 910 respondents 34.06 percent (310) respondents are male as compared to 65.93 percent (600) respondents are female. Most students have rural background (72.19 percent) and only 27.80 percent of respondents are from urban areas. Talking about the stream of study, 37.91 percent of respondents have a science stream followed by humanities (31.86 percent) and commerce (30.21 percent). The sample is almost equally distributed across types of families. Seventy

percent of parents have studied up to secondary level. A large majority of mothers are housewives (92.96 percent) and fathers of 57.80 percent of respondents are working in agriculture and allied sectors. Data related to the annual income of the family show that more than fifty percent of respondents belong to the low-income group.

Statistical Analysis: Data analysis was performed using SPSS version 20. For inferential statistics, the chi-square test was applied to examine significant associations between internet usage and various explanatory variables. Then, the multinomial Logistic Regression (MLR) was applied to investigate how a set of socio-demographic variables predict the possibility of internet usage among college students. The dimensional aspects of internet usage (educational, social, online and entertainment) are not considered for the analysis, therefore only summated scores are used in the analysis of data Categorization of the students based on internet usage: The sample of 910 college students is classified into two dichotomous variables, such as high and low internet usage based on the Mean +_ SD criteria. The mean internet usage score of the total sample turned out to be 111.34 along with SD 14.43. Accordingly, out of a total sample of 910 college students, 141 students had a score of 96 and below in internet usage were designated as low internet usage group and 174 college students had a score of 125 and above were classified as high internet usage group. Thus '1' value is assigned to the low internet usage group and '2' is given to the high internet usage group. For this case, one set of MLR for high internet usage group and low internet usage is obtained in which low internet usage group is entered as the reference group.

Categorization of the students based on explanatory variables: Further, all other predictor variables or explanatory variables are categorical, and these variables are grouped into dummy variables and coding is given accordingly.

Results: The results of the chi-square analysis testing show there is a significant association of stream of study, parental education with internet usage among college students which can be exhibited in table 1.

Table-1: Association between Socio-educational and family factors and Internet Usage

Socio-educational and family factors	Categories	Low internet usage (141)	High internet usage (174)	Total	Df	Chi-square
Gender	Male	48	58	106	1	0.01
	Female	93	116	209		
Residential background	Rural	109	127	236	1	.77
	Urban	32	47	79		
Stream of Study	Humanities	52	50	102	2	13.27**
	Science	60	55	115		
	Commerce	29	69	98		

Type of Family	Nuclear	74	84	158	1	.55
	Joint	67	90	157		
Maternal Education	Up to Elementary	42	27	69	2	9.85**
	Up to Secondary	90	129	219		
	Graduation and above	9	18	27		
Paternal Education	Up to Elementary	23	13	36	2	6.11**
	Up to Secondary	95	132	227		
	Graduation and above	23	29	52		
Maternal Employment	Non-working	132	162	294	1	.033
	Employed	9	12	21		
Paternal Employment	Agricultural and allied	91	95	186	2	4.00
	Private Job	15	30	45		
	Government job	35	49	84		
Annual Income (Rupees)	Low (2 lakh)	72	94	166	2	.37
	Average (2 to 4 lakh)	44	49	93		
	High (More than 2 lakh)	25	31	56		

**p, <.01

Table 2 shows the most significant estimated predictive effects of socio-educational and family factors in internet usage by multinomial logistic regression model where low internet usage group is considered as a reference group.

Table-2: Multinomial Logistic Regression Model Coefficients

Predictors	Categories	Co-efficients	SE	Walid	Df	Sig.	Exp(B) (Odd Ratio)	Probability (%)
Gender	Male	-.12	.26	.21	1	.64	.883	0.46
	Female*	0[b]	.	.	0	.	.	
Residential background	Rural	-.092	.29	.09	1	.75	.912	0.47
	Urban*	0[b]						

Stream of Study	Humanities	.17	.29	.34	1	.56	1.18	0.54
	Science	.96	.30	10.04	1	.00	2.61	0.72
	Commerce *	0[b]	.	.	0	.	.	
Type of family	Nuclear	.12	.24	.25	1	.61	1.12	0.53
	Joint*	0[b]	.	.	0	.	.	
Maternal education	Elementary	-1.15	.61	3.50	1	.06	.31	0.23
	Secondary	-.55	.53	1.06	1	.30	1.57	0.61
	Graduation and above *	0[b]	.	.	0	.	.	
Paternal education	Elementary	-.05	.57	.01	1	.91	.94	0.48
	Secondary	.51	.40	1.66	1	.19	1.67	0.62
	Graduation and above *	0[b]	.	.	0	.	.	
Maternal Employment	Non-working	.09	.49	.03	1	.84	1.10	0.52
	Employed*	0[b]	.	.	0	.	.	
Paternal Employment	Agriculture and allied	-.15	.29	.28	1	.59	.855	0.46
	Private job	.26	.40	.42	1	.51	1.30	0.56
	Government job*	0[b]	.	.	0	.	.	
Annual Income (In Rs.)	low (2 lakh)	-.07	.33	.04	1	.82	.93	0.48
	Average (2 to 4 lakh)	-.26	.36	.54	1	.46	.76	0.43
	High (4 lakh and above)*	0[b]	.	.	0	.	.	

*Reference category

Gender: Gender of students and internet usage is not significantly associated with each other (chi-square=.018) and value of the odd ratio (.883) of male college students is although close to 1.00 still it is less than 1.00 represents that male college students have to remain in 46 percent probability (.883/(1+.883) x100) low internet usage in comparison of female college students.

Residential background: In addition to this, the residential background is not significantly associated with internet usage as chi-square values are reported to be non-significant (0.772, 0.551). Rural college students have a 47 percent probability of low internet usage (odd ratio=.912) as compared to students having urban backgrounds.

Stream of study: Regarding stream of study the value of chi-square is connoted to be significant (13.27:

p<.01) and depicts that stream of study and internet usage are significantly associated with each other students. The results of the logistic analysis reveal that it is seen that more than 1.00 odd ratio (1.18) of students having humanities stream revealed that there is a 54 percent probability of high internet usage in the humanities group about the reference group which is commerce group. In the same way, a more than 1.00 odd ratio (2.61; p<.01) of science stream depicts that student having the science stream are found to be almost more than two times to use the internet regarding commerce groups. This means college students studying in science stream have 72 percent probability of being part of a high usage group in comparison to the commerce stream.

Type of family: On the other hand, students having nuclear families have 53 percent probability of high internet usage as the odd ratio is greater than one (1.12).

Maternal education: Chi-square values for maternal education in terms of internet users reported to be 9.85 which is significant at .01 levels and reveals that there is a significant association between maternal education and internet usage. In maternal education, the odds ratio of college students whose mothers are educated up to elementary level is .31 and the odds of college students whose mothers are educated up to secondary level is 1.57 and this value is greater than one. Therefore, college students whose mothers are low in their education level have a 23 percent probability of being in a low internet usage group and college students whose mothers are average in their education level have a 61 percent probability of being in a high internet usage group as compared to students having a high level of maternal education.

Paternal education: When considering paternal education, odds ratio of college students whose fathers are educated up to elementary level and secondary level in the logistic analysis showed that those college students having paternal education level up to secondary level are found to be almost two times more likely to use the internet (odd ratio:1.67) and have 62 percent probability of being remained in high internet usage and less than 1.00 odd ratio for students having an elementary level of paternal education (.94) exhibits 48 percent probability of being remained in low internet usage group with reference to students having high a level of paternal education. Similarly, the chi-square values for paternal education are 6.11 among college students which are significant. This shows that paternal education and internet usage are significantly associated with each other.

Parental employment: Parental employment does not significantly show an association between internet usage in college students as chi-square values turned out to be not significant both for maternal employment and paternal employment. Still, college students whose mothers are non-working have a disposition of internet usage and have a 52 percent probability of remaining in the high internet usage group (Odd value=1.10) as compared to students having employed mothers. College students whose paternal employment in agriculture and allied services have 45 percent probability (odd ratio=.855) of being in the low internet usage group and college students whose fathers are in the private jobs have 46 percent probability (odd ratio=1.30) of being in high internet usage group with respect to college students who fathers are working as government employees.

Annual income: Lastly, chi-square values depicting non–significant association between internet usage and annual income (.374), still college students whose family income is low,

and average have 48 and 43 percent chances (Odd values=0.93;0.96) of less usage internet as compared to college students having high levels of family income.

Conclusion

Empirical findings reveal that students having nuclear families, having science and arts stream with an average level of parental education (up to secondary) and whose fathers are in private jobs and mothers are non-working have a significant possibility of being in high internet usage and they are at high risk of internet addiction because there is a thin line between inappropriate and productive uses of the internet.

Discussion

These results are corroborated with the studies conducted in the field of psychology, education and organizational behaviour which have shown that demographic factors influence significantly internet usage (Taylor et al., 2003; Aghajani and Zamini, 2012; Ajuwon and Popoola, 2014; Wu et al, 2016; Rahman et al. 2020). There are significant stream-wise differences in usage patterns of internet usage favouring arts stream (Chandran, 2010; Prabhu, 2016; Kaur 2017), science stream (Amutha & Kennedy, 2015).

Gender is an essential demographic factor affecting usage of the internet and gender difference is also visible both in the frequency of usage of internet as well as purposes of internet usage. Males use the internet for longer hours, while women are moderate users (Bimber, 2000; Winker, 2005; Hamissi et al., 2013; Bahrainain, 2014; Hasan et al., 2014; Kaur, 2014; Sharma et al., 2014; Singh, 2015; Yosi & David, 2015; Arjunan & Edward, 2016; Prabhu, 2016; Sattari et al., 2016; Gedam et al., 2017; Kaur, 2017; CRY, 2020; Kumar, 2020). Male students use the internet for making new friends through social networking sites (Varghese et al., 2013; Thakur,2014; Krishnamurthy & Chetlapalli, 2015), seeking information (Thanuskodi, 2013) and for online gaming (Kilic & Guzeller ,2020) whereas girls use for educational assistance (Thanuskodi,2013; Varghese et al., 2013; Thakur,2014). However, in the present study gender does not emerge as a significant predictor of internet usage. These results are consistent with the literature (Chew, 2004; Masters, 2008; Mohammed, 2013; Khan and Awan, 2017; Singh, 2018; Rahman et al. 2020). The reason may be that the involvement of women in digital technology has been increasing day by day and the digital divide among male and female users has been narrowed.

Furthermore, the residential background of the students does not significantly predict internet usage and these findings are contradicted by Loan (2011), whereas supported by Arjunan & Edward, 2016 who concluded no significant variation in the internet usage in relation to the residential background. Annual income does not come as a significant predictor in the present study, whereas socio-economic status and family income lead to internet addiction as reported by Taylor,2003; Prezza et al., 2004; Debell and Chapman 2006.

Additionally, results of the study show that the nuclear family system contributes to internet usage. The reason may be that nowadays in workaholic society both parents are busy round the clock in their jobs and pay insufficient attention to their wards, therefore children are free to use the internet without monitoring their parents. It is seen that family plays a protective role in reducing pathological internet usage (Zhen et al., 2011) and family functionality affects internet addiction (Yen et al., 2007 and Yen et al., 2009; Wu et al. 2016). The parental educational level more particularly

average level of education along with the type of parental employment significantly predicts internet usage among college students. Therefore, it can be said that levels of parental education and employment significantly contribute to the usage of the internet. These results are compatible with the findings of Debell & Chapman, 2006; Ozgur, 2016 who concluded that the educational level of parents is positively related to internet usage among the students.

Recommendations

Finally, after knowing the socio-educational and family predictive factors through this study, educators may categorize students in particular groups according to their usage level and can provide them guidance according to their needs and can design the best educational environment for the students. The findings will be helpful to understand students' behaviours and use the internet for essential purposes and may assist higher education, libraries, information centres, and other agencies when making policies regarding future information technology; distance education programs; and digital resources. The Internet itself is a value-neutral thing and it is only a medium. What makes it good or bad is the content of internet usage, the way the internet is used and how much it is used; all these decide the balance between opportunities on one side and harms on the other side. The Indian society, with its socio-economic and cultural diversity, may often find itself unable to grapple with the multiple nuances of internet usage (Prakash, 2020). Therefore, for the judicious use of the internet, there is a need to recognize various factors associated with internet usage in shaping the behaviour of the youngsters in this digital world, so that students will have to be educated in safe and healthy practices for internet use. Appropriate preventive and interventional strategies need to be developed to encourage rational use of the internet to protect the physical and mental health of the users. Comprehensive prevention programs for students should be carried out to increase awareness regarding excessive use of the internet. The colleges/ universities curriculum must have customized programs to elicit a response from students and bring about the best in them and to channelize their energies in a way, where there is a positive impact of technology. An age that is ruled by the internet should be monitored and constant guidance sessions should be given by teachers and counsellors for shaping the future of the Indian digital ecosystem as well as safeguarding the well-being of youngsters.

Lastly, with reference to limitations of this study, it is worthwhile to mention that only summative score of internet usage scale has been considered in the analysis, therefore in future predictive effects of socio-demographic variables for various patterns of internet usage such educational, social, entertainment as online can be studied to get overall picture of technology. Furthermore, in the present research, only a set of socio-demographic variables is selected to study correlates of internet usage. Other combinations of socio-psychological predictors can be chosen for future study. Internet usage varies over time; it would be significant to replicate these findings across time (during and after the Corona pandemic). Future studies should be focused on essential and non-essential internet usage at different levels of education, such as school, college and university to enhance understanding the concepts of internet usage and internet addiction.

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Research Article

Perception and Preference of School Student's towards E-Classrooms in India during COVID-19 pandemic

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Abstract

After the outbreak of Corona, India's traditional education structure was completely shifted to E-classrooms. Many educational institutions, however, welcomed this new technology development without first examining the availability, price, accessibility, and acceptability of virtual learning among young, developing students. The purpose of the research was to focus on the perception and preference of E-learning of Indian school students from class V to XII with the help of an online survey of 816 respondents. The attempt was made to uncover the concrete issues of online classes faced by the school students and further suggestions on how to best utilize this integrated approach in the school education system in near future. Thus, the study addresses the student's perspective towards virtual classes and their expectation and experience to further improve the online education system. The study revealed that students are well equipped with the devices as well as technical knowledge and have good internet connectivity. The students opined that online classes are not effective as it requires self-motivation as well as a lack of direct interaction with the teachers and fellow-mates. However, they appreciated the convenience of E-classrooms, and many felt alienated as a result of their isolation, whereas sitting in front of a computer makes them feel drowsy, and many complained of eye problems. But in the school education system full model of virtual learning may not be possible, but a blended approach can be practiced.

Key words: Online Classrooms, E-learning, E-classrooms, virtual classrooms, COVID-19

Introduction

COVID-19, a novel coronavirus disease shattered the world and countries were enforced to impose the closures of educational institutions. The Indian education system also transformed from traditional classrooms to E-classrooms soon after the first lockdown which was imposed in India on 25th March 2020 and more than 320 million students were affected due to the closure of the school and higher education (According to UNESCO 2020). This brought a challenge for the educationalist think-tankers, how to continue the learning with traditional teaching methods as lockdown and social distancing was the only ways to slow down the spread of coronavirus. The burden to complete the syllabi within the stipulated academic calendar time frame was a big challenge for them. According to John Dewey, American philosopher, psychologist, and educational reformer, strongly argued that good education must lead the child's current interests and abilities organically to logically organized human knowledge.

This pandemic has utterly disrupted and raised a question on the Indian education system, that's why our education system in this digital era is

lagging. Though, E-learning is now being heralded as the key to transforming the education sector, in a country like India benefits of virtual classrooms accrue to those for whom the technology is affordable, accessible and adaptable. The study is relevant as school children aged 11 to 18 years old usually use mobile solely to play games or to chat on social media, but today they must sit and study with this device. This unprecedented implementation of the online mode in the education system caught everyone off guard, so in this context, the experience of the students can be helpful to incorporate the E-classrooms in a more convenient and productive way.

Further, the adaptation of E-learning among students and teachers teaching with this new pedagogy is appreciable. This flourishing technology and innovative change have initiated challenges in the education system with a new learning for both students and teachers. Hence, the results of the study can be significant inputs on deciding various attributes necessary for the adaptation of a blended education system approach. In the next section, a brief review of literature is provided, preceded by a research methodology section and then discussion on results and implications of the study with concluding remarks.

Objectives of the Study

1. To explore the attitude and perceptions of school children who have adopted E-classes during Covid-19 pandemic.
2. To identify the factors for improving academic performance by adopting E-classes.
3. To identify the future prospect of E-learning in the school education system.

Review of Literature

The technological advancement in the current education system has forced educators to think about ways to design online content. For the designing of online course content, preference and perceptions of learners are necessary to be considered for an effective and efficient learning process. Preference refers to the willingness of the students to adopt the blended learning approach and factors influencing the E-classrooms. During this difficult period, the main worry is not whether online teaching-learning methods can provide high-quality education, but rather how academic institutions will be able to implement online learning on such a large scale. (Carey, 2020).

The concept of readiness for online learning was proposed by Warner et. al. 1998. Readiness of VET clients for flexible delivery including online learning (Brisbane: Australian National Training Authority.) in Australian vocational education and training sectors, describing three main aspects: preference of the students for online learning, students' self-confidence with their technological competency and trust in internet and capability to engage in self-directed learning. The concept was further researched by many researchers, Smith et al.2003 revealed two preferred factors "comfort with e-learning" and "self-management of learning" are the preferred factors in E-learning. Singh & Thurman, 2019 defines online learning as learning experiences in synchronous or asynchronous environments using different devices (e.g., mobile phones, laptops, etc.) with internet access. In these environments, students can be anywhere (independent) to learn and interact with instructors and other students". According to Lin and Hsieh (2001); McVay (2001), online learning requires self-directed motivation and learner's control by Reeves (1993) and

online communication self-efficacy by Roper (2007). Further Basilaia et al., 2020 highlighted that E-classrooms can be successful when there are basic arrangements like, a video conferencing with at least 40 to 50 students can join, good internet connections, lectures accessible on mobile phones also, discussions with students can be done, pre-recorded lectures facility so that students can watch those videos later and instant feedback from students can be achieved and assignments can be taken.

