Volume: 3, Issue: 1
January, 2021

ISSN 2581-8325

# INDIAN JOURNAL OF EDUCATIONAL TECHNOLOGY

Central Institute of Educational Technology
National Council of Educational Research & Training

# Indian Journal of Educational Technology

Volume 3, No. 1, January 2021

## 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, 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 ideas and information among researchers, professionals and practitioners of technology related field 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 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 for your contributions in the coming issues. Your feedback and suggestions are also welcome on the following address:

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# Editorial Team



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# Editorial

*"If we teach today as we taught yesterday, we rob our children of tomorrow."*

***- John Dewey***

The National Education Policy, 2020, also known as NEP 2020, was formally accepted by the Government of India in July 2020. It has replaced 34-year-old educational policy, which was enunciated in 1986. This is the third National Educational Policy, formulated in the Independent India. The first National Educational Policy was announced by the Government of India in 1968 after Kothari Commission submitted its report in 1966. This was also the period when an Independent India was chartering its own journey for a modern nation. This policy considered education as the sine qua non for India's economic development. The first educational policy, therefore, was focussed on creating educational opportunities for all. The second National Education Policy was announced in 1986, which sought to make education more inclusive and socially integrated. Based on the recommendations of this policy, Government of India launched a Program of Action (PoA) in 1992. Later, the focus of the policy debates shifted from increasing access to enhancing quality of education in the country. When Government of India enacted Right of Children to Free and Compulsory Education Act in 2009, quality of education remained its core concern.

The need for a new educational policy was felt in the face of new realties and new aspirations. This policy proposes the revision and revamping of all aspects of the education including its structure, regulations and governance. It also seeks to create a new system that is aligned with the aspirational goals of 21st century education, including SDG4, while building upon India's traditions and value systems. The policy document has 4 major parts - the first part deals with the school education, second part with the higher education, the third part with the cross cutting areas while the fourth part charts the implementation strategies.

One of the salient features of NEP, 2020 relates to the use of technology in education. It takes a 3600 view of the use of technology in education. So, it talks about using technology in the context of the general concerns about the education in country, viz., quantity, quality, equity, affordability and accountability. From the perspectives of various stakeholders, the policy recommends specific measures for the intended benefits of students, teachers, administrators and parents. It also proposes integrating technology into the educational system from the standpoint of various errands of the educational system such as learning, assessment, continuous professional development of teachers, educational administrations, etc. This policy also dwells on bridging the digital divide existing in the country.

In order to achieve these goals, NEP, 2020 has recommended setting up of an autonomous body, termed National Educational Technology Forum (NETF) with the stated objectives to provide a platform for the free exchange of ideas on the use of technology to enhance learning, assessment, planning and administration. This

forum will advise State governments and agencies in the matters of educational technologies, will help build capacities of organisations and lead important initiatives in research and innovations. Technology-based education platforms, such as DIKSHA/SWAYAM, will be better integrated across school and higher education. Higher Educational Institutions (HEIs) will play an active role in conducting research on disruptive technologies and in creating instructional materials and courses including online courses in cutting-edge domains.

Keeping the mentioned aspects of NEP in mind, this issue of the Indian Journal of Educational Technology has tried to include studies on various aspects of technology and its integration in teaching learning. In this issue, there are six research, one review, two general and one communication articles along with a book review. Most of these articles have a reflection on the current situation of COVID-19 pandemic and the ways technology has been used in the process of teaching-learning. I hope these studies will help in getting insight into the ways technology has been used in the present scenario and will also help in initiating a dialogue on the same in the future.

I take this opportunity to thank all the contributors and reviewers for contributing in the journal. Though we received large number of manuscripts but, only few have been accommodated for publication. The support of members of editorial board in guiding with the whole process of taking out this issue has been appreciable. I hope this issue will provide yet another opportunity for contributing in the larger arena of academic discourse.

**(ABHAY KUMAR)**
**Editor**

*Research Article*

# Effectiveness of ICT Based Learning Material in Science Learning

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**Abstract**

*In the present study researchers developed an ICT based learning material. It was a self-learning material, which was based on the principles of programmed learning. In the present study, an ICT based programmed learning material was developed on the topics "Matter in our surroundings" and "Is matter around us pure" based on the content of the NCERT Science textbook for class IX Students. The sample for the present study comprised of 180 students of class IX. A quasi-experimental research design was adopted for the study. This study involved the dependent variable as -Treatment Groups (Experimental Group Vs. Control Group) and an independent variable as- Achievement scores of students. An ICT based Programmed Learning Material, Pre, and Post achievement tests developed by the researchers were used. The data were analyzed by using the Mean, S.D., and Analysis of variance. Analysis of data revealed that teaching with an ICT based programmed learning material is more effective for the students as compared to the conventional method of teaching.*

**Keywords:** ICT, Programmed Learning, Self-learning

## Introduction

Information and Communication Technology (ICT) has made great progress towards the improvement of quality of education. Also to meet the increasing demands in the educational context of digital India, it is imperative to use technological devices in the teaching-learning process. The technological devices are expected to enhance the academic performance of students by the application of better techniques of educational technology in the system of education. The significant role of Technology in school education has been highlighted in the National Curriculum Framework 2005 (NCF, 2005). According to NCF-2005, there is an urgent need to convince the educational system, which should play an important role in engineering the teaching-learning situation and to make it a more meaningful experience for both teachers and their pupils. NCF -2005 also focuses that it is necessary to enable students to access sources of knowledge and interpret them, and to create knowledge rather than acting as passive users. At this level it is required to promote a flexible model of curriculum transaction, promote individual learning styles. In National Curriculum Framework focus group on educational technology emphasized that "Recognizes the potential of ICT and the Internet, promote universal

access, facilitate participatory forums, and develop communities and interest groups and enable students to access sources of knowledge and interpret them and to create knowledge rather than be passive users. To promote flexible models of curriculum transaction and also promote individual learning styles" (NCF, 2005). The use of ICT for personalized learning enables and empowers young people to pursue their knowledge. The applications of ICT make possible new and better ways of student learning (Kolderle & Mcdonald, 2009).ICT policy (2008) spotted a light on the role of ICT in Education. There are many advantages and constraints in the applications of ICT. The use of ICT aids in education has plenty of resources to enhance teaching skills and learning ability. ICT as a learning tool has provided immediacy to education. Through ICT students can learn any time any- where. Shah (1964) developed and validated linear Programmed learning material on equation solving and also evaluated its effectiveness against the conventional lecture method. Desai (1966) developed a Programmed learning material on "The Types of Compound". The results revealed that the programmed learning approach was more effective than the conventional method of teaching. Desai (1985) made an investigation into the efficacy of different instructional media in the teaching of science to the pupils of class VIII. The major findings of the study revealed that the programmed learning approach was more effective than the traditional way of teaching science. Mohanty (2010) find out the effect of programmed instruction on achievement of secondary school children in life science and found that students learn through programmed learning material achieved more as compared to the traditional approach in life science. Tabassum (2015) revealed that there is an improvement in student achievement when they are taught with the use of ICT tools. Devaki (2015) explained the multimedia teaching improves the understanding and achievement of students. Solanki (2015) suggested that teachers should uptake the use of a new multimedia module in the teaching-learning process. Singh & Husain (2015) used multimedia content in teaching of science and found it effective in improving the achievement level of students in hard spots of science.

## Need of the Study

Since it was established by many pieces of researches that every student has different learning preferences, thus course material must be presented in such a way that no student unfairly gets disadvantaged. Often due to various circumstances, teachers may adopt a specific teaching method without considering the individualized needs of the group being taught. It may result in an unsatisfactory learning outcome from some students. Thus, when presenting learning material to students, all student learning styles must be supported. Further, the interaction between the learners and the learning material should be taken into consideration to improve the quality of educational outcomes (Alharbi, et.al., 2011).

Accommodating instruction to students with differences is one of the most fundamental problems of education since earlier to till date. The problem of

accommodation of individual differences is very important as many educators have suggested that instruction should be completely individualized so that the learners can work independently at their own pace. Children of today are the future citizens and they are going to be the pillars of the country. Hence, it is essential, that each pillar is as strong as the other (Balasubramanian & Meera, 2002). Somehow the problem of accommodation of individual differences in the learning of students can be overcome by the use of technology in education. When we focus on the contributions of technology in education, Programmed Learning seems like one of the most important contributions of educational technology for individualized instructions. Programmed Learning may be viewed as a standardized self- instructional system, in which the learner interacts with each step in a program presented through instructional material. Programmed Learning is a method of presenting the new subject matter to students in a graded sequence of controlled steps. Students can work through the programmed material by themselves and after each step test their comprehension by answering an examination question or filling in a diagram. They are then immediately shown the correct answer or given additional information. Computers and other types of teaching machines are often used to present the material. Computer-assisted instruction and computer-based instruction can be regarded as sophisticated extensions of programmed instruction theory and concept. It is also evident that computer-mediated instructions are based upon programmed instruction theory and research (Lockee et.al, 2001). Bangert Drowns (1985) concluded that computer-based delivery systems have a valuable role in supporting instruction. According to Satyarthi (2015), Learning modules and programmed learning have many features in common. The main principles of the module are self-explanatory, self-contained, self-directed, self –motivated, and self-evaluated as programmed learning is also based on these principles. Shikhare (2007) design and construct a multimedia instructional system on educational technology and revealed that the multimedia instructional system was found quite effective than the conventional method. Vellaisamy (2007) seems that multimedia has a favorable impact on the learning of science. Anderson (1996) developed a programmed lesson unit on 'Acids, Bases, and Salts' using a branching program and found this form of instruction is effective in improving the degree of learning accomplished by the students. Later, he developed a program on stoichiometry in chemistry in 2001. Desai (1966) developed a program on "Types of compounds" and program text on "Structure of Atom" developed by John (2012). Here, in the present study researchers tried to develop an ICT based programmed learning material on web page www.selflearnonline.com, which can be easily accessed by students anytime anywhere according to their pace and time. This program also provides an opportunity for remedial teaching which is helpful for the students who are getting their education from open education resources or distance mode.