Previous researchers have documented the favourable and unfavourable perceptions of the students towards online learning mode. Apart from favourable conditions, some researchers revealed that students in an online course lack social group formation in an E-learning environment by Song et.al (2004). As Gunawardena revealed that social presence is a must to maintain the flair in the education system, if the social presence is low the interaction in learning is also low. Other than this, social interaction is even essential for successful learning as it promotes learning engagement (Carini R, Kuh G, and Klein, 2006). Several studies indicated that students-teachers interaction have a significant impact on the students' perception of virtual classes.

Various drawbacks were also described by the previous researchers, lack of a sense of community and/or feelings of isolation by Vonderwell (2003); Lin and Zane (2005); sometimes technical problems persist by Piccoli et al. (2001); Song et al. (2004), delay in responses by Petrides (2002); Vonderwell (2003), problems in collaborating with the co-learners, Piccoli et al. (2001); Song et al. (2004). Further, the weakness of online learning, according to Golladay et al. (2000) and Serwatka (2003) are E-classrooms that require greater discipline, self-motivation and writing skills as well as self-directed time management.

Many educational institutes are implementing E-learning as an important method in the modern education era due to its flexibility, ease of use, low cost and to overcome the problem of shortage of faculty members (Linjawi and Alfadda 2018).

Further, many studies have been conducted to acknowledge the students' perception towards E-learning and according to many students loved E-learning, but many gave preference to traditional methods. Popovinci and Mironov (2015) suggested that acceptance of new technology depends upon its needs and demands, hence E-learning can be acceptable when students find it helpful and fruitful for their studies, whereas lack of information technology skill and internet connectivity can prompt negative perception towards e-learning (Silviyanti T M and Yusuf Y Q 2015). Many studies have also supported the fact that online class will be as effective as a traditional class if it is designed appropriately (Nguyen, 2015). But very few attempts have been made to understand the perception of school students regarding online classes. Further, attempts have not been done in this line of school students as traditional teaching is always preferred, so the researcher will try to fill the gap by focusing on the perception of school students towards online learning methodology.

Data and methods

Participants

5 English Medium schools were randomly selected from Raipur City, Chhattisgarh and a total sample size of 1000 was selected for the study. Initially, the key informants from these 5 schools were identified for an online survey. The link for the Google form

was sent to the key informants through WhatsApp and E-mail. After submitting their responses, they circulated the questionnaire among other students like snowball sampling.

Based on equal ratio proportionate random sampling, from each school, 200 students were randomly selected for the study. Total 1000 questionnaires were e-mailed to the students among which 816 participants responded that the relevant rest were rejected from the study. It includes 108 from Vth –VIth, 156 from VIIth-VIIIth, 312 from IXth-Xth and 240 from XIth-XIIth. Among them 553 male and 263 female

Procedures

Initially, the key respondents were identified from various English medium private schools where the online classes were implemented full-fledged for the online survey. A structured preliminary questionnaire was designed with the help of a literature review and further inputs were taken from discussions with the students. A pilot survey was done with 43 students and feedback was considered for the final questionnaire design the questionnaire was prepared in Google form to be sent through E-mail and WhatsApp to the students or on their parent's mobile/E-mail address. The final electronic survey was conducted from August 2020 and closed in November 2020.

Data Analysis

The data were collected from the school student's, attending regular online classes and further, the study was followed with the learner's perception, preference, availability, constraints, disadvantages, and valuable suggestions. The electronic survey was a researcher generated instrument, blended with a quantitative questionnaire consisting of 29 items on a 5-likert scale and few demographic questions. The data was gathered about: Technological competencies and the internet (6 items), Attitude towards Online classrooms (7 items), flexibility and convenience (5 items), inter-relationship with teachers and fellow-mates (5 items) and health problems (6 items).

The electronic pilot survey was conducted on a small sample of students and minor corrections were done based on the respondent's feedback. The reliability of the questionnaire was tested through Cronbach Alpha correlation test (See Table.1).

Table-1: Cronbach Alpha Test

S. No.	Items	Cronbach's Alpha
1	Technical knowledge and Internet Connectivity	.879
2	Online Classrooms	.767
3	Inter-relationship	.709
4	Flexible and Convenience	.765
5	Health Issues	.890

The perception of the students was summarized and analysed by the measure attitudes developed in 1932 by Rensis Likert, the typical Likert scale of 5-point ordinal scale used by respondents to rate the degree to which they agree or disagree with a Statement. The Likert 5-point scale is considered

an interval scale. The mean is very significant. From 1 to 1.80 it means strongly disagree, 1.81 to 2.60 means Disagree, 2.61 to 3.40 means Neutral, 3.41 to 4.20 means Agree and 4.21 to 5 mean Strongly Agree.
For data analysis, frequency, percentage, mean and standard deviation were calculated to summarize the data.

Results

Findings from the analysis of quantitative data gathered from the present study are presented below:

Basic information regarding Online classes

Due to the COVID-19 pandemic the closure of the schools and colleges compel the students for adapt of E-learning, though 21 percent of students suggested the suspension of classes and 5 percent of reading material and assignments should be provided to them. Hence, this probes into the matter to analyze the perception of students towards E-learning. (See Table.2)

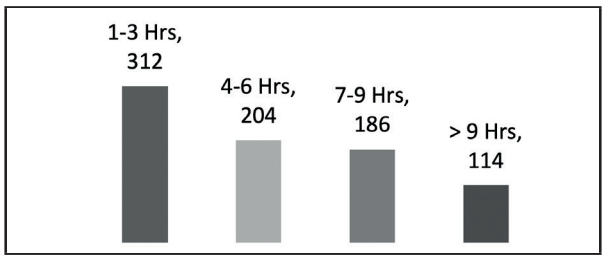
Table-2: Basic Information regarding Online Classes

Questions	Response	Percentage
Did you attend any online course		
earlier?	No	87
	Yes	13
Whether your school has begun online classes in the wake of corona?	No	
	Yes	1
What will you suggest to meet the current situation?	Curriculum schedule can be suspended	21
	Assignments and reading materials can be provided	5
	Managing with online classes	74

Daily Screen Timing

The below figure 1 predicts that 312 students screen timing is from 1-3 hours and only 114 students screen timing is more than 9 hours.

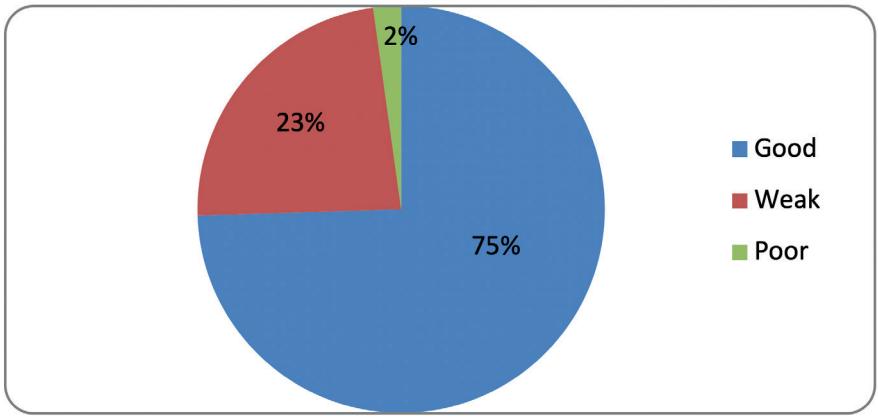
Figure-1: Daily Screen Timing



Internet Connectivity

It was found that (608) 75 percent the students have good internet connections in their house. Hence, the student's do not face many technical issues related to weak connectivity, joining problem or instructor's voice issue.

Figure-2: Internet Connectivity



Device Availability

Majority of the respondents use their parent's smartphones and laptops (53 percent of the respondents). Hence, they do not have a problem of availability of the device for attending online classes (See Table-3).

Table-3: Availability of Devices

Available Device for the Students	Total No. of Students	Percentage
My Smart Phone, My Laptop, Parent Smart Phone	48	6
My Smart Phone, Parent Mobile	144	18
My Laptop and Parent Mobile	95	12
My Laptop and Parent Laptop	52	6
My Tablet and Parent Mobile	45	6
My Parents Mobile and Laptop	432	53

Respondent's Perception towards Online learning

1. Technical knowledge and Internet Connectivity

The result on the attitude of students towards technical Knowledge and Internet connectivity revealed that the students have sufficient equipment like smartphones, laptops, tablets, etc. to participate in online classes and do not suffer from internet connectivity problems. But for the guidance provided before the implementation of online classes and having sufficient data for online classes, they were neutral. As many expressed that after 2-3 classes their net data pack get over.

Table-4: Descriptive statistics on the attitude of students towards Technical Knowledge and Internet connectivity

Questions	Min	Max	Mean	SD
1.You have sufficient equipment and facilities (computer/laptop/Internet/software) to participate for online lectures	1.00	5.00	3.55	1.16
2.You have sufficient computer knowledge and IT skills to manage your online learning	1.00	5.00	3.51	1.15
3.Guidelines are provided (ex. how to use relevant online tools) before starting online lectures by your lecturer	1.00	5.00	3.28	1.25
4.Have good internet connectivity	1.00	5.00	3.43	1.19
5.Have sufficient data for online classes	1.00	5.00	3.34	1.26

2. Attitude of students towards Online Classrooms

Table 5 reflects the attitude of students towards online classes. The below table depicts that the Statement "Online tools are easy to use" and "happy about online teaching methods and lecture materials" students were neutral. The students disagreed that online lectures are more effective than traditional classrooms and online learning is fun for them. They were neutral on the questions that with online classes they gained new experience and it has reduced their writing work.

Table-5: Descriptive statistics on Attitude of students towards Online Classrooms

Questions	Min	Max	Mean	SD
1.Online tools are easy to use	1.00	5.00	3.22	1.19
2.Happy about online teaching methods and lecture materials	1.00	5.00	2.86	1.23
3.Online lectures are effective than traditional/ live classroom lectures	1.00	5.00	2.06	1.12
4.Using online learning is fun	1.00	5.00	2.56	1.20
5.Gained experience of learning in a new online environment	1.00	5.00	3.36	1.23
6.Lack of written work	1.00	5.00	3.18	1.32

3. Students Relationship with their teachers and fellow mates

The result depicted in Table 6 that during online classes' students lack contact with their teachers as well as classmates and they were unhappy about their interrelationship with their fellow-mates and teachers during E-classrooms. Students agreed that the lectures and notes are not sufficient for them, and they were neutral to the point that they get the proper facility to clear their doubts.

Table-6: Descriptive statistics on students Relationships with their teachers and fellow mates

Questions	Min	Max	Mean	SD
1.Lack of direct contact with other students/colleagues/friends	1.00	5.00	3.80	1.21
2.Lectures and notes are sufficient for me to understand the topics	1.00	5.00	2.69	1.23
3.Are you happy about the student-teacher interaction during online teaching & learning process	1.00	5.00	2.80	1.22
4.Do you have facility to ask questions or clear doubts during online lectures	1.00	5.00	3.21	1.24

4. Attitude of students towards Flexibility of Online Classrooms

Table 7 displays that student were neutral on the flexibility of online lectures as time schedules were fixed for the classes, but they enjoyed the flexibility of study location as from anywhere they can access online classes. Student's responses towards the motivation for online lecturers were neutral as well as on finding a suitable home environment for E-classrooms.

Table-7: Descriptive statistics on Attitude of students towards Flexibility of Online Classrooms

Questions	Min	Max	Mean	SD
1.Flexibility in participating for online lectures	1.00	5.00	3.06	1.23
2.Motivation is high in participating online lectures	1.00	5.00	2.86	1.15
3.Home environment is suitable for participating online lectures	1.00	5.00	3.05	1.31
4.Study location becomes flexible	1.00	5.00	3.44	1.26

5. Health Issues of students

Table 8 revealed that due to online classes students suffer from headache problems, irritation in the ears, feeling tired and lethargic and excessive screen timing causes eye problems. They were neutral on the Statements that "Frustration and lack of interest during lockdown" and "complain about pain on backs, shoulders and neck.

Table-8: Descriptive statistics on Health Issues of students due to Online Classes

Questions	Min	Max	Mean	SD
1.Frustration and lack of interest in learning while being locked down	1.00	5.00	3.09	1.41
2.Have complain about extreme pain on backs, shoulders, and neck muscles because of slouching or straining for long periods of time	1.00	5.00	3.18	1.30
3.Due to long screen timing have headache problem	1.00	5.00	3.38	1.35
4. Excessive use of headphones irritates my ears	1.00	5.00	3.44	1.33
5.Feel tired and lethargy due to excess sitting posture	1.00	5.00	3.67	1.31
6.Excessive use of screen creates my problem in eyes	1.00	5.00	3.65	1.36

Discussion

The primary purpose of this research was to examine the perception and preference of school students regarding online classes and to explore the favourable factors useful in future for the blended teaching approach.

The study has identified the successfulness and hindrance factors of online learning with respect to student's perceptions. The factor identified for the successful implementation of E-learning where online classes should not be for long hours as to avoid physical problems due to prolonged sitting posture and working with electronic gadgets, which is supported by Thompson's (2014) revealed the formula of work for 52 min and have to break for 17 min. Further, the technical proficiency of learners too is a major requirement for the efficient usage of online classrooms. Apart from this, students enjoy the location flexibility and convenience to work in E-classrooms as they have the freedom to join their class anywhere from their home as well as use mobile, laptop, or tablet as per their convenience. Poole (2000) found that class schedules should be fixed as per the convenience of student's and online classrooms can be made better if pre-recorded videos are uploaded so that students can access it anytime.

School education system is based on a strong bond between teachers and students, but in online classes it lacks. According to Johnson et al. (2008) for the satisfaction of participants, E-learning requires a developed and a collaborative learning space, whereas a strong correlation between learner's social presence and their over satisfaction (Gunawardena and Zittle, 1997). Further, health issues are one of the major constraints as prolonged uses of electronic devices have the worst effect on their eyes and make them lethargic.

In the school education system where the students are learning to be disciplined and collaborative, shifting completely to online mode is very difficult and impossible. Hence, the factors found favourable for the successful implementation of E-learning were:

Table-9: Factors affecting the success of Online classes

Factors Identified	
Availability of Device	Requires suitable devices and electronic gadgets
Internet Accessibility	Good internet connectivity to attend the classes without interruption
Data pack	Sufficient data pack to attend all the classes regularly
Technical Skills	Knowledge of computer and internet is required
Easy to use	User friendly and less writing work
Instructor's Competency	Instructor should be well trained and efficient in computer knowledge
Flexibility	Study anywhere and any time
Interactive	Inter-relationship between teacher's-student's and student's- student's. Allowed to switch on their mice as well as cameras regularly
Motivation	Needed self-discipline and goal direction
Time schedule	Online classes should not be more than 2-3 hours
Health Issues	Students' regular follow-up on their health should be taken care

Soon the school education may think of a blended approach as for small kids' self-direction study is very difficult. The finding of the study will be very useful in designing the effective structure of online classes as well as for the development of course content for E-learning.

Conclusions

At present, it may be too early to speak about the adaptation of E-learning among students and teachers, but it is necessary to address the constraints and challenges of student's during E-classes.

The findings of the study revealed that most of the school students have adopted the E-classroom pedagogy very successfully. E-learning turned out to be a successful methodology during the pandemic. But students did not find this teaching methodology much effective in comparison to traditional classrooms.

Further, students enjoyed the flexibility and convenience of virtual classrooms, but they do not have the flexibility to learn anytime as the timetable was fixed and mandated, whereas they enjoyed the convenience of E-classrooms as they were free to join from anywhere. Students feel isolated and lack interaction with teachers and fellow-mates as the class timing is fixed and they must keep their mice and cameras off during the classes. Apart from this due to excessive use of technology, students suffer from eyesight problems, some have irritation in ears because of excessive use of headphones and sitting for long hours make them lethargic. Hence, all these factors should be considered while developing E-learning courses at school level to make it more effective. After the COVID period is over this new learning will provide a new platform in the Indian education system, but it requires a systematic planning and implementation. The outcome of this study will be useful for redesigning blended teaching methodology in the school education system.

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Research Article

Impact of Hand Therapeutic Exercises Using Touch Devices on Handwriting Performance: Case Studies in School Children

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Abstract

Handwriting is one of the complex tasks in school years and it is very important for academic excellence. However, various learning disorders can interfere with the learning of basic skills such as reading and writing. The primary objective of this study was to explore whether the digital learning environment reshapes the characteristics of handwriting performance in children with handwriting difficulties. Hence, we have conducted two case studies on two school children studying in 5th and 6th grade. These students were selected for the study based on poor handwriting performance as reported by their class teachers. As part of the study, they have participated in a training session using the 'Dexteria' software. This software comprises two fine motor activities and a letter tracing activity. The principle behind this study is that improving fine motor skills may improve handwriting skills. After the training programme, the experimenter has introduced some fine motor activities using crayons and colour pencils to observe the influence of the touch-based training in their drawing and colouring. They were also asked to write some text to compare the pre- and post-training handwriting samples. It was observed that their fine motor control in drawing skills and handwriting was improved. These case studies were conducted as part of ongoing research work to develop an application for children with handwriting difficulties.

Keywords: Fine motor skills, iPad with Dexteria application, handwriting difficulty, handwriting performance

Introduction

Handwriting is considered an important developmental ability and an essential ingredient for the academic success of a child (Feder, K. P., & Majnemer, A., 2007). It is used in many situations such as notes preparation, examinations, class worksheets, homework, etc. This skill consumes considerable time in a regular classroom routine (Ziviani, J., & Elkins, J., 1986). Acquisition and performance of handwriting skill are related to the perceptual-motor abilities in children (Laszlo, J. I., & Bairstow, P. J., 1984). Illegible handwriting, poor motor control and speed stroke are the core handwriting problems experienced by dysgraphic children (Chang, S. H., & Yu, N. Y., 2013). Handwriting legibility is related to the reading ability of a child, and it is derived from the connection theory of reading and writing (Rose 2004).