## Purpose of the Study

1. To Prepare the ICT based Programmed Learning Material on "Matter in our surroundings" and "Is matter around us pure" based on the content of the NCERT Science textbook for class IX Students.
2. To Evaluate the Effectiveness of ICT based Programmed Learning Material (PLM) as compared to the Conventional Method of Teaching (CMT) on the performance of class IX Students.

## Research Methodology

**Research Design:** A Quasi-Experimental design was adopted for the study. This study involved the dependent variables as -Treatment Groups (Experimental Group vs Control Group), one independent variable as - Achievement scores of students.

**Sample-** For the present study 180 students of class IX who were studying in two private co-educational CBSE affiliated English medium schools were selected in the month of April 2017 by random sampling technique.

## Tools

1. ICT-based Programmed Learning Material developed by the researchers.
2. The Pre and Post achievement tests were developed by the researchers.

## Description of ICT based Programmed Learning Material

This ICT based Programmed Learning Material was based on the two chapters of class IX NCERT science textbook namely "Matter in our surroundings" and "Is Matter around us pure". Linear style as well as Branched style of programming had been chosen for this study. This ICT based PLM was divided into two Parts. Part -1 is based on "Matter in our surroundings". Part -2 is based on "Is Matter around us Pure". Part -1 divided into 7 subunits and Part-2 divided into 8 subunits. These subunits were divided into frames. There were a total of 55 Frames in this ICT based PLM. There were 21 Frames in Part-1 and 34 Frames in Part-2. These frames were arranged in sequence to allow learners to learn on their own. After reading with each frame the learners get immediate knowledge of their learning.

In any programmed learning material, the frame is the smallest unit of a program in which the learning material is presented in a small step. There are three different components in a frame stimulus, response, and reinforcement. In the present programmed learning material, each frame was presented in such a way that it had a stimulus in the form of information; the response part was presented in the form of multiple choice type questions in each frame after the stimulus. The immediate information about result given in the form of the correctness of answer that worked as a reinforcer for the learners. The prompts were given in each frame in the form of animated pictures to elicited correct responses from the learners.

Initially, it was prepared in PowerPoint by using hypertext, pictures, visual basics, and animations, etc. This ICT based Programmed Learning Material was uploaded on the website www.

selflearnonline.com with the help of technology ASP.NET, NET Framework4.0 IDE: Visual Studio 2010, and Database: SQL Server2012.

In this ICT based PLM firstly, students were instructed to do their registration. After registration process they were able to continue with their login. After opening of learning material students read each frame carefully and after reading the frame they answered the multiple choice questions given in each frame. After answering the questions students immediately got the responses like "congratulation" or "try again". If the students found their answer correct they continued their learning towards the next frame. If the students attempted the wrong answer then they continued with reading the frame again or students get back to the required frame where they can learn again. Students verified the correct answers and proceed to the next item or frame. The counting of responses was done mechanically. At the end of ICT based Programmed Learning Material students got their result reports.

**Execution of Experiment and Collection of Data**

The execution of the experiment and the collection of data for the present study took approximately one month's period that was fifteen days in each school. The first step was the administration of the pre-test. The pre-test administered to access the prerequisite knowledge of the students and also for the equivalence of control and experimental groups. In the second step, the experimental group taught through ICT based programmed learning material and control group taught through the conventional method of teaching. After the completion of the learning of both groups' experimental and control groups the post-test administered on both groups.

**Analysis of Data**

To analyze the effectiveness of ICT based PLM and CMT on the Achievement scores of the Students of Experimental group and Control group, the following hypothesis was formulated.

**Hypothesis**

There is no significant difference in the performance of students who taught through ICT based Programmed Learning Material as compare to the performance of the students who taught by the Conventional Method of Teaching.

To test this hypothesis, the F-ratio for the main effect of treatments was computed. To see the difference between the control and experimental group, the mean and standard deviation of post achievement scores were also computed.

**Table-1: The F-value and Level of Significance for the Main Effects of ICT based Programmed Learning Material (PLM) and Conventional Method of Teaching (CMT)**

| Source of Variance | df | Comp. F-Ratio | Level of Significance |
|---|---|---|---|
| Treatment Groups | 1 | 15.781 | 0.01 |

Table 1 shows the analysis of variance and significant F-value for treatment effects. The above results revealed that the computed F-value is more than the Table F-value, thus the null hypothesis rejected, and hence the research hypothesis accepted which indicated that there is a significant difference between the Post achievement scores of the students of the experimental group and control groups. Further, to see the difference between the mean of control and experimental group, the mean and standard deviation of post achievement scores were also computed. Table no. 2 given below shows the difference between the mean achievement scores of control and experimental groups.

**Table-2: The Mean achievement scores of Students in Control and Experimental Groups**

| Variable | Control Group (N= 91) | | Experimental Group(N= 89) | |
|---|---|---|---|---|
| Post achievement scores | **Mean (M)** | **S.D.()** | **Mean (M)** | **S.D.()** |
| | 23.21 | 2.421 | 24.20 | 2.450 |

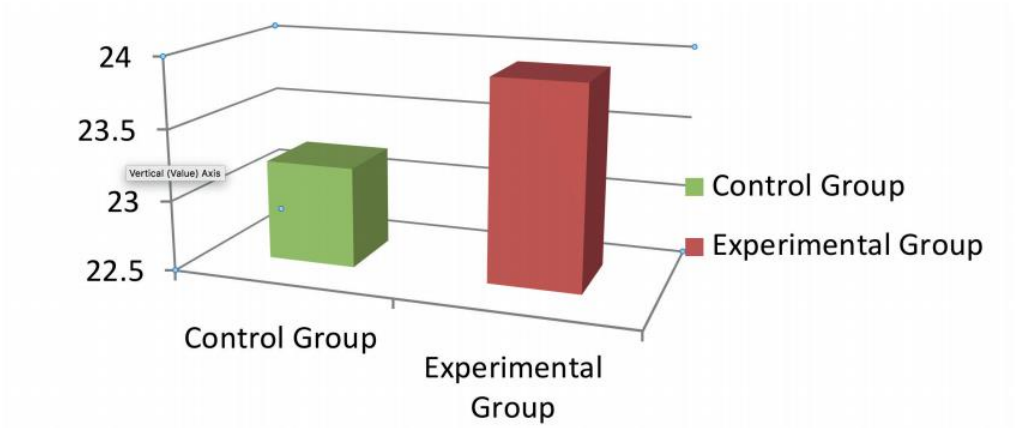


**Fig.-1: Post achievement scores of Control and Experimental Groups**

Table- 2 shows that there is a difference between the mean achievement score of the experimental group and that of the control group. The Mean achievement score of the experimental group is higher than the mean achievement score of the control group.

In Figure-1 the difference in the mean achievement score of the experimental group against the control group indicates that the group which was taught through the ICT based programmed learning material (Experimental group) performed better in the post achievement test than the group which was taught by the Conventional Method of Teaching (Control group). As this difference is in favor of the experimental group, it can be concluded that the ICT based

Programmed Learning Material (PLM) is more effective than the Conventional Method of Teaching (CMT).

**Findings and Conclusion**

In the present scenario in this pandemic situation, we are moving towards digital India and online education is acting as the most important tool in the progress of a country. It is the necessity of our country in the present time to use digital, ICT, computer-based devices in our education system. Digital India demands to do some fruitful contribution to digital content. Thus, in the present study researchers developed an ICT based programmed learning material on the topics 'Matter in our surroundings' and 'Is matter pure around us'. Letina & Dikovic (2012) conclude that programmed based teaching develops critical thinking; programmed teaching has the potential to produce positive learning environments that are supportive, structured, and, most importantly, directed towards training students for independent lifelong learning. ICT based Programmed material is also recommended for gifted students because it requires independence in their work and allows them to skip familiar content, but also it can be prepared for students with disabilities as a part of their individualized curriculum. Sozcu, Ipek & Taskin (2013) also discussed that conventional CBI generates new learning environments with instructional design approaches and e-learning technologies. Today, traditional CBI has extended to knowledge management systems to develop web-based learning, e-learning, distance education, and online systems, from face to face to virtual classrooms.

The results of the present study are also supported by Gupta (1976), Debi(1989), Thatte (1998), etc. developed programmed learning material and found that the programmed learning materials are more effective in the learning of students as compared to traditional methods of teaching. From the result of the present study and previous studies, researchers concluded that these kinds of ICT based programmed learning material can be used as a supplement with Conventional method of teaching as Spradlin (2009) also found that students performed equally well when receiving traditional classroom instruction and traditional classroom instruction supplemented with computer-assisted instruction. Thus, these kinds of ICT based programmed learning material can be used with conventional classroom learning to enhance the learning of students. From the present study, researchers concluded that in the making of digital India program and online education this kind of ICT based self-learning material can be used by the teachers to enhance the learning of students. It is also suggestive for researchers and teachers to develop more such kind of ICT based learning material for science and also for other subjects.