Legible handwriting is an important skill and deserves great attention by teaching professionals and health practitioners (Feder, K. P., & Majnemer, A. (2007). In the early school years, paper and pencil was a common practice used by children. However,

the popularity of smart devices, such as tablet computers, kindle, laptops, etc. introduced a new way to young children's learning experience in the interactive environment (Crescenzi, L., et al., 2014; Neumann, M. M., & Neumann, D. L., 2017). Thus, education becomes smart which fosters their academic performance (Neumann, M. M., & Neumann, D. L., 2017).

The objective of this study was to explore whether the touch-based digital environment reshapes handwriting performance in school children. We have introduced an iPad application named Dexteria for developing fine motor skills in school children with handwriting difficulties. Dexteria has three activities, two direct hand-therapeutic fine motor exercises (tapping and pinching) and a letter tracing activity (upper- and lower-case alphabets). The participants were asked to perform these activities under the observation of the experimenter. This paper describes 2 case studies where 2 schoolchildren underwent Dexteria based training to reinforce their fine motor skills to reshape their handwriting performance.
The paper is organized as follows: Section 2 describes the related literature, Section 3 explains the methodology, Section 4 describes the results followed by a discussion and Section 5 concludes the study.

Related works

Handwriting is one of the interesting and complex tasks in human communication (Rosenblum, S., et al., 2013). A good handwriting sample can be related to different abilities of a person and the theory of handwriting (Hollerbach J.M., 1981). Grissmer, D., et al., (2010) have identified that fine motor skills and hand-eye coordination have influence on handwriting skills. These skills are age-based developments, which interact with physical, mental, and cognitive developments in children (Accardo, A. P., et al., 2013: Feder, K. P., & Majnemer, A., 2007). Fine motor development is one of the important aspects of every child to complete their daily activities and it is improved through different practices (Ungerleider, L. G et al., 2002). McHale, K., & Cermak, S. A. (1992), noted that most of the children in elementary schools spent 30-60 percent of the whole day completing fine motor activities, such as writing and other manipulating tasks.

Research has found that the integration of fine motor activities with picture cards in the classroom has an impact on school skills, such as pencil grip and motor development (Ohl, A. M., et al., 2013). West, J., & Haskins, E. (1995), introduced training on fine motor skill development using crayons and pencils in kindergarten to accomplish kids' academic and pre-academic tasks. In school years, the achievement of every child is determined by their academic performance, behaviours, multi-curricular activities, and their school readiness (Pianta, R. C., et al., 2007) and these are measured in terms of handwriting, literacy, and math abilities.

Research studies have proved that the use of e-learning tools, Learning Management Systems (LMS), web-based technologies and other ICT-related tools provide a great opportunity to improve the quality of the learning process. Murray-Smith, R., et al., (2002), have investigated the use of personal digital assistants (PDA) in teaching and shown that it enabled the full participation of individuals with special needs. Adam, T., & Tatnall, A. (2008), have identified that the use of Information and communication technology (ICT) environments provide learning resources and improve the lives of people with learning difficulties. Kumar, K. R. A., et al., (2011) have discussed various techniques to facilitate human-computer interaction. Becker, H. J.

(1986), has identified that systematic use of a computer could support individualized learning and attention. Another study showed that assistive technology with tactile experience could support the handwriting ability of preschool children (Neumann, M. M., & Neumann, D. L., 2017). The unique benefits of touch screen portability and easy navigation allow young children for independent practice and learning with multimedia effects (Mize, M. K., et al., 2018). Martín, E., et al., (2019) showed that touch devices let a direct interaction between students and devices. It also enables students to focus on the content presented and learn how to use these devices easily.

From the literature study, it is obvious that technology-enhanced learning has an impact on young children's learning experience and quality. Motivated by these studies, the authors have conducted case studies on two children who have handwriting difficulty, checking the impact of hand therapeutic exercises using touch-based devices on their handwriting performance.

Methodology

The main objective of this study was to explore whether the touch-based digital environment with hand therapeutic exercises reshapes handwriting performance in school children. We have used case study as the methodology and selected two students having poor handwriting. It was a pre-test post-test-based experiment. The same set of tasks was given in the pre-test and post-test. The idea was to check the influence of a fine-motor skill development application on these students' handwriting performance. There are physical factors such as hand-eye coordination, pen-grip, hand and wrist flexibility, etc. that play a role in the development of handwriting skills and research has proved that fine motor skill influences handwriting. Moreover, the handwriting theory (Hollerbach, J. M., 1981) views handwriting production as a constrained modulation of an underlying oscillatory process where vertical and horizontal oscillations are responsible for letter formation.

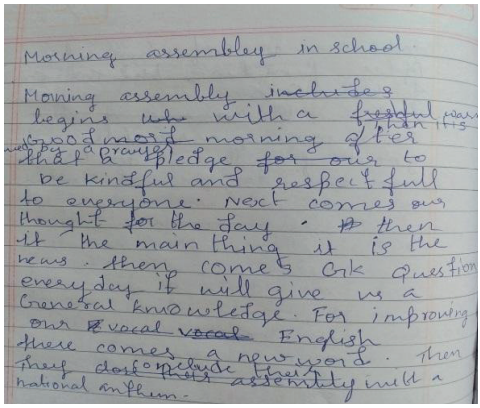
1). Participants

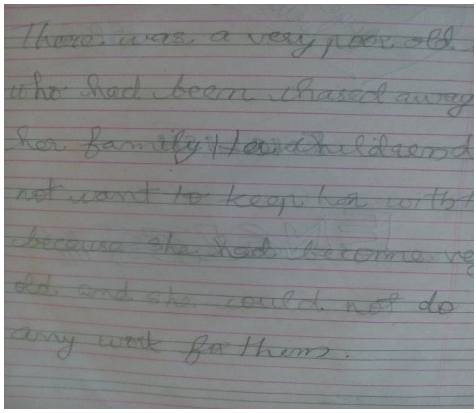
The participants were two female school children studying in 5th and 6th grade in different schools in Kochi, Kerala. We call them participant-1 and participant-2 respectively to identify them. These students were selected for the study based on a report from their class teachers, about their poor handwriting performance. According to their academic performance, they were strong in mathematics and good at reading. They had issues in comprehension and writing. The students participated in the experiment after getting written consent from their parents. The participants were given a pencil, a pen, a ruled notebook and a four-line notebook to record their handwriting performance on pre-test and post-test. They were free to choose among these items.

2). Procedure

To evaluate the participants' current handwriting performance, a pre-test was conducted using paper and pen/pencil. Participant-1 was asked to copy regular class works from a textbook in a rule book and participant-2 was asked to copy an English passage from a storybook in a four-line notebook. The experimenter collected these pre-test samples (see Figure 1) and measured various parameters on handwriting performance. The handwriting rubric used for this study was retrieved from www.YourTherapySource.com/rubricshandwriting.

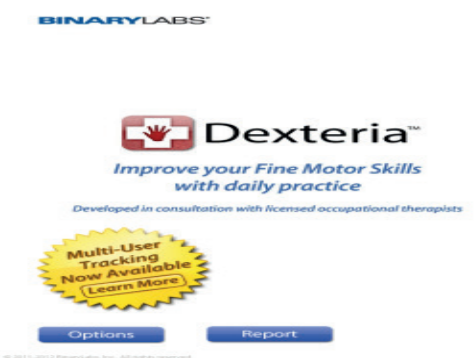
Figure-1: Pre-test samples from participant1 and participant 2





After the pre-test, then as part of the training process, they were introduced to the fine motor skill development app Dexteria (see Figure 2) run in iOS. It comprises three activities, such as 'Tap it', 'Pinch it', and 'Letter tracing' (both upper and lower case). The first two activities are touch-based hand therapeutic exercises to warm up the hand and the third activity was for letter formation. Each participant was allotted 30 minutes of training on a tablet computer for the hand therapeutic exercises and 10 minutes for the letter tracing activity (see Figure 3). Thus, one participant got a total of 40 minutes of training in a day. The training period was in 8 weeks and each participant received an average of 24 hours of training on the 'Dexteria' app to strengthen their hand muscles and handwriting readiness.

Figure-2: Screenshot of Dexteria application with 3 activities -Tap it, Pinch it and Write it



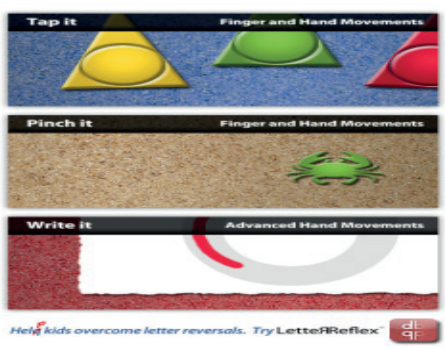


Figure-3: Participants interacting with 'Dexteria' application using tablet computer

Each day after the training session, the experimenter asked them to copy a passage from the given storybook to observe their daily progress. It was then graded using the rubric (see Table 1) and charted to see the progress throughout the training period. It was observed that their fine motor control in the handwriting process was improving. The entire experiment was conducted individually in a university laboratory and the experimenter observed the participants during the training process. The rubric has various parameters on handwriting performance, such as the letter formation, size of letters, the spacing of letters, placement, and neatness for copying tasks. For each participant, the experimenter measured their handwriting performance in pre-test and post-test in terms of letter formation, placement, spacing of letters, neatness, and letter sizing using the Likert scale from '1' to '5', where '1' indicates distorted letter and '5' indicates perfectly written letter. During the training process, the parents of the participants were allowed informally to observe their performance.

Table-1: Handwriting rubrics used for performance evaluation

Parameters of Handwriting	5	4	3	2	1	Final Score
Letter Formation	All the letters are formed correctly	Most of the letters are formed correctly (more than 75%)	Some of the letters are formed correctly (50-75%)	Few of the letters are formed correctly (25-50%)	Less than 25% of the letters are formed correctly	

Placement	All letters are oriented correctly on the lines	Most of the writing samples are oriented correctly on the lines (more than 75%)	Some of the writing samples are oriented correctly on the lines (50-75%)	Little of the writing samples are oriented correctly on the lines (25-50%)	Less than 25% of the writing samples are oriented correctly on the lines	
Letter Sizing	All letters are sized correctly	Most of the letters are sized correctly (more than 75%)	Some of the letters are sized correctly (50-75%)	Few of the letters are sized correctly (25-50%)	Less than 25% of the letters are sized correctly	
Spacing of Letters	All letters are spaced correctly	Most of the letters are spaced correctly (more than 75%)	Some of the letters are spaced correctly (50-75%)	Few of the letters are spaced correctly (25-50%)	Less than 25% of the letters are spaced correctly	
Neatness	Writing assignments are always neat without erasures, torn paper or cross-outs	Most (>75%) of the writing assignment is neat without erasures, torn paper or cross-outs	Some (50-75%) of the writing assignment is neat without erasures, torn paper or cross-outs	Little (25-50%) of the writing assignment is neat without erasures, torn paper or cross-outs	Less than 25% of writing assignment is neat without erasures, torn paper or cross-outs	

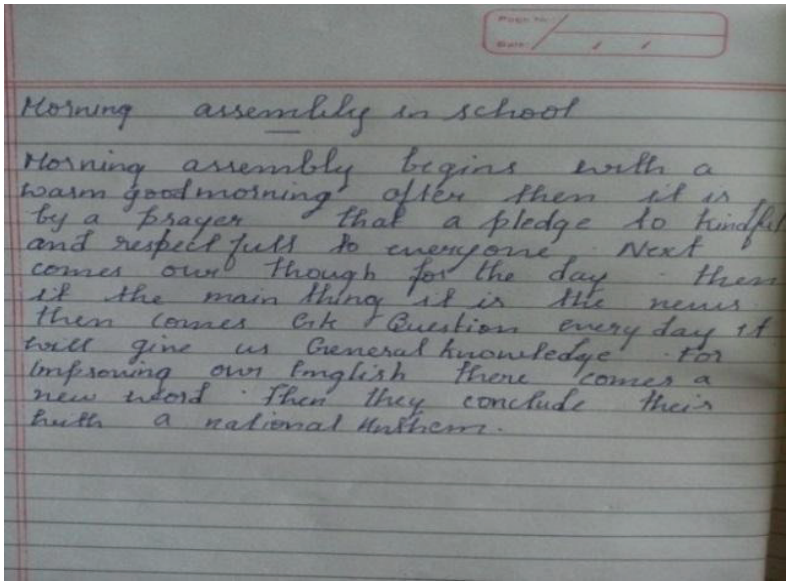
Results and discussion

Over this course of case study research, it was observed that their fine motor control in drawing and handwriting was improved. This was visible through the pictures as well as their handwriting performance. The degree of handwriting performance of each

student on their written expression was uniquely different. The results of the case study, along with the findings of both the participants are given below:

Participant-1: Throughout the study, we have focused on handwriting performance and fine motor skill development. During the first week of training, it was observed that participant-1 had expressed a lack of interest in the training process. But after one week of training, the participant has gained confidence in handwriting and the overall performance of the participant was improved by eight weeks of training. This was visible through their handwriting performance and pictures. We have assessed the handwriting performance based on five attributes, such as letter formation, placement, spacing of letters, neatness, and letter sizing. The initial performance of the child was an average of 2.42 for these five attributes. In the second week, the participant scored 3.39, while in the third week scored 4.24 and in the last week, the participant scored 4.6. The increase of score from the first week to the last week was 2.18 points on the 5-point 'Likert' scale. This result shows that iPad-based training for fine motor skill development was effective for improving the handwriting performance of participant-1. The handwriting sample after 8 weeks of training is given in Figure 4.

Figure-4: Post-test sample from participant-1

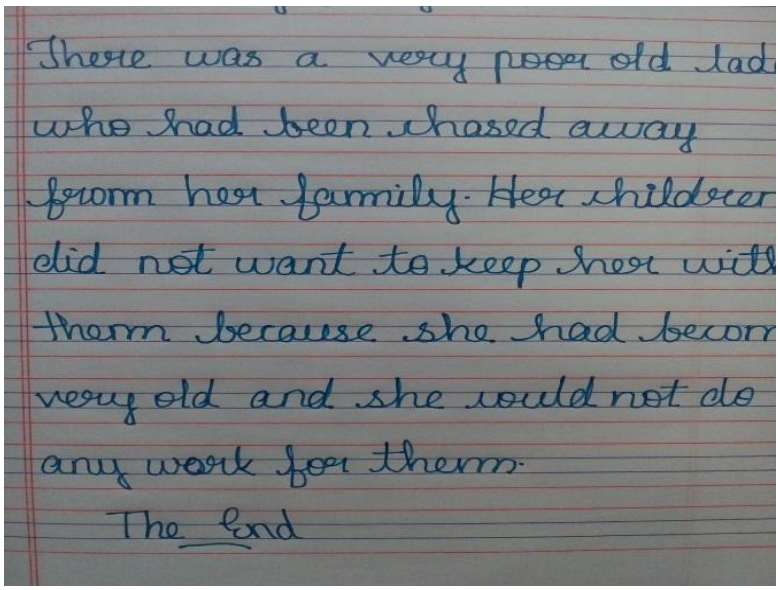

Morning assembly in school

Morning assembly begins with a warm good morning after then it is by a prayer that a pledge to kindful and respect full to everyone. Next comes our thought for the day. then it the main thing it is the news then comes Gk Question every day it will give us General knowledge for improving our English there comes a new word. then they conclude their with a national Anthem.

Participant-2: In this case, the participant had started school years with nominal writing skills, but after third grade, the handwriting skills became sluggish and meagre. Hence, the participant had displayed a lot of hindrance with respect to handwriting development. Also, the pressure applied to the tripod by the participant varied from pencil to pen. This would make a discontinuity in the fluid movement of handwriting. Hence, the experimenter suggested to this participant to maintain a uniform tripod grip. During the fine motor activities on the iPad, we were trying to strengthen the participant's hand muscles to control the tripod and improve the letter formation. After the pre-test, we evaluated the initial performance on

handwriting and got an average score of 2.46 for the 5 handwriting parameters as mentioned in the rubrics in Table 1. The participant has scored an average score of 2.96 in the second week, during the third week the participant has scored an average score of 3.56 and in the last week, the participant has scored 4.32. The progress of this participant from the beginning to the last week was 1.86 points on the 5-point Likert scale. Hence, we can say that the fine motor activities on a touch device were effective for participant-2 also. The sample of improved handwriting is shown in Figure 5.

Figure-5: Post-test sample from participant-2



After the training program, the experimenter introduced some fine motor activities using crayons and colour pencils to observe the influence of touch-based training in drawing and colouring. The pictures drawn (see Figure 6) by them showed visible improvement in their fine motor skills.

Figure-6: Participants' fine motor activities on paper using crayons and colour pencils

In addition to these evaluations, we have conducted a feedback session for the parents to give their valuable feedback/ suggestions on the training process. They mentioned that the technology-based training enabled a better tactile experience for the children, and they were more attentive and motivated during this training than a conventional training method. They Stated that the Dexteria application did not provide any feedback when the participant's haptic movement went wrong. Moreover, the 'Pinch it' activity was tougher for the children, especially at higher levels of the activity where the number of the crabs and the speed of the crabs were high.

Legible handwriting is one of the most important tools for students in their academic excellence (Feder, K. P., & Majnemer, A., 2007). The results of this study indicate that fine motor control has an impact on handwriting performance and drawing skills. Personalized writing style becomes the product of many factors, such as model system, artistic ability, muscular control, nature of employment, frequency of writing and exposures to the writing of others, and it is developed throughout the childhood to adolescent years (Desai, B., & Kalyan, J. L., 2013). In the context of the digital age, computer mediated communication (CMC) can have a positive effect on students and interpersonal interaction. Therefore, today's teachers prefer the implementation of these technologies into their classrooms (Everett, D. R., & Ahern, T. C., 1994). Digital writing supports the students to promote their critical thinking and enrich learning across different writing experiences. Hence, technology is an effective vehicle to help all pupils to develop their skills individually (Chicu, S. et al., 2014).