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*Research Article*

# Blended Learning and Social Science at the secondary school level: A step towards engaged classroom

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**Abstract**

*Blended Learning is emerging as one of the powerful tools in teaching across the world in recent times. The present paper tries to look at varied aspects of blended learning, and provide resources which can be used for a social science classroom at secondary level in the Indian context. Further, various examples and lesson plans from social science are developed to elucidate usage of blended learning in the classroom at the secondary level. It is an influential resource for teachers, and helps to enhance student engagement and participation.*

**Keywords:** Blended Learning, Social Science, and lesson plan, pedagogy, technology in classroom.

## Introduction

Blended Learning is an approach that combines classroom teaching popularly referred to as face- to-face teaching with online methods. It is a model which has gained momentum all across the world due to its flexibility, adaptability and helps one to master skills and aid in becoming lifelong learner. In the lecture style education, there is a possibility that it is passive and does not provides much scope for student's interaction or engagement; especially in the Indian context which are characterised by large student strength in the classes. Blended learning sessions may be synchronous or asynchronous which may be customised and can be used by students at their own pace. It is an intended 'synthesis of face-to-face and online learning experiences' (Garrison & Vaughan, 2008). The greatest advantage of blended learning is that the learner can be at various places, they may or may not be at one place, it aids learning and provides flexibility to the learners. What is crucial is the accessibility and affordability it provides to the learners as well as the faculty, to have classes with learners from across the country or the globe. It is conducive for classroom environment to have diverse learners as it is helpful for group engagement.

Graham (2006) said that one of the crucial goals of blended learning is to advance pedagogy by merging the benefits of face-to-face instruction with the benefits of computer-mediated instruction (Graham, 2006; Horn & Staker, 2015).While Garrison and Kanuka (2004) put forth that combining face-to-face learning with online

learning may sound simple but in reality it requires abundant depth, knowledge and skills. Similarly, in another study that examined blended learning and its impact on the teaching of mathematics, blended learning approach was established to be more effective than traditional face-to-face learning approach (Acelajado, 2011). In addition, this study shows that blended learning has brought in interested, enjoyable and an attractive activity for students in mathematics learning (Acelajado, 2011). However, Graham cautioned that if not designed properly, the blended learning 'might turn out to be the mix of least effective tools of both worlds' (Acelajado, 2011, p. 8).

The greatest advantage of blended learning is the pace, flexibility and the ability to enhance student leaning. However it is to be distinguished from ICT enhanced or online learning, as it is scheduled at a given time and place like school or college etc. However, blended learning offers many advantages as it offers possibility of using various resources from the internet, like various e-resources developed by national bodies like Central Institute of Educational Training (CIET), and National Council of Educational Research and Training (NCERT), e-pathshala, SWAYAM, Khan academy, YouTube etc. to improve the classroom learning. Clifford Maxwell (2016) defines blended learning as having three components-the first component defines blended learning as a formal education programme where students learn from online medium such as web based content, online tutorials and so on, as students have some control over the pace of their learning and their schedules. What is crucial is being able to control the pace, which is an essential requisite of blended learning. The second constituent of blended learning is that learners undertake specific work in a supervised or directed environment that is away from home. It is essential that they have some on - campus experience in their learning schedules like school for which they may visit the institution. The third essential element is that students' progress is tracked in real time. In addition to this, there should be proper coordination between the online content delivery and what is being done at the face-to -face level. Without such coordination the whole exercise would prove to be cumbersome, as there may be a chance(s) of repetition of the same content over and over.

Blended learning takes education beyond the classroom. It is shift away from the rote learning of classroom and helps one to engage and adapt to new technology from home. It opens new avenues for the learners and caters to diverse learners as per their need, helping them take up employment and reduce travel time. Due to the Covid-19 pandemic where teaching- learning is through the online medium, in such a case, blended learning is one of the most suitable and successful option.

**Social Science and Blended learning**

Social science, as an epistemology, has been widely dominated by two different theoretical strands, which include both positivism and phenomenological. The two strands help the researcher to be critical and objective, as the practice helps one to be impartial and scientific,

as it has to be valid and reliable. The social science researcher relies on various disciplines/subjects which helps one to comprehend social reality in a nuanced way. Social science has largely been concerned with Bentham's principle of utilitarianism rather than being normative (NCF, 2006: vi). Unlike the science, human interaction and inter-relationship are primary in social science as one is constantly interacting with the societal issues. At the secondary stage, social sciences include components of various disciplines/ subjects like geography, political science, history, and economics. The main thrust is to develop a critical understanding of various socio - cultural issues and challenges faced in the country and train the learners to be a responsible citizen and take part in the democratic process of the country in the future.