These case studies were conducted as part of ongoing research work to develop an educational game for children with handwriting difficulties. The major drawback associated with the Dexteria application is that it does not provide any visual or oral feedback when the participant's haptic movement goes in a wrong manner. Moreover, this app is proprietary, hence may not be affordable to children from lower socio-economic backgrounds. But our idea is to develop an android app that would be simple and affordable. It may be complementary to the traditional teaching-learning system used for students with learning difficulties. This case study has given an idea about the pros and cons of the existing tools, which may help us to design a better technology-based tool for handwriting. India's educational vision is to provide basic education for every child through mainstream schools. Sooner these schools will be fully equipped with active learning environments to support the students with learning disorders also. In this context, we plan to introduce some technology-based tools for students with writing disorders to support their academic achievements. They also need individual attention during their learning process, which can be achieved through personalization of the proposed software.

Conclusion and future work

Handwriting is one of the complex tasks in school years, so it is very important to the students who have writing difficulties. This study examined the impact of training on the Dexteria app in handwriting performance. It was obvious that there was an improvement in the handwriting performance of the participants after the training. So, we can conclude that the fine motor development activities using Dexteria have an impact on handwriting performance and drawing skills.

Motivated from the case study results, we are planning to develop simple software to help students having handwriting difficulties. We have studied

the prerequisites for new software and the use of touch-technologies can play an important role in setting an active learning environment for students with handwriting issues. To collect further requirements for the software, we have visited various special schools in Kerala and interacted with the teachers, therapists, and students with dysgraphia. We hope that the use of touch-technology based training interfaces can play an important role in setting an active learning environment for students with writing difficulties.

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Research Paper

Perceived Parental Involvement in Digital Learning of Higher Secondary Adolescent Students in Kerala

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Abstract

Many nations executed emergency strategies, such as lockdown and temporary school closings due to the new-fangled situation of COVID-19. It has pointedly affected families as of the involvement essential in backing children's online learning at home. The current inquiry aims to examine adolescents' participation and their home-based parental involvement along their online learning provided by 'KITE VICTERS' Educational channel under the General Education Department, Government of Kerala throughout the lockdown and school closure period in 2020- 2021 academic year. The online survey, using closed-ended questionnaire, was administered. Variables included parent's and their children's socio-demographic characteristics; students' participation in online learning through 'First bell'; and their perceived parental involvement. Data were collected from a sample of adolescent children from higher secondary adolescent students, and statistical data analysis was performed using SPSS. The researcher used univariate, bivariate and multivariate analysis to investigate the association between parents' involvement in students' online learning. Findings exposed that, according to the adolescent students', their parents reinforced them throughout the pandemic mainly through the monitoring of participation in online classes and task realization. However, several socio-demographic variables appear to have no significant relation to the participation of students in online/ digital learning. Implications for policies, schools, families are discussed to promote children's online learning and academic accomplishments.

Keywords: Digital learning, adolescents' participation, parental involvement, higher secondary adolescent students, KITE Victers

Introduction

The family that functions in a knowledge society influences the adolescent child and plays an important role in the process of development. The influence of the family is supplementary in this twenty-first century, distinguished as a digital century. Digital technologies have become increasingly integrated into educational institutions, serving not only as means to facilitate learning, but also as platforms that link home and school.

Parents' preferences and beliefs towards technology have a major role in adolescents' use of technology as they directly affect the quality and the quantity of digital media available to them, especially at home. It is, therefore, crucial to understand how parents perceive the changes imposed by online education upon their children's development, their diverse beliefs, and practices. Digital learning/online education is a type of learning that is reinforced by digital technology or by

instructional exercise that makes actual usage of technology. Masrom (2007) explains e-learning/ online education as the learning enabled and reinforced through the employment of Information and Communications Technology (ICT) which can be used in different learning situations to progress learning routine (AL-Adwan & Smedley, 2012).

The online education tossed owing to the COVID-19 epidemic has enhanced the "digitization" procedure in teaching-learning. Going digital is not a modest process; it consumes multifaceted ingredients, such as perseverance, a computer-generated administration structure, willingness to pact with on-line teaching-learning tools, digital eloquence, and handling the moods of fear and societal loneliness (Angoletto & Queiroz, 2020). It is, consequently, essential to distinguish that distance education through online education includes numerous problems and restraints rather than discerning that it is "simply home-based education". Conferring to Mulenga and Marbán (2020), COVID-19 has amused an arbitrating role in helping people use digital strategies, online capitals, societal media technologies, and e-learning actions more efficiently. Ribeiro et al. (2021) had their conclusions giving eminence to the necessity for a noteworthy outlay of spell as of parentages, predominantly of school adolescents, producing difficulty to stick effort or telework with scholastic actions, in demand to encourage teenagers' education and accomplishment. Difficulties recognized as far as the adolescents and parents were concerned included a dearth of contact to technologies and the internet, alternative approaches for academic activities provisions, such as supplementary responsibilities and disproportionate assignments, and inadequate occasions for added in-depth clarifications from educators once essential (Wajdi et al., 2020). The investigation by Çevik, M., and Bakioğlu, B (2021) intended to assess whether the fear of constricting COVID-19 (CoVFC) had a controlling outcome on the forecast of pre-service educators' academic motivations through their computer self-efficacy observations (CSE). The upsurge was realized to consume a negative controlling consequence on the forecast of academic motivations with the computer self-efficacy observations of pre-service teachers. Research led by Griffith and Arnold (2019) by thirty-six families in the US propose that parents perform significant part in supporting the child's perspective progress when engaging online apps with their kids. As observed by further research, the non-technical proficiency and working out required to effectively steer the gadgets may also impact the child parent relationships as the emphasis swings away as of learning how the usage of technology is to utilize the technology to study (ViDunn, J et al., 2018). Kour, Sunmeet (2017) conducted a study in 'Exploring adolescent students' attitude towards the effectiveness of e-learning in their academic life'. The outcome pointed out that the adolescents have a favourable attitude towards e-learning and no significant differences among male and female students.

The public education system in Kerala has been changing slowly to include digital education in its daily conventional classroom practices for the last few years. But as the Covid 19 pandemic has changed the system very quickly and rapidly, many of the parents and adolescents were taken swiftly into a new situation of learning experiences at home. The schools were not functioning for the last few months; there were no regular classes and face to face interactions between the teachers and peers. At this juncture, the government has begun virtual classes for the school children coming

under the department of general education through the 'KITE VICTERS' channel. The programme named 'First bell classes' was transmitted for the higher secondary adolescent students in different subjects. Online education, consequently, gives rise to advanced stages of stress for adolescent school children and parents (Carvalho et al., 2020).

This study investigates the parental involvement in the participation of students in First Bell Classes, an alternative digital learning system, during the Covid-19 situation. Through this programme Govt. of Kerala provides digital classes from pre-primary up to the higher secondary students through, Television, YouTube channels and other private channels. The parents had to change their role to be their child's 'educator' as the adolescent students needed their support. Some students were using the devices or gadgets of parents to watch the first bell classes. While most of the higher secondary students had their gadgets (mobile phones, tablets, iPod, etc.). It is in this scenario that the study investigated parental involvement along with the adolescent student's participation in 'First bell' classes during the academic year 2020-2021.

In this study, the parents were identified as those who are biological fathers and mothers and, in their absence, the ones who took up the responsibilities of adolescent child-rearing. Parental involvement was defined as the parental efforts to plan, engage in, support, monitor and/or assess the learning experiences of their children at home predominantly using technological devices and media, increasing technology literacy; enabling easy and quick access to information sources; enhancing learner autonomy and academic achievement. Symbolic interactionist theory establishing the base of this work reflects micro-level societal relations to make us realize how persons in a family particularly the parents socialize and mature individualities besides the way of communication in their normal existence.

Research question

What is the relationship between the participation of parents and their adolescent child's participation in digital online education in Kerala during the Covid-19 period?

Objectives of the study

1. To identify the extent of participation of mothers in the digital learning process of Higher Secondary School adolescents in Kerala.
2. To identify the extent of participation of fathers in digital learning of Higher Secondary School adolescents in Kerala.
3. To find out the participation of adolescent students in the digital learning process.
4. To identify the relationship between socio-demographic variables and adolescent student participation towards digital learning.
5. To identify the relationship between the participation levels of parents in the digital learning process of school adolescents and the adolescent students 'participation level.

Method of the study

As the inquiry was about the involvement of parents and the participation of students in digital learning, the investigation was designed as a quantitative study. The population selected was the second year higher secondary school adolescents of Kerala during the academic year of 2020-2021. A stratified random sampling technique was used. A total of 321 higher

secondary school adolescents from the identified four districts of Kerala have been selected to be included in the sample. Two districts each from south and north of the State were identified. The districts were Kasaragod, the northernmost district of the State, Malappuram, the district which is the one which has the largest number of higher secondary adolescent students, lying towards the central part of Kerala, Ernakulam, a metropolitan district from central Kerala and Kollam which is one among the southernmost part of Kerala. A rating scale consisting of 26 Statements for the parents and five Statements for the adolescent students were used. These Statements were piloted among a small group (7 no.) of adolescent school students as a trial and modifications were made appropriately. Then, the tool was administered online using a Google Form, the data collected were scrutinized and classified and statistical data analysis was performed using SPSS Statistics.

Analysis and Interpretation of Data

The results based on a statistical analysis of the data collected for the study are presented in tables and figures, following the sequence of the specific research problem regarding student participation in digital education.

Profile of the Respondents

Table-1: Distribution of Sample Taken for the Study by District

District	Number Of Respondents	Percent
Ernakulam	105	32.71
Kasaragod	42	13.08
Kollam	63	19.63
Malappuram	111	34.58
Total	**321**	**100.00**

The data were collected by online mode from the districts of Kasaragod and Malappuram as the representation from the North region while Kollam and Ernakulum represented the South region of Kerala. Among the sample, 32.71 percent of respondents belong to Ernakulam district and 34.58 percent are from Malappuram district. The respondents from Kollam and Kasaragod districts consisted of 19.63 percent and 13.08 percent respectively.

Distribution of Sample by Demographic Characteristics

The unit of study is the higher secondary school going student. According to the age distribution, most of the respondents of the sample were of the age of eighteen (204). Among the sample, 54 percent of respondents were males and 46 percent were females.

Distribution of Sample by Subject under Study

Among the sample, 53 percent of students were from the science stream. Those from the Humanities and Commerce stream were 32.4 percent and 14.33 percent respectively.

Distribution of Samples by Place of Residence and Socio-Economic Status

Among the sample 63 percent respondents were from rural areas and the remaining 37 percent from

urban areas. The socio-economic status described was based on their category of ration cards used for purchasing from the public distribution system. As per the ration cards, 67 percent of respondents belong to Above Poverty Line (APL) and 33 percent were of the Below Poverty Line (BPL).

Student's participation in Digital Classes

The different types of gadgets used by the students

Among the sample majority of the students (80 percent) were depending on mobile/Smartphones for attending digital classes. Twelve percent of the sample students attended the classes telecasted through television and two percent used computers for attending the online classes. Six percent of the students were occasionally using all the above-mentioned gadgets for participating in digital learning.

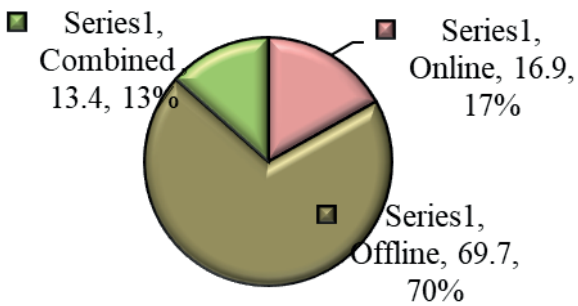
The Ownership of gadgets used by the students

Among the sample 47 percent of the students were using their parent's gadget for attending digital classes while 41 percent of students were having their own gadgets, whereas eight percent of the respondents were using their sibling's gadgets.

Student's preference about attending mode of learning

Among the sample, 70 percent of the adolescent students preferred offline classes while 17 percent of them were interested in online classes. There was 13 percent of students who preferred the combination of online and offline classes.

Figure-1: Students Preferred Mode of learning



Students Participation in Online/ Digital Classes

Various indicators used for measuring the student's participation level in online/digital classes are described in table 2. There were 5 indicators with five categories of response, such as Never, Sometimes, Often, Almost and Always.

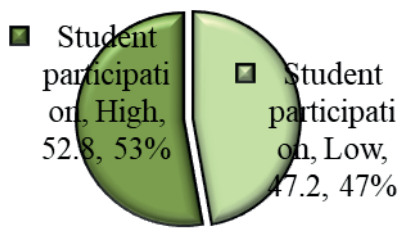
Table-2: Various Indicators Used for Measuring the Students Participation Level in Online/Digital Classes

Indicators	Response (%)				
	Never	Sometimes	Often	Almost	Always
I am interested to be in digital/online classes	25.9	22.2	12.5	18.8	20.6
I can comprehend the content discussed in online classes without further help	25.3	21.8	18.8	19.1	15.0
I have full-time participation in the digital/online classes	15.6	20.0	16.6	24.1	23.7
I regularly participate in the digital /online classes related to my subject aired by KITE VICTERS Kerala First Bell	22.5	16.8	19.1	19.7	21.9
I was able to properly finish the homework and extended works given in the first bell classes	23.1	16.3	18.4	15.6	26.6

Among the sample, 26 percent of respondents were never interested in being in the digital/ online classes, while 20 percent were always interested. Nineteen percent of adolescent students could almost, and 15 percent could always comprehend the content discussed in online classes without further help, but 25 percent of the respondents were never able to comprehend without further help. Around 48 percent of respondents reported that they had full-time participation in the digital classes. Twenty-two percent of the respondents reported to have regularly participated in online classes related to their subject aired by KITE VICTERS, while 22 percent never participated in digital classes. Twenty-three percent of respondents Stated that they were not able to properly finish the homework and extended works given. Only 26 Percent of the respondents disclosed that they were able to properly finish the homework and extended works given during the first bell classes

Level of participation of online/ digital classes among the students

Figure-2: Students Participation Level in Digital/ Online Classes



From among the sample, 47 percent of students were identified as having low and 53 percent of high-level participation in digital/ online class.

Parents Participation towards Online/Digital Classes

Father's and mother's participation in digital classes were measured separately by using 13 indicators. These indicators were the experiences of the respondents in relation to their parents' involvement in digital classes.

Mothers' participation towards online classes of their adolescents

Among the sample seven percent of the respondents do not have a friendly talk with their mother while 53 percent of them had. Twenty percent of respondents reported that their mother never helps them in the activities of digital learning; while 21 percent of respondents pointed out that their mother always helps them. Ten percent respondents of the sample said that their mother never asks about their daily online classes. 12 percent of respondents' mothers never help them to do their homework. In this sample around 55 percent of mothers always praise their child as they do something satisfactory, while 9 percent do not care about this.

Table-3: Various Indicators Used for measuring the mother's participation towards Online/Digital Classes

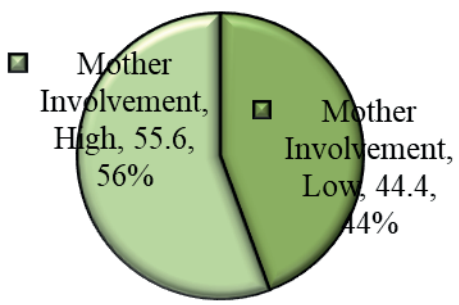
Indicator	Response (%)				
	Never	Sometimes	Often	Almost	Always
I have friendly talk with my mother	7.5	10.6	9.7	19.4	52.8
My Mother helps me with my activities in the digital learning	20.3	30.3	11.9	16.6	20.9
My Mother asks about my daily digital/online class	10.3	11.9	12.8	15.9	49.1
My Mother doesn't help me with my homework	50.6	23.8	5.6	8.1	11.9
My Mother praises me as I do something satisfactory	9.4	11.6	7.8	16.6	54.7
My Mother talks to me about my friends	10.3	12.8	15.6	20.9	40.3
My Mother is often busy that she forgets what I am doing online	52.5	23.1	10.0	6.9	7.5
Mother provide information on how to assist and improve skills on digital/online classes	19.4	20.6	15.3	18.8	25.9
Mother gives me the responsibility for discussing important things I learn	14.7	15.6	11.3	17.8	40.6

Mother know how to support, encourage, and help me at home in the digital learning	12.8	11.3	8.1	20.9	46.9
Mother know that my study needs are personal and different for another individual child	10.9	8.8	11.3	19.7	49.4
Mother helps maintain acceptable noise levels, break times, and lighting during my digital / online classes	10.6	5.9	10.9	14.1	58.4
Mother discuss with my teacher about how they can support and encourage me for my achievement	15.3	17.8	16.3	17.2	33.4

In our society where online media is so popular, parents need to be aware of their children's online and offline friends. Around 40 percent respondents in the sample reported that their mother always talks about their friends, but 10 percent of mothers neglect this. Seven percent of the respondents pointed out that their mother fails to recall what the respondents are doing online because of her busy work. Twenty-six percent of the respondent's mother always helps and information on how to improve skills in online classes, while 19 percent of the respondent's mother never gives attention to it. Among the sample, 41 percent of mothers always give their child the responsibility for discussing important things that they learn. Around 13 percent of respondents' mothers don't know how to support, encourage, and help their children at home in digital learning. Also, around 49 percent of mothers know that their children's study needs are personal and different from others. 58 percent of respondents' mothers help to maintain acceptable noise levels, break times and lighting during the online classes at home. Around 33 percent of respondent's mothers always discuss with teachers how they can support and encourage their children.