Social sciences have a normative concern to develop a broader horizon, and improve the understanding of learners about their environment, social, economic and political contexts. The aim is to cultivate a critical understanding of the various subjects namely, History, Geography, Economics, Political Science, Sociology etc. The National Curriculum Framework (NCF, 2006: 4-5) envisaged the following reasons for studying the social science for children as:-

- to know about the Constitution and the values enshrined in the Preamble;
- to question, examine ideas, institutions and practices;
- to grow up as dynamic, accountable, and thoughtful members of society.

At the secondary level the objectives of studying social sciences are as follows:-

- to appreciate the constitutional rights and duties of citizens in an egalitarian and secular country;
- to know the roles and responsibilities of the government;
- it is also to understand the problems of the country in relation to world economy (as mentioned in NCF 2006: 6).

What is important is that, social science prepares one to actively engage in a democracy in the future as citizens of a country. So it's important for the students that such themes are chosen where there's an inquiry/issue/ perspective/context and students can reflect and discuss with their peers and comprehend multiple perspectives. It is also significant in social science to relate it to their everyday lives. Like, for example educational visit to neighbouring villages to understand the working of Gram Panchayat and Gram Sabha can be undertaken or visit to National Museum, Parliament Museum etc. aid the teachers to appreciate various digital resources as well as the cultural sites and their significance in the sub-continent. Like the Indus Valley civilization - various artifacts, utensils, pottery and jewellery etc. are on display at the National Museum, Janpath, New Delhi which helps to understand the architecture, people, social and cultural life, advancements in science during that time.

Blended learning style can be used in a social science secondary level classroom. Some of the examples are discussed below:

- While taking a History lesson on the religions in class VI social science class, the teacher can discuss the time period and context of the rise of the 'Buddhism' as a religion. Then, a video to show the life of Siddhartha (Gautama Buddha) can be shown to complement their understanding of the life and context of Buddha apart from elucidating the rise of Buddhism. Further, the Viharas and Vinaya Pitaka and their role in the serving of the Buddhist followers can be explained. This will help to bring out and describe the historical background to the rise of Buddhism and can be done with pictures, videos to help students understand history through visual aids. The lesson afterwards can be proceeded to show the pictures and videos related to the life of Buddha.
- While taking a History lesson on the Mughal dynasty in class VII, students can be grouped in 4-5s and asked to choose any one Mughal emperor and present the significant facts of his life to their peers. Then they will be asked to make a timeline of all these emperors, their period of rule, and their significant life instances and/or socio - economic conditions, political administration. The class will then be asked to take an online quiz on the Mughal dynasty and assess their understanding.
- In Economics class IX, chapter 'Environment and Sustainable Development', the Sustainable Development Goals, Agenda 2030 can be discussed as a part of our everyday life, students can make short video on how it affects their daily life or discuss plans or strategies to protect climate crisis in their community. The recent videos by teenage Swedish activist Greta Thunberg can be discussed on global climate strike in September 2019, which was the largest demonstration on climate in human history.
- The book on 'Social and Political Life' class VII chapter 'Markets around Us' the students may interview the shopkeepers in their neighbourhood market and understand how they get raw materials, supply chain, storage, their challenges etc. or they could take pictures from weekly markets and the items on sale and the variety of goods sold.
- While taking a History lesson on nationalism in India in class X, students can be explained the different phases of the colonial struggle, leaders during the nationalist movement in India while complementing the classroom teaching with resources, audios, videos and instances that have happened during that period, apart from showing pictures and movie clips etc. to describe the nationalist struggle.
- While teaching a Geography lesson on types of drainage system in class IX, students can be shown the different types of drainage systems (images and videos) and will be asked to notice any differences they observe in the drainage systems of Harappan Civilization and now, or it could be done with reference to differences with Indus Valley

Civilization and twenty first century urban planning. Further, similarities and transformations can be discussed in pairs in the class noting down the main points. A detailed discussion and presentation will be held on their observations and then finally the critical analysis, evaluation.

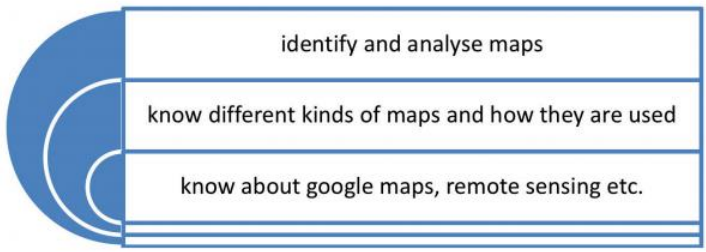
- Another example is from class VII Geography, lessons on Water and Deserts. Students can be presented with online material related to geographical description of deserts in India and any country outside India, climate in deserts, how scarcity of water can affect us, what is the vegetation, flora and fauna at these locations; where we can see the deserts and so on like for example Jaisalmer in India. Along with this, carrying a map in classroom with locations of deserts and places with high rainfall can also be used which will be as extremely helpful. Students can also be asked to fill the locations on their own on a map of India

**Social Science- Sample Lesson Plan**

This section describes the lesson plan from the chapter Maps from class VI. Geography textbook of NCERT, which has tried to explore the different types of maps and explain the concept of distance and direction on a globe and map, use different symbols which will help one to identify different places like hospital, airport, railway station, wildlife sanctuaries etc. Another method can also be used to explore the google maps and how it can be used for day-to-day needs. Like travelling to home, school by bus or car, ordering a pizza from a restaurant and how it's delivered at a designated place. The various aspects can be discussed in the class, and various online resources mentioned below at p. 6 can be explored. The NCERT portal bhuvan (https://bhuvan-app1.nrsc.gov.in/mhrd_ncert/) can be explored by the students, which has various dimensions related to the topic and has varied levels, apart from being fun and entertaining for the learners. There are various additional e-resources for advance learners also, mentioned for the learners who would like to explore and understand other aspects of social science learning.

A sample of blended learning lesson planning and how it can be used is discussed in Table-1.

**Table-1: A sample of blended learning lesson planning**

<table>
<tr><td>Social Science – Geography</td><td colspan="2">Topic - Class VI - Maps Time 40 min</td></tr>
<tr><td>Learning objectives</td><td colspan="2">The learner will be able to-<br> 
</td></tr>
<tr><td>Instructional Design Steps-</td><td colspan="2">• Understand what is a map, distinguish it on a globe<br>• Distinguish between different kinds of maps<br>• Identify distance, direction<br>• Using different symbols, letters, pictures etc. on a map<br>• Know about Google map - remote sensing – GPS<br>Introduction – 2-3 min</td></tr>
<tr><td>Teaching- Learning Process</td><td>Face to Face – Classroom 15 min<br>• Understanding Map;<br>• Different kinds- political, physical, thematic;<br>• Identify distance - small scale map and large scale map;<br>• Recognise about directions, cardinal points;<br>• Symbols - colours, letters, shades, pictures, lines etc., conventional symbols;<br>• Plan, sketch.</td><td>Computer- based/Online Learning- 10 mins.<br>Locating places on map NCERT resources which can be accessed here- https://www.youtube.com/watch?v=NKr8l-CHcszA&list=PLUgLcpnv-1YieVe-Epsww-engrBFlntgB-h&index=69&t=0s<br>A portal developed by NCERT to sensitise the learners about India's physical and natural resources and the environment which can be accessed on the bhuvan app- https://bhuvan-app1.nrsc.gov.in/mhrd_ncert/<br>While the E- course on Geospatial Technology and Remote Sensing can be accessed on https://elearning.iirs.gov.in/ which is IIRS and ISRO joint collaboration.</td></tr>
</table>

| | |
|---|---|
| Learning Outcomes 2-3 mins | • The learner will be able to distinguish among different types of maps, know about cardinal points, different symbols used, and recognise them on a map.<br>• Locate any place on a map.<br>• Use google maps |
| Feedback 5 mins Comments/ Suggestions/Any other | Quiz |

Further, some e- resources which can be used for the social science for advanced learning as given in Table-2.

**Table-2: e- resources which can be used for the Social Science for advanced learning**

| Advanced Resources - NCERT which can be accessed through the following: |
|---|
| **Teaching- Learning Resources in Social sciences** |
| https://www.youtube.com/watch?v=b2Loa-T7Cc8&list=PLUgLcpnv1YieVe-Epsww-engrBFlntgBh&index=94&t=0s |
| **Concept Mapping** |
| https://www.youtube.com/watch?v=_z_Jy_YBxdo&list=PLUgLcpnv1YieVe-Epsww-engrBFlntgBh&index=24&t=0s |
| **Visuals in the teaching of history** |
| https://www.youtube.com/watch?v=o9F95AoIQpk&list=PLUgLcpnv1YieVe-Epsww-engrBFlntgBh&index=41&t=0s |

The next section describes the lesson plan from the chapter Rural Livelihood from class VI. NCERT's textbook of Social and Political Life. The section is more interactive and is engaging for the learners as the content is discussed in the class around rural livelihood, their work and how they earn and their life in the village. The chapter is interesting as it discusses various examples of issues people in rural area face, and the challenges associated with it. The various activities are discussed in the class, which can be done online, which is followed by a Quiz at the end.

The lesson plan from class VI- Social and Political Life is given in Table-3.