Combining the 13 indicators mentioned in table 3 produces the participation level of mothers in their children's digital classes, which is described in figure 3. Around 44 percent of respondents' mothers have identified low level participation towards their child's digital learning and 56 percent as high-level participation.

Figure-3: Participation level of Mother's in Digital Learning of the Child



Father's Participation towards Online Classes of their child

Various indicators used for measuring fathers' participation in their child's online learning are presented in table 4.

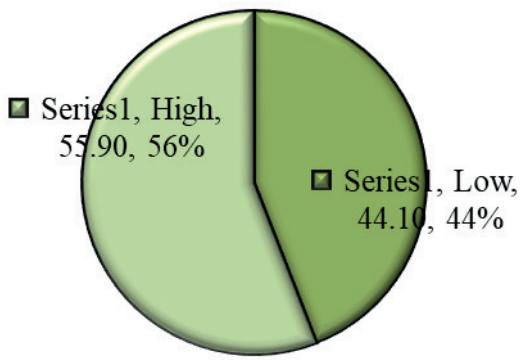
Table-4: Various Indicators for measuring the father's participation in Online Classes

Indicator	Response (%)				
	Never	Sometime	Often	Almost	Always
I have friendly talk with my father	13.1	17.8	13.4	14.1	41.6
My Father helps me with my activities in the digital learning	25.9	22.8	14.4	13.1	23.8
My Father asks about my daily digital/online class	16.3	20.9	12.8	12.5	37.5
My Father doesn't help me with my homework	49.7	21.3	5.9	10.6	12.5
My Father praises me as I do something satisfactory	14.4	12.5	10.3	16.6	46.3
My Father talks to me about my friends	22.2	18.1	13.8	17.8	28.1
My Father is often busy that he forgets what I am doing online	43.8	22.5	12.2	6.6	15.0
Father provide information on how to assist and improve skills on digital/online classes	20.0	23.1	9.7	15.6	31.6
Father gives me the responsibility for discussing important things I learn	19.7	17.2	12.2	15.0	35.9
Father know how to support, encourage, and help me at home in the digital learning	18.1	15.9	10.6	16.3	39.1
Father know that my study needs are personal and different for another individual child	17.2	12.2	8.4	16.3	45.9
Father helps to maintain acceptable noise levels, break times, and lighting during my digital / online classes	20.0	15.0	11.3	10.6	43.1
Father discuss with my teacher about how they can support and encourage me for my achievement	27.8	19.1	11.6	12.8	28.8

Among the sample 13 percent of respondents don't have a friendly talk with their father while 42 percent do have. Twenty-six percent respondents' fathers never help them with their activities in digital learning. Twelve percent of respondents' fathers never help the children to do their homework. 46 percent of respondents' fathers in samples praised their children as doing something satisfactory. 28 percent respondents' fathers inquired about the friends of the respondents, but 22 percent didn't pay attention to this. Fifteen percent respondent's fathers forget what their children are doing online because of their work pressure. Among the sample 32 percent of respondents' fathers are giving assistance and information to their child on how to improve skills in online classes. Thirty-six percent respondent's fathers give the responsibility to their children for discussing important things that they learn. Eighteen percent of respondents' fathers don't know how to support, encourage, and help their child at home in digital learning. About 46 percent of the respondent's father in the sample knows that the study needs of their children are personal and different from each other. Forty-three percent (43 percent) of the respondent's fathers always help their children by maintaining acceptable noise levels, break times and lighting during the online classes. Among the sample, 29 percent of the respondent's fathers always discuss with their children's class teacher how they can support and encourage them for achievements.

By combining all the indicators presented in table 4, the participation level of fathers towards their adolescent's digital learning is presented in figure 3. Among the sample, 44 percent of respondents' fathers have identified low-level attitudes towards their child's digital learning, whereas 56 percent have high-level attitudes.

Figure-4: Participation levels of Father in the Digital Learning of the Child



Factors Influencing Students Participation in Digital/ Online Classes

There may be a lot of factors influencing the student's participation in digital learning. One of the important factors of student participation in online classes is the participation level of parents in it. The relation between parents' participation in digital learning and students' participation in digital learning is presented in table 10. When the parent's participation level towards digital learning increases, the participation level of students in digital learning also increases and it can be proved scientifically with the significant level of the probability value.

Table-5: Relation between the participation of parents and children in digital learning

Participation level of Parents		Students' participation in digital class		P value
		Low (%)	High (%)	
Father**	Low	64.5	35.5	0.000
	High	33.5	66.5	
Mother**	Low	67.6	32.4	0.000
	High	30.9	69.1	

P value is < 0.05

In the case of fathers', the P value 0.000 is less than 0.05. Hence, there is a significant relationship in the case of the participation level of the father with the student's participation level in the digital classes. This implies that when the participation level of the father becomes low, the participation of students in digital learning also becomes low and when the participation level of the father becomes high, the participation level of the child in digital learning also becomes high.

In the case of mother's, the P-value of 0.000 is less than 0.05. Hence, there is a significant relationship in the case of the participation level of mothers with the student's participation level in the digital classes. This implies that when the participation level of a mother becomes low, the participation level of a child in digital learning also becomes low. When the participation level of mothers becomes high, the participation level of students in digital learning also increases.

The Relation between Socio-economic and Demographic Factors in the Participation of Students in Online Learning

It was found that the students who were studying in the commerce and science stream had higher participation levels in online learning than the students who were studying in Humanities.

Table-6: Relation between Socio-economic and Demographic Factors and Children Participation in online Learning

Socio demographic variables Low		Participation level		P-value
		High		
Age	17	47.2	52.8	0.223
	18	47.1	52.9	
	19	56.5	43.5	
	20	0	100.00	
Gender	Male	46.8	53.2	0.488
	Female	47.6	52.4	

Subject**	Humanities	55.3	44.7	0.006
	Commerce	43.5	56.5	
	Science	35.6	64.4	
Residence	Rural	48.3	51.7	0.351
	Urban	45.4	54.6	
Economic status	APL	48.4	51.6	0.313
	BPL	44.8	55.2	

**P value is < 0.05

The age level of students under study is 17, 18, 19 and 20. The p-value related to age is 0.223, implying that there is no significant relationship with the various age groups. There is not much variation in the participation level in the digital learning process about various age groups. In case of the selection of optional subjects, P-value is 0.006, which is less than 0.05. Hence, there is a significant relationship in the digital learning of various streams of subjects. The students who are studying commerce and science stream have higher participation levels in digital learning when compared with the participation level of humanities. When we consider the gender difference of students on online learning the p-value is 0.0488. This shows that there is no significant difference between male and female participation in online/ digital learning. When we study the place of residence of students the p-value is 0.351. This shows that there is no significant difference in the rural urban level in the participation of students in online learning. As we reflect upon the economic status of students as APL and BPL, the p-value is 0.313, which shows that there is no significant difference in the participation in online learning with regard to the economic status of the students.

Multivariate Analysis on the Factors Influencing the Participation Level on Digital Learning of Students

More specifically the relation between the dependent variable and the independent variables is described in table 7 based on multivariate binary logistic regression analysis. The students who studied in Commerce and Science stream have two times higher chance to participate in digital classes as compared with the students who studied in Humanistic. If the parents' participation level towards digital learning is high their child has a higher chance of effectively participating in online classes as compared with the reference category.

Table-7: Multivariate Analysis on the Factors Influencing the Participation Level

Variables		Sig.	Exp(B)
Stream of Study	Humanities ®		
	Commerce	.013	2.002
	Science	.048	2.066
Mother participation through Digital Class	Low ®		
	High	.000	1.324

Father participation through Digital Class	Low ®		
	High	.010	2.098

®= Reference Category

In the case of a stream of study, the reference category is Humanities. When compared with the Humanities stream, Commerce and Science students have two times higher chances to participate in digital classes.

As for mothers' participation in their child's digital classes, the reference category is 'low'. When the mother's participation level is higher, their children have a higher chance of participation in online classes. In the cases of fathers' participation in digital classes, the reference category is low. Hence, the father's participation level is higher, their child has a higher chance of participation.

Limitations

The researchers identified some limitations in this study. The responses were collected using online self-reports and the respondents were not personally contacted. The time and willingness of the respondents was a major factor; hence the study was not that perfect in the sense of universal representation. But within these limitations three hundred and twenty-one responses were derived to be included in the sample.

Notable findings

Among the sample, 70 percent of the adolescent students preferred offline classes. 25 percent of the respondents were not able to comprehend without further help, while 22 percent reported that they never participated in digital classes aired by KITE VICTERS. Only 26 Percent of the respondents disclosed that they were able to properly finish the homework and extended works given during the first bell classes.

Twenty percent of respondents reported that their mother never helps them in the activities of digital learning, around 40 percent of respondents in the sample reported that their mother always talks about their friends. Twenty-six percent respondents' mothers always aided and information on how to improve skills in online classes. Around 33 percent of respondent's mothers always discuss matters with teachers.

Friendly talk with their father was enjoyed by 42 percent of the respondents, while twenty-six percent respondent's father never helps them with their activities in digital learning. Twenty-eight percent respondent's fathers inquire about their friends. Thirty-two percent of respondents' fathers are giving assistance and information to their children on how to improve skills on online classes. Twenty-nine percent of the respondent's fathers always discuss with their children's class teacher. About 46 percent of the respondent's fathers know that the study needs of their children are personal and different, while 49 percent of mothers know about that.

Discussions and conclusion

Around 56 percent of respondents' mothers have high-level participation and 44 percent were identified as having low level participation towards their children's digital learning. 44 percent of respondents' fathers have identified low level participation in their child's digital learning, whereas 56 percent have high-level of participation. 47 percent of students have identified as of low participation and 53 percent of high level in digital/ online class. It is inferred that only half of the parents, both the

mother and father, participated in the learning process of their adolescent.

There is not much variation in the participation level in the digital learning process concerning various age-groups. No significant difference between males and females regarding the participation in online/digital learning was found. Absence of significant difference in adolescents' students' rural-urban differences and concerning economic status in participation of online learning was identified. When compared with the Humanities stream, Commerce and Science students have two times higher chances to participate in digital classes.

This study aimed at identifying the relationship between the perceived participation of parents and their adolescent participation in digital/ online education. It was recognized from this study that as the mother's participation level is higher; their adolescent child has a higher chance of participation in online classes. Similarly, as in the case of the father, participation level higher, higher becomes the adolescent child's chance of participation in online classes. Thus, from the results, the theory of symbolic interaction is substantiated

Educational implications

The governmental authorities, educators, NGOs, and the community should take initiatives in helping the parents about the awareness of their participation. Activities and scaffolding should be given to the parents about effective parenting of adolescents, digital education, and its training. It is noteworthy that the findings point out that there are no differences in participation of the adolescents in online learning regarding age, gender, rural/urban differences, and APL/ BPL categorization. Parents of the Humanities students should be given more awareness towards the need for proper participation and support to their adolescents to help them effectively utilize their online classes. As of this investigation, it was derived that only around half of the adolescent students in the sample had properly participated in this online learning process, which is an alarming rate. Officials and educators must come up with new strategies towards improving their participation and restructure the online learning situations by also considering the Socio-psycho needs of the adolescents along with their academic accomplishments. The combination of online and offline learning will be the State-of-art and it is going to prevail even after the pandemic situation. It is high time that we, as educators, ponder over it.

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Review Article

Factors Influencing Digital Competence of Pre-Service Teachers: A Systematic Review of Literature

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Abstract

Technology has become an integrated part of today's education system. It has become the need of present times that the teachers must easily use, create, and adapt to the technological environment. This literature review aimed to identify factors that influence the digital competence of pre-service teachers. The study has been conducted by reviewing empirical findings, which are focused on the utilisation of digital tools in teaching pre-service teachers. The databases of SpringerLink, JSTOR, Education Resource Information Center (ERIC), Google scholar were accessed. Results of analyses revealed that attitude & self-efficacy, required skills & knowledge, practical experiences of using technology and access to technology are the factors that majorly influence pre-service teachers' digital competence. Based on the reviews, the suggestions are provided for education policymakers, stakeholders and Teacher Education Institutes (TEIs) to further improve teacher education programmes and focus on technology-integrated teaching practice to help pre-service teachers in becoming comfortable with digital equipment.

Keywords: Digital Competence, ICT, Pre-service teachers, Technology, Teacher Education

Introduction

Technology integration into the education system has now become a key focus for educators. The use of technology has become a necessity to survive in our day-to-day life. In all the leading sectors such as health, education, real eState, automobiles, banking, etc. technology is playing a major role in transforming their functioning and becoming an essential component in all the sectors. In the education sector, the use of digital equipment and newly emergent technology is rapidly increasing. In the times of pandemic, the discontinuation of face-to-face lectures and the increased dependence on online teaching brought revolutionized changes in the new educational setup (Hew, 2020). This sudden transformation raised many questions on the preparation, skills and beliefs of teachers on accepting and integrating technology in their curriculum delivery (Chang, 2020). In such times, when ICT is changing the face of the education sector then the teachers must be prepared to fulfil the needs of technology-integrated learning opportunities in classrooms. Many world level organisations recognised the need for teachers to be highly competent in the field of Information and Communication Technology. These organisations predicted that soon technology will dominate its role in the field of education, thus they prepared essential competency frameworks in

the field of educational technology to prepare our teachers with skills of incorporating technology effectively into the classrooms.

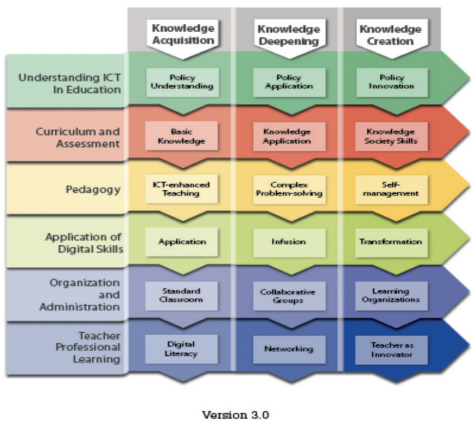
UNESCO ICT-CFT Framework

In 2008, UNESCO had developed the first version of its Information and Communication Tools Competency Framework for Teachers (ICT-CFT), which highlighted the ICT competencies for pre-service and in-service teachers to be acquired by them across the nations to advance the teaching-learning process. Till 2018, UNESCO had publicized a total of three versions of ICT-CFT Framework. In previous versions of the ICT-CFT three levels of teacher development namely, Technology Literacy, Knowledge Deepening and Knowledge Creation and six different focus areas of teachers' professional practice, such as Understanding ICT In Education, Curriculum and Assessment, Pedagogy, ICT, Organisation and Administration and Teacher professional Learning were arranged in such order that the teachers not only become skilled in using ICT but also teach and solve the real-time ICT problems encounter by them in the classrooms. In the third version of ICT-CFT among the three different teacher development level, the area 'Technology Literacy' was re-modified to 'Knowledge Acquisition' and the earlier key aspect named 'ICT' was modified to 'Application of Digital Skills'.

In total, 18 ICT competencies were given a place in this framework which is focused on the holistic development of teachers in the field of Information and Communication Technology (ICT). In this framework, as shown in Image1, teachers are required to possess a basic knowledge about policy perspectives involved in ICT in Education, ICT-enhanced pedagogy, knowledge and application of digital skills, classroom management, and digital literacy in the first level. The second level of teacher development focuses on deepening knowledge, where the teachers are required to learn skills of facilitating the learning environment with the use of technology and making it student-centric. Teachers are required to display and connect their ICT skills to fulfil classroom requirements.

The third level of the ICT-CFT framework requires teachers to innovate, create and manage their pedagogies in such a way that they can transform the learning environment for students. The framework seeks teachers to make technology integrated classrooms to set an example and inspire others to achieve the desired outcomes.

Figure-1: UNESCO ICT-CFT Framework



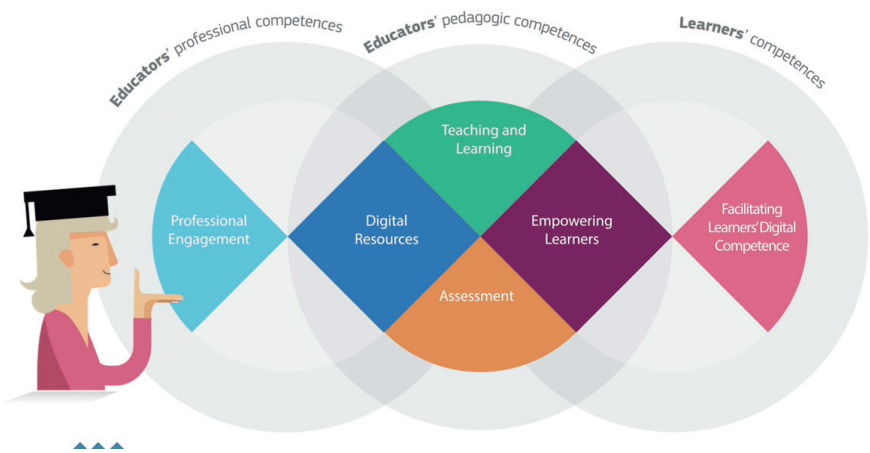
Source: en.unesco.org

The ICT-CFT is aimed towards the crucial role of technologically competent teachers that can help students in becoming creative learners and effective citizens. The teachers nowadays are required to be more efficient in integrating technology into the classroom and provide new pedagogical practices that will transform the education sector. (UNESCO, 2013).

Digital Competence for Education (DIGCompEdu) Framework

The European Union had developed a Digital Competence (DigComp) Framework for EU citizens. According to reports, in 2015, 44.5 percent of the EU population had shown insufficient digital skills and there was also a sufficient increase in the number of cyberbullying cases among the young population of Europe. The Digital Competence framework (DigComp) was aimed at educating and improving the digital skills of the citizens of Europe (Vuorikari. Et.al, 2016). The DigComp framework was divided into five areas: Information and data literacy, communication and collaboration; Digital content Creation: Safety and Problem-solving. In the year 2017, the European Union publicized its education-specific Digital Competence for Education Framework (DigCompEdu). Its main focus is on developing professional, pedagogic and Learner related competencies among teachers. It does not concentrate on core technical skills, but rather developing digital skills to ensure effective technological usage and making a better learning environment.

Figure-2: DIGCompEdu Framework

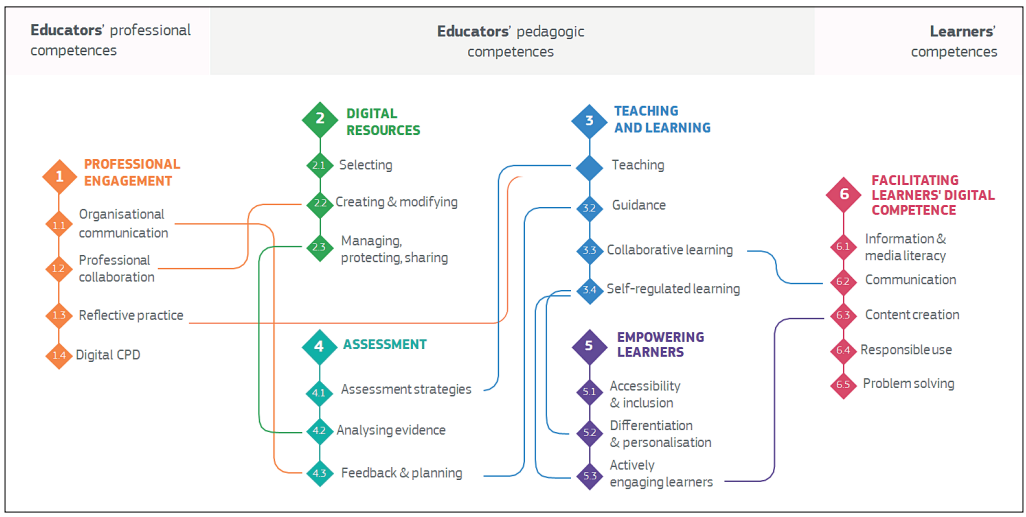


Source: ec.europa.eu

According to Redecker (2017), the DigCompEdu framework consists of 22 teacher-specific competencies which are organised in six areas such as "professional engagement, Digital resources, teaching and learning, assessment, empowering learners and facilitating learner's digital competence". These professional competencies are designed in a way that major professional requirements as identified by the framework i.e., organisational communication, professional collaboration, reflective practice and digital Continuous Professional Development can be attained using digital tools effectively. It also emphasises on achieving pedagogic competencies such as selection, creation, managing, protecting and sharing digital resources;

to innovate assessment strategies using digital resources; to plan the digital technologies enriched lessons and using them for collaborative and self-regulated learning; to ensure the availability of digital resources to address diverse learner needs; to make sure that every learner is actively participating in learning. It gives importance to teachers' role in educating the learners about the reliable ways of finding information on digital networks; to communicate responsibly using digital networks; to create digital content considering ethical ways of using digital information; to avoid risks involved in the digital world and maintaining social and emotional well-being and to convert their technological knowledge while addressing new situations.

Figure-3: Teacher-Specific competencies as per DIGCompEdu Framework



Source: ec.europa.eu

It's a requirement of this time that the training of student teachers should be done in this way so that they can meet the needs of digital natives and facilitate their needs by using effective digital resources. (Mishra and Koehler, 2006). The digital competence in education can help in fostering various innovative ideas among teachers to incorporate digital tools and facilitate learning. The various factors among the pre-service teachers such as lack of experience, attitude, beliefs, lack of accessibility, etc. hinder their digital competence. (An, Y., 2018; Yerdelen-Damar, 2017; Cak, 2017)

Methodology

The logic behind the search of the literature was to find the major factors that influence the digital competence of pre-service teachers. The databases of SpringerLink, JSTOR and Education Resource Information Center (ERIC) were searched. Few limitations, to assure the quality of the research, were decided in advance, which are as follows:

1. It was published in peer-reviewed journals only.
2. It was written in the English Language only.
3. It was available with full- text.
4. It included pre-service teachers only.
5. It was empirical research.

The following terms: 'Digital competence' and 'pre-service teachers' or 'teacher trainees' or 'teacher education' or 'ICT Competence' and a combination of such terms were used to get desired search results. In total, 1036 search results were generated. Initially, the search results were delimited based on title, abstract and keywords. After removing duplicate studies, a total of 90 search results were selected for further analysis. After reviewing full paper analysis, a total of 21 studies given in Table 1 were selected to make the source of the present article.

Table-1: Selected studies on pre-service teachers' digital competency (n=21)

Author	Method	Data Sources
Altun, D. (2019).	Correlational research design	Cross-sectional Survey
An, Y. (2018)	Mixed method	Pre-test Post-test design
Barak, M. (2014)	Mixed Method	Five-point Likert Scale; reflective drawing analysis framework;
Çak, Ü., Universtiy, K. T., & Göko, S. (2017)	Quantitative method	Likert scale
Çebi, A., & Reisoglu, I. (2020)	Cross sectional Survey	Questionnaire
Ciğerci, F. M. (2020)	Explanatory Sequential design: Mixed method	Pre-test post-test design; Interviews
Demirkan, Ö. (2019).	Phenomenological Design	Written form for pre service teachers' views
Dorner, H., & Kumar, S. (2016)	Online collaborative Mentoring Approach	Questionnaire; mentoring intervention
Efe, R. (2011)	Quantitative method	Questionnaire
Erbakan, N., Acceptance, T., Situations, U., Pedagogic, W., Knowledge, C., Variations, D., & View, T. (2015)	Quantitative method	Digital Competence Scale
Goktas, Y., Yildirim, Z., & Yildirim, S. (2008)	Quantitative and Qualitative methods	Questionnaires; Semi-structured interviews
Gordillo, A., López-Pernas, S., & Barra, E. (2019).	Mixed method	Questionnaire; Pre-test post-test design; LORI instrument
Hong, A. H., & Sullivan, F. R. (2013)	Mixed method research design	Survey data; Phenomenological study; Interviews

Ju, Y., Park, S., & Lim, E. (2018)	Quantitative	Five-point Likert Scale
Kimmons, R., Miller, B. G., Amador, J., Desjardins, C. D., & Hall, C. (2015)	Mixed method	Pre-test and post-test survey; Self-assessed technology competence and written reflections
Korucu, A. T., Yücel, A., Gündoğdu, M. M., & Gençtürk, T. (2016)	Quantitative	Digital competence scale
Lin, T., Tsai, C., Chai, C., & Lee, M. (2013)	Quantitative	Survey data
Mccullagh, J. F., & Doherty, A. (2018)	Mixed Method	Questionnaire; Interviews
Sancar-Tokmak, H., Surmeli, H., & Ozgelen, S. (2014)	Case study method	Interviews; observation and open-ended questionnaire
Yerdelen-Damar, S., Boz, Y., & Aydın-Günbatar, S. (2017	Quantitative	Self-efficacy scale
Yiğit, E. Ö. (2020).	Interpretative Phenomenological Analysis	Open-ended questionnaire; content analysis; interviews

Findings

The reviews covered the studies that were focused on the integration of digital technologies in pre-service teacher education programmes. In the reviews, data was collected through quantitative, qualitative and mixed-method research methodologies. The quantitative analysis of studies constructed 38.09 percent of the source of information, whereas the remaining 61.91 percent of data in selected studies were collected from qualitative and mixed-method research design.

After analysing the studies, the main factors identified below:

Reviews

Attitude and Self-Efficacy

TPACK competencies are directly associated with the pre-service teachers' attitude towards technology. The daily usage of social media and playing games on smartphones does not reveal that the teachers' will use these technologies for their professional development. Altun, D. (2019) suggested including practical experience of digital tools in pre-service teacher education programmes to increase awareness regarding the integration of digital tools in teaching. The online professional development courses brought changes in the perception of pre-service towards integrating digital games as an effective learning tool, whereas it was also measured that there has been a positive development in an attitude of pre-service teachers (An, Y., 2018). The confidence in using digital tools plays a big role in adopting technology and making a positive attitude towards technology (Barak, M., 2014). Hong, (2013) used a five-point Likert scale questionnaire to measure the readiness of pre-service teachers for technology integration which predicted

that prior teaching experience and the student teaching experience at different grade levels from elementary level to secondary level impacts on the readiness of pre-service teachers. Sancar, et, al. (2014) found that the pre-service teachers show various misbeliefs regarding their technological skills in their initial teacher education programme. When they face real time scenarios in solving digital problems then they lack sufficient knowledge. Yerdelen-Damar (2017) found that the higher the pre-service teachers' skills and experience of using technology, the higher will be their self-efficacy. Improving TPACK by various workshops and training programmes at teacher education institutes will bring positive effects on the pre-service teachers' self-efficacy. This will also prepare teachers to accept technology as an integral part of the classroom. (Ju, 2018)

Practical experience of using technology

The experience of teachers with technology plays an important role in determining their competence in using technology in the classroom (Cak, 2017). The online professional development courses that provide hands-on experiences to pre-service teachers were found to be more effective in making them comfortable with the use of technology (An, Y., 2018). In another study, a positive relation was found between the pre-service teachers' previous experience of using technology and their familiarity regarding technological tools with their digital competence level (Efe, 2011). Prospective teachers are more inclined to get practical knowledge of ICT resources rather than just theoretical knowledge. The more they get exposure to the practical experiences, the more their confidence will increase (Goktas, 2008).

Dorner, (2016) conducted a study on implementing a Mentoring Innovation Model by combining the knowledge and expertise of technology mentors with the teaching practices of pre-service teachers. The online interaction and collaboration with mentors helped in understanding the practical ways of integrating technology in the classrooms and brought more confidence in pre-service teachers. As of Dorner, when pre-service teachers were allowed to collaborate with in-service teachers to use technology in their lesson plans they had shown high confidence in comfortably using technologies for classroom teaching. Findings from a study in which the experiences of pre-service teachers were recorded while using a web-based video analysis tool Video Ant Stated that the pre-service teachers enjoy using such tools and it also helps in enhancing their confidence in teaching while using technology (Mccullagh, 2018).

Required Skills & Knowledge

The pre-service teachers show very less digital competence in knowledge of identifying digital tools and skills required in developing digital content than in other areas of digital competence viz. information and data literacy, communication and collaboration and safety (Çebi, A., & Reisoglu, I., 2020). Searching and using various media tools while developing digital content with the help of various online resources helps in increasing technological skills (Ciğerci, F. M., 2020). The efficiency in using mobile devices in daily life impacts the digital competence level of pre-service teachers (Erbakan, 2015). The use of online open course platforms in training student teachers to create digital content and to make them aware of safe and responsible use of technology helps in enhancing their digital competence (Gordillo, 2019).

Pre-service teachers are required to be taught to integrate technology

in almost all the semesters of the teacher education programme and the experiences of technology experts, in-service teachers and teacher educators should be incorporated in these programmes. By doing this, they would get proper exposure to reflect on digital pedagogies (Dorner, 2016). Findings from a study revealed that the Instructional Technology and Material Development (ITMD) course in Turkey helps prepare pre-service teachers for their professional life and gives freedom to pre-service teachers to use their creative abilities in designing required course materials (Goktas, 2008). Yigit (2020) had conducted a phenomenological analysis and asked the pre-service teachers to create their digital stories by using appropriate software. After analysing survey and interview data, it was suggested that proper training must be given to pre-service teachers to get an understanding of technology and creative ways of using it in the classroom.

Access to technology

Majority of the pre-service teachers believe that the use of digital material in the classroom can be beneficial in grabbing the attention of learners and increasing their motivation in the classroom, but access to high-speed internet and user-friendly technological equipment are required for the smooth functioning of teaching-learning activities (Demirkan, Ö. 2019). The access to mobile devices and their efficient usage impacts the digital competence level of teacher candidates (Erbakan, 2015). The constant availability of internet and ICT infrastructure in teacher education institutions helps teacher candidates to collaborate and communicate with their peers and become more digitally competent. (Korucu, 2016). Yerdelen-Damar (2017) Stated that access to technology has a direct relationship with the technological competency of pre-service teachers. The open access to user-friendly software and technological support enhances their interest in developing technological competencies.

Lee (2013) found in their study that the teacher education institutes must provide access to technology and training to their students to give better exposure to technology. Kimmons (2015) also suggested in a study where they applied pre-test and post-test surveys to self-assess the technological competency of pre-service teachers. The results indicated that the teacher education programmes need to involve meaningful technological integration programmes to assist students in careful selection and critical evaluation of technology in the classroom.

Discussion and Suggestions

This review highlights the major issues which are hindering the growth of pre-service teachers in being digitally competent. The studies had shown that the attitude and belief of pre-service teachers can be changed regarding their future intentions of integrating technology by giving proper practice and training. Most of the studies revealed that there exists a gap between theory and practical experience among pre-service teachers. The knowledge, skills and right approach of using technology can majorly affect the professional growth of these teachers (Çebi, A. & Reisoglu, I., 2020; An, Y., 2018). Following recommendations on the major aspects of the DIGCompEdu framework are discussed and suggested for pre-service teachers' professional digital competence development in the digital learning environment.

For professional growth

For professional growth, the pre-service teachers need to critically analyse the use of various digital tools and

techniques in educational contexts. They need to change their beliefs and look for positive attitudes for using technology in the classroom effectively. The pre-service teachers need to spend more time in a digital environment to ensure their professional and academic growth. (Altun, D., 2019; Cebi, 2020). Researches have revealed that the professional development programmes significantly affect the attitudes and perception of pre-service teachers. The training programmes can prove to be beneficial for the professional growth and development of pre-service teachers (An, 2018). Korucu (2016) suggested that teacher education institutes need to take more effective steps to assist pre-service teachers in developing skills related to technology integration. Future researchers can also concentrate on the effects of these professional training at each aspect, such as organisational communication, professional collaboration, reflective practices, and digital continuous development of professional engagement to make pre-service teachers ready for the professional world.

Being aware and knowledgeable of digital resources

It has been identified in online surveys and interviews that the appropriate knowledge of digital resources; selection of digital tools and creation of technology-integrated instruction helps the pre-service teachers to prepare for integrating technology in the classroom (Hong, 2013). Kimmons (2015) suggested that the technology should be selected carefully in teacher education programmes. To enhance the performance of student teachers should be an important aspect of these programmes so that the teachers can do a critical evaluation and reflect on the innovative practices of such tools. Cebi (2020) Stated that the knowledge and skills in selecting, developing, managing and sharing such resources should be provided in the pre-service teacher training programmes which can help student teachers to be more confident in using upcoming digital technologies meaningfully. There is a requirement of giving practical experience of ICT tools to student teachers in their teacher education programmes to make them digitally competent (Goktas, 2008).

For effective guidance and assessment

Studies indicate that the skill and knowledge of various digital tools can help student teachers to enhance the effectiveness of teaching and will help in experimenting with the various new ways of providing support to the learners and in assessing their performance (Yerdelen-Damar, 2017). The planning and designing syllabus according to the needs of learners will benefit pre-service teachers in critically analysing and digitally verifying the activities of learners (Kimmons, 2015). The gaps in the studies show that the pre-service teachers lack the required competence of using digital equipment for providing required support and guidance to their learners. (Cebi, 2020). Some studies have proven that technological challenges indirectly affect the intention of using such technologies in future classrooms. (Ju, 2018)

For facilitating learners' Digital competence

Kimmons (2015) suggested that it is important for teachers to accept that they are going to be the facilitators of digital natives. They need to have good command over accessing, creating and effectively utilising such digital resources to get their learners acquainted with a better understanding for its meaningful exploitation. Demirkan (2019) also insisted on developing a positive attitude towards integrating technology in the

classroom and developing higher self-efficacy towards technology that can help pre-service teachers in using digital tools in communicating, collaborating and actively engaging learners into the classroom. The studies have suggested that the teacher education institutions can utilise various effective ways such as providing practical experience; mentor guidance; interaction with technology experts and updating knowledge of student teachers at all the levels of teacher training programmes to help these student teachers to have a positive attitude and in future they can facilitate their learners to help to make a digitally competent society. (Barak, 2014; Dorner, 2016; Yigit,2020).

Conclusion

In the present study, the reviews that are included revealed that there is a dire need of exposing the pre-service teachers to the digital world. The UNESCO ICT-CFT framework and DIGCompEdu Framework show how teachers can be envisioned as the makers of digital societies. In developing nations, such frameworks can work as an example to transform the face of the digital world. The governments can collaborate with private industries to provide latest digital resources to teacher education institutions to improve their conditions. Further, more specialized research can be promoted in the field of teacher education with special focus to implementation of such digital frameworks.

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General Article

Digital Transformation of Education: An Overview

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Abstract

Digital transformation of education is the need of the hour especially during and after this unusual situation of pandemic Covid-19, where face to face education has become infeasible. The vacuum created due to the inaccessibility of our traditional system of education has compelled all of us to look for an alternative to the traditional system of education and the virtual world of education in one such kind alternative. Such virtualization of education is the result of the digital transformation of education that had been taking place for decades ago not only in our country but all over the world. Our educational world has a long history of using technology in almost all spheres of education. So, it becomes very important for all of us to explore our history to know how such a digital transformation of education was started and what was the role of government in this paradigm shift? What interventions, policies and programs of government have been proved as a turning point? All such questions can be answered only through a thorough study of our history. A historical overview of the education system will help us to understand the role of government policies in the implementation of ICT in the education system to identify the trends and development in the digitalization of education. In this paper, the focus of the researcher is to highlight all those technologies and initiatives that have been taken for the digitalization of education from time to time by different countries. Keeping in mind such objectives of the study, the researcher has selected 7 countries: Italy, Korea, Finland, Morocco, Portuguese, New Zealand, and India and threw light on educational initiatives taken by these countries for the digital transformation of education.

Keywords: Digital transformation, ICT initiatives, technology, virtualization, paradigm shift, etc.

Introduction

Education being a fundamental right and fundamental need of survival is a matter of both national and international importance, as well as success of any country, is also directly related to their skilled and competent society. So, it becomes very important for a country to create such a strong system of education that can build a strong foundation for its citizens. For which, it is mandatory to upgrade our system of education with the time to meet ever-changing demands of society. Digital transformation of education is one of such changes that had been taking place for decades, though it has not reached its full-fledged stage, still playing a very important role in meeting the challenges of increasing population, globalization of education, to address the individualized needs of learners and recently fulfilling the universal obligation of social distancing.

Digital Transformation of Education

Digital transformation of education means the use of technology in the field of education. The introduction of technology has facilitated a very smooth and gradual transition of the traditional system of education into a digital one. Earlier, it started as a supplement to an education, now technology has become an integral part of it. Although, it was not an easy journey from the traditional to a digital system of education. It had taken decades to establish a proper system, to train personnel and motivate users to accept the change. For which various agencies including government, semi-government & private agencies had taken multiple initiatives to provide connectivity (at personal, national and international level), to generate digital educational content, to arrange training and orientation programs for users, to develop low-cost equipment required for digital education and organized various other promotional activities to encourage digital education.

Here, we will discuss the education system of different countries in terms of their digitalization. When these countries have started adopting ICT in their education system and what type of measures and policies, they have taken to ensure the gradual digitalization of their system of education.

Why there is a need for Digital Transformation of Education

"Necessity is the mother of invention" is a famous proverb. When there is a need or problem, there is a solution to that problem. Likewise, digital transformation of education also addresses multiple problems and needs of the education system such as:

- To address the issue of increasing population
- To provide equal access to quality education to all
- To open the door of education for all anytime, anywhere
- To optimize the use of available resources both physical and human resources
- Preservation, conservation, and transfer of educational resources
- To preserve the educational assets in digital form
- To globalize, individualize, and universalize the system of education
- To create a virtual system of education
- To provide a platform to intellectuals for virtual interaction

An Overview to Digital Transformation of Education

In this paper, the researcher had discussed the education systems of only seven countries: Italy, Korea, Finland, Morocco, Portuguese, New Zealand, and India and highlighted the major initiatives taken by these countries towards the digital transformation of education.

The major reasons why the researcher had chosen these counties are:

- To cover the different digital educational initiatives taken by different countries across the world as much as possible
- To cover countries from different regions of the world
- Availability of data
- Limitation of time and resources

Italian System of Education

The first national ICT initiative of Italy in the field of education was the "National Plan for Informatics" launched in 1985 for the professional development of

science and mathematics teachers of upper secondary schools. But the "Programme for the Development of Educational Technologies" initiative taken in the early 1990's had been proved as a milestone in the field of the Italian education system as it provided autonomy and funds to the schools to establish technological labs and also facilitated professional development of their teachers. A large-scale National Programme for Teacher's Professional Development was launched in 2000 to develop ICT awareness and knowledge among the teachers and also to encourage them for its educational use. In 2007, a new large scale initiative for ICT introduction in schools "National Plan for Digital Schools" was launched to introduce ICT directly into the classroom activities at all levels of education including all subject streams. Four initiatives that have been taken under the "National Plan for Digital Schools" are:

1. **Piano LIM-** To provide funds for interactive whiteboards in the schools
2. **Cl@sse 2.0-** To create ICT based learning environment in the schools
3. **Scuol@ 2.0-** To promote innovations to the traditional method of education
4. **Editoria digitale scolastica-** To provide digital books to the students

Other than these initiatives, there are some more initiatives that have been taken for the digitalization of education and these are:

- **Database SD2 -** Managed by the Institute for Educational Technologies of the National Research Council in Genoa and it offers online service of documentation, training, and updating to the teachers.
- **The Internet site 'INDIRE'-** Managed by the Library of Pedagogical Documentation situated in Florence and provides information and resources to the teachers and students.
- **OTE: Technological Observatory-** Managed directly by the Ministry of Education and it provides technical assistance to schools in Italy.

Korean System of Education

In Korea, computers have been included in their school curriculum since the 1970's, although the formal plan to introduce ICT in education took place in 1987 with the launch of the "Computer Education Strengthening Plan".

In 1996, The Ministry of Information and Communication appointed an Informatization Promoting Committee which proposed a Master Plan for Informatization Promoting popularly known as Master Plan I (1996). The major focus of this plan was to set up ICT infrastructure and to achieve this objective, initiatives like EDUNET (1996), RISS (1998) and KERIS (1999) were taken. EDUNET was the first comprehensive educational information service of Korea, while RISS was the first Research Information Service System of Korea. KERIS came into existence with the merger of the Korean Multimedia Education Center (KMEC) and the Korean Research Information Center (KRIC) as per the KERIS Act. KERIS framed the guidelines for elementary and secondary schools for the use of ICT in education.

To strengthen the use of ICT in education, Master Plan II came into existence in 2001. Under Master Plan II, initiatives like Educational Content Sharing System (2001), National Education Information System (NEIS), Cyber Home Learning System (2004), and e-learning Global Cooperative Centre (2006) were taken to invigorate the use of ICT in education.

In 2006, Master Plan III was launched for the further advancement of ICT in education and for these initiatives like Digital Textbook Development Plan (2007), U- Classroom (2007), Operation of Digital Textbook Model Schools (2008), Cyber Security Centre (2008), and KOCW (2010) were taken under Master Plan III.
Further, Master Plan IV (2010) and Master Plan V (2014) also came into existence for smart education and student-centred learning respectively.

Finnish System of Education

Finland's system of education is considered as one of the successful systems of education across the world and this is because of their efficient teachers, availability of the best quality infrastructure and resources and their traditional curriculum & pedagogy. Integration of ICT in the Finnish system of education is attributed to the policies that had been launched from time to time for digitalization of education such as Education Training and Research for the Information Society (1995), National Strategy (2000-2005), Information Society Program for Education Training and Research (2004-2006) and The National Knowledge Society Program (2007-2015).

These policies have played a very important role in establishing their ICT infrastructure, developing ICT literacy among the users, addressing issues related to its implementation and ICT integration with the community & their daily life.

Ubiquitous Information Society Strategy (2008), a joint initiative of the Ministry of Education and the National Board of Education, led by the Ministry of Transport and Communications and run by an inter-Ministry advisory board was taken to encourage ICT in teaching-learning and to identify best practice innovations in schools.

All these Finnish policies played a very important role in the development of ICT infrastructure, professional development of teachers, development of digital content and technology-based digital tools of teaching–learning.

Moroccan System of Education

In Morocco, integration of ICT in the education system started with the launch of the 'National Charter of Education and Training' in 1999, wherein Article 10 assimilation of ICT and computer facilities in education had been emphasized along with the promotion of distance learning. Further, a 'National Action Plan' was prepared in 1999 under the supervision of King Mohammed VI who declared the period of 1999-2009 as the "education decade". Thereafter, the Government of Morocco identified five themes: education, governance, private sector development, e-commerce, and access and included them in their 'e-Maroc plan' to facilitate the use of ICT in almost all the sectors of society including education and to reduce the cost of using computer and internet facilities. Apart from these, there are some more initiatives, such as CATT (1999), Marwan project (2002), CVM (2002), GENIE (2005), CIVICS, BRIDGE, ALEF, and MAF that have been taken to promote the digitalization of education in Morocco.

Portuguese system of education

In Portugal, the system of education is mostly centralized and managed by the Ministry of education along with the Ministry of Science, Technology and Higher Education. As far as integration of ICT in the Portuguese system of education is concerned, Lisbon Strategy (a European Union [EU] plan) and Portugal's Strategic National Plan were prepared for the upgradation of education as well as for ICT integration in education. These two plans led to the development of 'Portugal's Technological

Plan for Education' which was although prepared by the concerned Ministry but also approved by a resolution of the Council of Ministers in 2007 which means Portugal's Technological Plan for Education was approved by the entire Government. It was a comprehensive plan with four major dimensions of a) Technology Goals, b) Content Goals, c) Training Goals and d) Investment & Financial Goals. To accelerate the pace of ICT integration in education, to develop ICT infrastructure and to provide ICT access to students, many other programs were started such as Technological Kit (to lower down a student to computer ratio), Voice Over Internet Protocol: VOIP (to provide VOIP & video conferencing solutions to the schools), Internet in the Classroom: Local Area Networks (to provide wireless access in Local Area Network), High-Speed Broadband Internet (to provide access to high-speed internet), Portugal's laptop distribution programs (to distribute laptops to the students and teachers) and ICT Competencies program (to trained teachers with ICT skills and ICT implementation in the classroom).

New Zealand System of Education

In New Zealand, the first Digital Strategy to implement ICT in different sectors of society including health, governance, commerce and education was released in 2005. In 2008, Digital Strategy 2.0 was released with a major focus on investment in fibre-based broadband and adopting different strategies for rural and urban areas. The first national plan for ICT integration in education 'ICT Strategic Framework for Education' was released in 2006-2007. This framework for education covered primary, secondary as well as the tertiary levels of education with four major dimensions of a) Connection, b) Capability, c) Content, d) Confidence. 'ICT Strategic Framework for Education' was initially developed for the period of 2008 -2012. Some other initiatives taken for ICT implementation in the field of education includes School Network Upgrade Program–Phase 1 (SNUP-1) and School Network Upgrade Program–Phase 2 (SNUP-2) (to provide connectivity to small schools), School Network Upgrade Program–Phase 3 (SNUP-3) (to prepare schools for fibre-based, 100 Mbps connectivity), TELA Laptop Scheme, 2003 (to provide subsidized laptops to teachers), The Computer Access New Zealand Trust (to provide recycled computers to schools), The National ICT Helpdesk (to provide software and hardware support to schools) and The Ministry of Education (to provide free of cost basic software to schools such as MS Office, antivirus etc.)

Indian System of Education

In India, the use of technology in education has a history of years since British rule. In 1930, the first educational and cultural program was aired by British Broadcasting Corporation (BBC) through broadcasting radio and in 1937, All India Radio (AIR) broadcasted educational programs for school students. Further, the invention of television and its acceptance as a medium of information exchange led to the introduction of educational television for secondary schools in Delhi in 1961. In 1975, Satellite Instructional Television Experiment (SITE) was launched to develop rural communities through education. The use of computers in education started with the launch of Computer Literacy and Studies in School (CLASS) in 1984.

Besides these initial initiatives, the Government of India had taken two major initiatives named INFLIBNET (1991) and NMEICT (2009). These are not single initiatives, but umbrella terms for multiple initiatives that have been taken under these two initiatives for different levels of education including primary, secondary, senior-secondary, higher and technical education. The list of initiatives

that have been taken under INFLIBNET are e-shodhsindhu (Consortium for Higher Education e-Resources), Shodh Shuddhi (to enhance research quality by providing plagiarism detection software to member educational institutions), N-list program (to provide an access to e-resources to colleges), INFOPORT (a gateway to all Indian scholarly e-content), IR@INFLIBNET (Institutional repository of INFLIBNET), OJAS (Open Journal Access System, but services has been terminated since 2016), Shodhganga (an open repository of Indian theses), Shodhgangotri (an open repository of Indian synopses submitted to Educational Institutions for Ph. D. program), IndCat (a union catalogue), SOUL (a library automation software), e-PG Pathshala (to provide e-content to postgraduate level students), Vidya-mitra (an integrated e-content platform to provide an access to all education e-content through a single-window interface), Vidwan (a premium database of experts), Research Project database (to provide information about ongoing and completed project of faculty members) and many others.

While initiatives that have been taken NMEICT are Virtual lab (to provide a remote access to labs to those who don't have an access to costly lab equipments), Sakshat (one stop educational portal, an integrated platform to provide an access to all educational e-content), e-yantra (an initiative taken for engineering students), A-view (to provide a platform for teaching-learning in real time through video conferencing), SWAYAM (an Indigenous MOOC), SWAYAM Prabha (34 DTH channels dedicated to educational programs), FOSSEE (to promote the use of FLOSS tools in academia and research), GIAN (to provide an opportunity to learn from international faculties), NPTEL (to provide e-content to science and engineering students), e-Acharya (an integrated platform to provide e-content), National Digital Library (to provide an access to all type of educational e-content), SOS (to provide tools for analysis of system), Spoken tutorial (to provide an access to free and open software) and Baadal (a cloud orchestration and virtualization management software to maximize the utilization of ICT infrastructure), etc.

National Academic Depository (NAD) is an online depository of academic awards including certificates, diplomas, degrees, mark sheets, etc. It provides 24×7 hours accessibility to academic awards to its stakeholders. Its stakeholders are not only students but also educational institutions, verifying entities, the Ministry of Education, UGC and DigiLocker.

The Current Situation

Italy- Currently, the use of technology and ICT in Italy is not confined to the only secondary and vocational levels of education, but has also become an inseparable part of their education system at the primary level. ICT technologies, interactive whiteboard technologies, multimedia equipment, and internet facilities are now available to all levels of education including primary, lower secondary, upper secondary and vocational education. Teachers are being trained to use ICT to improve student's performance, and attainment, educational communication and cooperation as well as to achieve specific learning goals.

Korea- In Korea, the Government has started the use of ICT in education to strengthen its system of education. Now, their focus is on SMART education where S means self-directed, M stands for motivated, A is adaptive, R means resource-enriched and T stands for technology embedded. In schools, students are not only learning through traditional methods but also actively using ICT at all possible levels to become a new generation of learners. A digitized

curriculum is being used to reflect the modernization of education. Not only teachers and students, but also society is being encouraged to utilize the ICT facilities to become a digital society.

Finland- In Finland, the National Board of Education, responsible for education systems all over the country, has implemented national ICT policy all across primary and secondary educational institutions to ensure the development of ICT infrastructure and strategies required to meet the national framework. Teachers have been trained to achieve mastery over the ICT skills, using ICT tools for educational purposes, to develop digital content, create digital networks of institutional management, etc.

Morocco- In the Moroccan system of education, ICT is being used to achieve two major objectives of making students digitally literate and secondly in developing different digital pedagogical approaches to achieve the national goals of education, i.e. using innovative methods and approaches in educational institutions. GENIE programme of Morocco was awarded UNESCO King Hamad Bin Isa Al-Khalifa Prize in 2017 for its considerable efforts and impact on the use of technology in the field of education.

Portuguese- Portuguese system of education managed by the Centralized Ministry of Education has developed ICT infrastructure and resources to reform and modernize the education system at the school level through a national initiative 'Technical Plan through Education'. Now, their schools are interactive places of learning with ICT trained teachers and school staff to create an information society. Proper government guidelines have been issued for teachers to develop ICT competencies. Teachers are being provided with three levels of certificate for digital competencies.

New Zealand- The Government of New Zealand has launched the Ultrafast Broadband Project to provide fibre-based ultra-high-speed internet connectivity to all the schools by 2020. Schools have been developed and facilitated to use ICT infrastructure for the modernization of the education system. The government is also providing heavy funds for the professional development of teachers in terms of digital competencies.

India- Although the Government of India had already taken multiple initiatives for digitalization of education since 2016, it has accelerated its pace of taking and implementing new ICT initiatives for integration of technology in education, such as online educational portals, content in digital form for different levels of education, virtual classrooms, online admission and examinations as well as digitalization of administration and management activities. In 2016, it launched 28 new initiatives and programmes at different levels of education, but due to lack of awareness and encouragement, these initiatives were not reaching their end-users. But now because of this pandemic of Covid-19, both teachers and students are forced to learn and explore these new digital ways of learning and with the passing of time, they are becoming more sincere, confident and techno-savvy with the use of these ICT initiatives and programs.

Discussion

After studying the education system of the above countries, we concluded that the use of technology in the system of education was started decades ago but the major advancement in the terms of formal policies and concrete initiatives took place after 1980. Almost all the countries have spent lots of money, time and attention on establishing educational ICT infrastructure, providing training for use of ICT in education,

development of low-cost tools for digital education, creating digital content & making it freely accessible to all, organising orientation programs to bring awareness among users and motivating them.

Being completely aware of the importance of ICT in education, the government of above-described countries put lots of effort into the digitalization of education but still, it has not reached its optimum level and the major problem is concerned with proper implementation and execution of these policies along with other challenges of insufficient funds, resources and trained manpower. For which a lot of research is required to identify the area of problems and to properly address them.

Though digitalization of education is mandatory in the current scenario, its opportunities should also be taken into consideration. Like programs and policies taken for the advancement of ICT in education, the Government should also make policies and take measures to address the challenges related to them.

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ICT Resources for Teaching-Learning Process

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Abstract

ICT is a big buzzword for its use in education. A lot of emphases is on the integration of ICT technologies in the teaching-learning process. Consequently, the teaching-learning process is shifting from chalk and talk to online mode. The pandemic COVID-19 exponentially accelerated this process in education. But this also created a lot of hitches in front of the stakeholders, the paper presents a wide-ranging overview of the use of ICT in the teaching-learning process. It also discusses abundant digital tools which can be used to make teaching learning more effective.

Introduction

The exponential development of technology and easier access to information has brought tremendous changes in the social, political, economic and educational fields. This change further accelerated due to the Covid-19 pandemic. The pandemic brought the whole world to instil, including education. That's why the use of digital technology in education has already gained acceptance. The need is to educate the teachers, students, parents and school administrations to manage the new technologies, become able to solve the problem with the help of technologies and make a decision. This has tipped the balance between skills and knowledge slightly more in the direction of skills, particularly problem solving and thinking skills.

The teachers, researchers and experts in the field of education are continuously putting their effort to raise the standard of the student's achievements in their learning process by examining how students learn effectively.

To deal with the sudden transition from face-to-face teaching mode to online teaching mode, the institutions have developed some alternative plans, under the guidance of various agencies like the ministry of health, MHRD and UGC, etc.

The UGC has issued guidance to conduct online classes smoothly in which UGC suggested reducing the curriculum, flexible timing of online classes, alternative ways of assessment and evaluation. The teacher education institution also shifted to online mode. At an earlier stage, most of the teachers were not prepared to deal with such a situation because they were not skilled enough to use online platforms for the teaching-learning process (TLP). Universities organized several workshops, short-term courses and webinars to train the teachers to harness the opportunities in this diverse situation. These initiatives play a significant role in enabling teachers to utilize online resources fruitfully.

As we know the Covid-19 pandemic pushed the teachers to the limit in every aspect of life but the leverage

of technology, especially digital technology, provides learning continuity when the students cannot be present in the classroom (Anna Dabrowaski, 2020). However, there are several barriers to the success of the online TLP ranging from teachers' and students' preparedness, easy access to the online resources and devices and student support at home.

ICT Resources

ICT is a diverse set of technological tools and resources used to communicate and to create, disseminate, store and manage information". According to National Policy on ICT in School Education (2012) "ICTs are defined as all devices, tools, content, resources, forums, and services, digital and those that can be converted, into or delivered through digital forms, which can be deployed for realizing he goals of teaching-learning, enhancing access to and reach of resources, the building of capacities, as well as management of the educational system. ICT tools can be employed to improve the learners' ability of understanding. García-Valcárcel (2014) goes so far as to say that the ICT becomes the channel for communication and information that is essential for guaranteeing learning environments that are open, interactive, replete with incentives, sources of information, motivating for students, and focused on developing skills.

The use of ICT as a resource of TLP has the following functions:

1. It promotes, arouses and maintains the learner's interest.
2. It enables the learner to organize information, create new knowledge, link the knowledge and apply it to new situations.
3. Provide an environment for learners to create and express ideas.
4. It guides the learners' learning.
5. It provides the opportunity for learners to assess knowledge and skills.
6. It provides an environment for observation, exploration and experiments with simulation, animation and videos.

ICT aids are employed in the teaching and learning process, it involves most of the sensory organs of students and also makes learning more real to students (Abdulai & Akaglo,2020). In Edgar Dale cone of experiences, the cone shows the progression of learning experiences from concrete to abstract rather than as a prescription for instruction with media (Lee & Reeves,2007). Edgar Dale introduced the modern media in education, postulated the "Cone of Experience". The arrangement of Dale's cone of experiences is not based on difficulty level but abstraction and also several senses involved in learning. The cone of experiences can be categorized into 11 stages starting from concrete experiences at the bottom of the cone and becoming more and more abstract as we move upward to the peak of the cone. Thus, the moving from verbal symbol (Peak of the Cone) to direct and purpose experiences, the degree of abstraction gradually decreases and learners become more participative Edgar Dale's cone experience recommends more learning from reality, simulation and various types of active and experiential learning (Lee & Reeves,2007; Abdulai & Akaglo,2020). The ICT resources use multiple senses in the formation of experiences. The selection of these resources or tools is responsible for bringing a change in the classroom environment. The availability of a wide range of such teaching-learning material will catalyze the transformation of classrooms into ICT-enabled classrooms. Therefore, the teacher must be competent enough

to select and critically evaluate digital content and resources. Initially, the teachers may start with the computer lab, later on, more classrooms can be equipped with appropriate ICT resources making way for ICT-enabled classrooms.

ICT Resources for the TLP

The development of digital technology provides an abundance of ICT resources and tools to enhance the teaching-learning environment. Various ICT resources can be analyzed based on their use in the TLP. The ICT can be categorised as:

- Informative resources
- Collaborative resources
- Learning resources
- Resources for assessment and evaluation
- Resources for professional development

ICT as an Information Resource

The use of ICT has become increasingly important in academics and most of the academic activities are switching over to ICT-based resources and services. It has opened new avenues like online learning, e-education, e-journal, CD-ROM Database, e-books, web-based resources, etc. (Singh, Krishna & Jaiswal, 2014). The major resources of learning before the invention of digital resources were libraries only. The development of ICT-based technologies forced most libraries, not only in India but all over the world to go online and become a rich source of information. The National Digital Library of India (NDLI) is a huge resource of digitally available learning resources written by millions of authors across various subjects in different languages. The National Repository of Open Educational Resources (NROER) is another huge resource of learning materials for school and teacher education. Similarly, DIKSHA (Digital Infrastructure for Knowledge Sharing) also considered as One Nation One digital Platform is a storehouse of educational resources which is available as a portal and app as well for easy access to all.

This highly developed digital environment provided a scenario to teachers and learners with ample flexibility and an abundance of learning content and direct access to it. The internet enables the teachers as well as learners to find out additional information to address a topic from basic to advanced levels. For example, if you search 'teaching and learning' on Google, you will get billions of pages in less than one second. Thus, the internet becomes a huge resource of information. Online databases are also some other ICT resources that provide information.

ICT as collaborative resources

The learning environment depends on engagement among stakeholders. No engagement means no attention, no attention leads to no effective instruction, no effective instructions lead to no sufficient development regardless of whether the technology is used or not. The learning environment can be enhanced by the collaborative learning process. The collaborative learning approach involves teamwork and is based on the constructivist theory of learning. The constructivist theory of learning refers to the learners constructing their knowledge upon the foundation of their previous learning. This type of learning has many academic, psychological and social benefits. Collaborative learning is a way of constructivist learning and it encourages students to see situations from different perspectives, creates an environment where they can practice social and leadership skills (social

benefits) and provides a satisfactory learning experience that significantly reduces anxiety (psychological benefits) (García-Valcárcel, 2014). Collaborative learning works very efficiently with ICT; it places the learners in the process of generation, managing and sharing of information by interaction with each other in a virtual community driven by ICT resources.

Thus, collaboration is the cornerstone for the success of technology-enhanced learning in the classroom. At this time, most of the learners use the internet through their smart mobile. Therefore, most of the social networking sites, the forum moved to inform of the app. Facebook, WhatsApp, Google classroom, Edmodo, YouTube, email, blogs, wikis are some of the examples of collaborative tools in the TLP. The Edmodo and Google classrooms are very easy to use among all collaborative resources.

ICT as a learning resource

ICT learning resources offer the possibility of acquiring knowledge, attitude and procedure during the TLP (Gonzalez, 2011). ICT can supplement learning activities by using several ways, such as digital educational resources, interactive tutorials, simulation, eBooks and open knowledge reinforcement exercises.

ICT-based learning resources provide a lot of teaching-learning materials created by teachers, educators, experts, researchers and learners. Interactive tutorials provide enriched learning materials with pictures, animations, simulations and videos. The most interactive resource for learning can be simulation. The simulation is a type of modelling that provides an opportunity for the learner to engage in the construction of knowledge and experiences by experimenting with the model. Thus, the simulation provides a constructivist environment in which the learner learns the thing by "learning by doing approach". Just as children do simulation activities by role-playing, adults use computer simulations to understand complex systems, real situations or dynamic processes. The simulation model is very useful for science subjects. The virtual laboratory allows the learners to perform experiments from anywhere at any time without using the actual laboratory (Bajpai, 2013).

The educational electronic books (eBooks), audios and videos, podcasts are other digital resources that enable learners to enhance and create their knowledge (Gonzalez, 2011). There are various e-resources where anyone can find a large number of e-books, videos and audios on different educational subjects. ePathshala, a digital initiative of NCERT provides a large number of eBooks, videos, audios and other educational resources for students, teachers, parents and researchers.

ICT as resources for assessment

The term 'assessment' in education means the procedure that is used to collect information about the knowledge, attitude and skills of a learner. Based on the assessment, the teacher judges the student and gives feedback on their progress, strength and weakness. Thus, the assessment plays a vital role in the educational process. The rapid development of ICT in education enables the teachers to use different technologies and their applications to assess the students' progress. ICT-based assessments can be various types i.e. computer or laptop-based and mobile device-based. With the help of ICT, a teacher can assess the students' performance in different formats i.e. text, image, audio, video and simulation-based.

- Computer-Assisted Assessment or Computer-Aided Assessment (CAA);
- Computer-Based Assessment (CBA)

Computer-assisted Assessment

Computer-assisted assessment refers to the use of a computer to facilitate, manage and support the assessment and evaluation of the learners' progress. A teacher can use CAA at any stage of the TLP. CAA is mostly used for scoring multiple-choice questions and questions with short-answer responses using an optical mark reader (OMR). The CAA can be used to identify the learners' difficulty in the subject of trends and patterns within the learners' group. It can be also used diagnostically to identify students who would benefit from extra direction or support.

Computer-based assessment

Computer-based assessment (CBA) is generally done by the computer. It is used mostly in digital tools for assessment-related activities. It can be used for summative, formative or diagnostic purposes. This type of assessment includes multiple-type questions (MCQ), other objective type questions, essays and short answer questions. This type of assessment can be used from anyplace and anywhere with laptops, tablets and smartphones. This type of assessment is an integral part of e-learning teaching and training. For example, the assessment tools of google classroom are computer-based assessments. The concept mapping tools are also part of it.

ICT as a Resource for Professional Development

The professional development of the teachers is another important factor that can influence the teaching-learning environment in the classroom. Professional development means the acquisition of skills for personal and career development. There are various courses such as in-service and pre-service courses, designed for the professional development of the teachers. Ahmad & Chopra (2015) emphasized that the teachers have to be fully equipped to integrate ICT in their pedagogy. For this, they need extensive training on how to use ICT in their TLP. The pandemic COVID-19 also established the fact that teachers need a Continuous Professional Development program on ICT integration in TLP. The enhancement of ICT especially, MOOCs provided the opportunity to design and develop tailor-made courses for career advancement. Different institutions and organizations developed and are developing a large number of courses according to the needs of the learners. There are various platforms that provide these courses either free of cost or on nominal fees such as Coursera, edX, Udacity, Ivercity, NovoEd, Udemy, SWAYAM, etc. The SWAYAM is developed by the Government of India, which provides a platform of learning for various courses of school education, graduation, post-graduation, professional education of different streams. Besides this, the teachers can also use BLOGS, social sites, social bookmarking, podcasts and YouTube to share ideas, opinions and understanding of any topic.

Final discussion

The COVID-19 shifted the whole education system online. This sudden shift created a lot of problems in front of the stakeholders of education i.e. teachers, students, parents and school administration. Where it created a lot of problems, it also provided the solution to various problems. Due to this online education, the TLP has been continuously moved on. But the use of technology in education gives us some lessons also, such as;

- **No technology is a panacea for education**

  Most current, capable digital technology resources do not offer quick easy or universal solutions for educational problems. The digital technologies, materials and strategies are usually tools in a larger system and must be integrated carefully with other resources and with teaching activities.

  The pandemic COVID-19 forced stakeholders of the education system to shift to digital technologies for continuing education. But the overuse of digital technologies can create more problems than the solution provided by it in education. Judicious and realistic planning is necessary to harness the potential of digital technologies in education (Roblayer, 2011).

- **Teachers usually do not develop the teaching materials and curriculum**

  Teaching is one of the most time and labour-intensive jobs in society. Generally, the teachers do not develop software or create complex technology-based teaching materials. Most of the time the companies, personnel in funded projects at different levels develop the learning materials. This is one of the most crucial issues in the field of digital education. Because those developers develop the learning materials by generalized needs. Therefore, these learning materials fail to cater to the local needs. Unless teachers are not involved in the field of material development, the local needs will always be left out.

- **Technically possible but not equally desirable and feasible**

  A popular saying is that today's technology is yesterday's science fiction. But science fiction also shows us that technology brings undesirable as well as desirable changes. For example, ICT has allowed attending professional conferences online, rather than traveling to another location, but it is also correct that people continue to want to travel and meet face to face (Roblayer,2011). Human cloning is technologically possible but not acceptable in society. Technology demands us to become a critical consumer of its power and capability and also decide which science fiction can become reality.

- **Things change faster than teachers can keep up**

  The resources and methodologies of teaching are changing continuously. Technological development further accelerated this change. Gone were those days-if, indeed, they ever existed, when a teacher could rely on the same handouts, homework, or lecture notes from year to year. It is very difficult to predict the new technological development in the field of education but it would be different from the present. That's why, the teachers must anticipate and accept the inevitability of change and the need for continual investment of their time (Roblayer, 2011).

Conclusion

The development of ICT technologies changes the teaching-learning environment. The teaching-learning process is now moving from traditional chalk and talks to an ICT-enabled environment. The real change in classroom teaching will be visible when the teachers will be able to integrate the ICT in every spare part of the TLP,

whether it is an objective formulation, contents selection and methodology of teaching or evaluation in the classroom. A good education depends upon the good teacher, in the same way, the effective integration of ICT in the TLP depends upon the teachers with good ICT skills. There are various ICT resources especially, MOOCs which provide tailor-made courses for teachers' professional development. Besides this, Blogs, digital bookmarking, simulation tools, podcasts, YouTube, etc. provide the opportunity for the teachers to develop their professional skills related to a different field. Thus, the teachers need to keep themselves upgraded with new ways of teaching. Today is the age of videos and podcasts and children can easily learn through this interactive media and hence teachers of the current era need to keep up with the current technology (Rani & Surana, 2015). A good teacher needs to explore themselves and try innovative educational measures to teach children.

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MEDIA LITERACY
Keys to Interpreting Media Messages
INDIAN EDITION
Art Silverblatt, Anubhuti Yadav & Vedabhyas Kundu
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Media Literacy is one of the new-age phenomena like the ones emerging post-globalization. Some of them are information literacy, digital literacy, financial literacy, cultural literacy, etc. Some of these types can be subsumed under the term literacy as a skill-based extension of the literacy skills. Media literacy has emerged from the extension of the term media, the plural form of medium. The term media has transcended its narrow sense and developed into a metaphor for what Marshall McLuhan refers to as the phrase 'Extension of Man'. The evolution of media has been organic in nature where it has evolved itself into different semiotic systems for communication. These semiotic systems collectively referred to as media have also created a socio-cultural context in an organic and mutual relationship with our pre-existing linguistic contexts. Media, therefore, is not delimited to the role of medium, but it has become an extension of our language. The idea of media literacy is the result of this evolutionary process of the organic and mutual relationship between media and language.

Media literacy like other types of literacies is generally characterised as the ability to understand, analyse, evaluate, appreciate, and create media in different forms. Media literacy, therefore, includes skills to create messages using various forms of media for a variety of purposes. With the recent developments in media, these skills also require critical ability to understand the role of media in society and the multifaceted function of the messages. Media literacy thus includes the competence of critical interpretation. The skill of critical interpretation is essential to decode the media messages.

The volume in review is the Indian edition of the book entitled, Media Literacy: Keys to Interpreting Media Messages by Prof. Art Silverblatt, Prof. Anubhuti Yadav, and Dr Vedabhyas Kundu is an outcome of the project titled Digital International Media Literacy Education (DIMLE). Originally the book was published in 1995 as the first edition by Greenwood Publishing Group. The Indian edition of the book appeared as an e-edition in 2018 and was subsequently published as a print edition in 2022.

The Indian edition of this volume is simply divided into seven chapters unlike the international edition which is organised into four parts and thirteen chapters therein. With a snapshot of the content, it is evident that the Indian edition of the volume is entirely a new re-creation of the text and therefore, it is organised accordingly.

Chapter one, Introduction to Media Literacy presents an illustrative discussion on the basic concepts, e.g. elements of media literacy, obstacles to media literacy, affective nature of various types of media, and issues related to the levels of meaning and messages. The chapter successfully initiates the reader into the subject and also helps to conclude the lessons by providing a brief and crisp summary of the content.

Chapter two entitled Process Overview: Elements of Communication discusses technical aspects of communication and media by revisiting the different models of communication and mass communication, audience preference, audience, media multitasking, and audience reception theory. The chapter also presents the reader with some media literacy tips. This section of the volume is a little longer due to its content, however, the presentation of the content is lively and lucid and finally, all is supplemented with a summary.

The third chapter refers to the subtitle of the volume, i.e. Keys to Interpreting Media Messages deals with vital topics like historical context, stages of evolution, the evolution of media systems, and systems approach to media history followed by a summary of the chapter. The content is brief yet it presents all the important issues clearly and concisely way that makes the book easy to read especially for a reader from a non-media background.

The fourth chapter entitled Cultural Context deliberates on the issues related to the media and culture. It discusses the relationship between media and popular culture, the Opportunity Agenda, and the mutual relationship between media and culture.

The fifth chapter with its title Media Structure highlights the issues of the impact of the consolidation of media ownership on content and also the issue of copyright. The presentation and deliberation of the content are quite illustrative and interesting. Most of the description involves cases and examples from the Indian context that suffice the relevance of this volume.

The sixth chapter entitled Keys to Interpret Media Messages: Framework is another vital addition to the issues presented in chapter three with similar titles having different contents. This section begins with media literacy tips, the function of the genre and evolution of genre and a conclusion for discerning keys to interpreting media messages followed by a summary of the chapter content.

The seventh and the last chapter is titled Production Elements highlights the media elements like colour, lighting techniques, shape, scales, relative position, movement, angle, cutline, word choice, and manipulation of messages. The contents of the chapter primarily designed for the students of media are presented lucidly and therefore, despite the use of media jargon, the text remains readable for a common reader also. The illustrations used in the descriptions are of mixed variety; drawing from both Indian as well as international contexts. The chapter ends with a summary of the contents.

The volume ends with Endnotes including Video Sources, Graph Sources and Image Sources and also an Index. The present volume, similar to its original counterpart, seems to have used the endnote approach to avoid putting a lengthy bibliography at the end that could have been cumbersome and confusing especially for a common reader. However, the present volume has skipped the section on Suggested Reading for unknown reasons which could have been a good help for the readers.

The Indian edition of the volume Media Literacy: Keys to Interpreting Media Messages by Prof. Art Silverblatt, Prof. Anubhuti Yadav, and Dr Vedabhyas Kundu is concise yet comprehensive, clear yet interesting, and introductory yet vast in capturing and providing information on media literacy. It is also successful in its adaptive recreation of the content to suit the Indian readers. It has become a different book altogether and therefore, a reader having read the original international edition of the book, can venture into reading this one without any loss of interest. The book is equally useful for media students as well as a common reader intending to explore the nuances of media and media literacy.

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