**Table-3: Lesson plan from class VI- Social and Political Life**

<table>
<tr><td>Social Science – Social and Political Life</td><td colspan="2">Topic- Class VI- Rural Livelihood (NCERT Textbook) Time 40 min</td></tr>
<tr><td>Learning objectives</td><td colspan="2">The learner will be able to-<br>• Know the functioning and dynamics of rural economic life.<br>• Describe the various factors responsible for availability of different occupations in rural areas.<br>• Classify different types of farmers.<br>• differentiate between farm and non-farm activities<br>• Understand the concepts of debt and debt trap, credit, farmer suicide and factors associated with it.<br>Introduction 5 min</td></tr>
<tr><td>Instructional Design Steps-</td><td>Face to Face – Classroom 15 min<br>• What all things are required to live life in rural India?<br>• What all jobs/work people in villages do to earn a livelihood?<br>• Discuss various activities which go on in a village (kalipattu) like pot making, basket making (non –farm), however the main activity is farming;<br>• Life of landless labour, small farmer, how they get caught in debt trap, which may lead to farmers suicide;<br>• How Thulasi (landless labour), Shekar (small farmer) are different from Ramalingam (rich farmer).</td><td>Computer- based/Online Learning- 10 mins<br>Identify Kalpattu village in Tamil Nadu on the blank map of India<br>Identify the different types of work that are related to farming and those that are not. List these in a table.<br><table><tr><th>RELATED TO FARMING (FARM)</th><th>NOT RELATED TO FARMING (NON FARM)</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table></td></tr>
</table>

| | |
|---|---|
| Learning Outcomes 2-3 mins | • The learner will be able to distinguish among different types of activities undertaken in rural India with the help of examples discussed.<br>• To understand the farming activities and the concept associated like debt trap, loan, credit and factors leading to farmer suicide. |
| Feedback -5 mins Comments/Suggestions/Any other | Quiz<br>Q1.Which is the main source of livelihood in rural areas?<br>a. Farming<br>b. Fishing<br>c. Pot making<br>d. Weaving<br>Q2. Who is most likely to borrow money?<br>a. Small farmer<br>b. Mill owner<br>c. Rich farmer<br>d. Landlord<br>Q3. Which of the following is not a farm activity?<br>a. Sowing<br>b. Ploughing<br>c. Weeding<br>d. Mining<br>Q4. Which of them is a farm activity?<br>a. Fishing<br>b. Dairy produce<br>c. Harvesting<br>d. Pot making<br>Q5. Give 3 examples of non-farm activities. |

**Discussion**

Since social science is a discipline that demands the depth as well as breadth in thoughts and perspectives, apart from developing critical and evaluative skills, blended learning has immense scope to provide children the opportunity to read and understand the various viewpoints, perspectives which may be diverse, contrasting view points on a particular issue through research articles, journals etc. which are available online. Hence, instructions combining online and both face-to-face elements can surely be seen to have a greater advantage relative to purely face-to-face instruction. The resolved of blended learning is to augment education by joining together the online as well as the offline elements of education. Along with this, it appears to lend itself to encouraging student's self-

study interest through online method as the motivation to interact in a newer medium is challenging as well as more productive. Therefore, it somewhere seems to encourage students to learn on their own, without depending much upon the teacher's viewpoints and instructions as it is flexible and offers one the opportunity to learn at one's own pace.

Blended learning has emerged as a growing trend in the arena of 'progressive learning'. It can be viewed as a kind of symbolic way to diminish the gap between 'traditional educations' and connect it with 'digital learning'. It somewhere seems to strive to bring out the balance between the traditional teacher-centered education model as well as the modern computer based model. With the recent push by the government on the use of e-resources and technology at higher education, blended learning is gaining ground and proving to be a valuable resource for all. It is quite useful for learners with diverse needs and contexts. Apart from it, Right To Education (RTE) has mandated learning from home that is home schooling, it is in this context that blended learning assumes significance. There are areas in the classroom teaching especially in social sciences such as, facts, or analytical thinking or different viewpoints, perspectives, which need more elaboration. Here blended learning is most suitable and productive. Further, the learners with diverse needs like with autism or Attention Deficit Hyperactivity Disorder (ADHD) or physical or motor needs, hearing impairment (for details see Rights of Persons with Disability Act 2016 https://www.ncpedp.org/sites/all/themes/marinelli/documents/RPWD%20Act%202016%20Rules-copy-En.pdf) may require additional or advanced resources sometimes to supplement the classroom teaching. Blended learning provides scope to learners who may need customized methods of teaching and are not able to cope up in large classroom. Apart from it, mixing face to face learning and online learning is extremely useful although it is at one's own pace, and blending them together is a specialization, difficult to master, and needs concise articulation and precision with appropriate resources and technology as per the suitable level and class of the learners. It is a valuable source and can be used for practice and encourages learners to stay engaged, apart from being fun and entertaining. One of the keys to develop successful blended learning programme is self-pacing, as it helps learners to stay in touch with the module and ensures that they don't drop off, as students who are focussed learn easily and can work independently. But if students are given some targets or study is planned unit wise, it helps students to retain and sustain the programme, otherwise there is a high possibility of dropping off or not completing the course. It is also essential that diverse learner's are taken care of, in blended learning programme so as to provide audio- video recording, podcast, readable text, etc. should be integrated with technological resources and applications for example for differently abled learners

While generally seen as a 'trend' in 'progressive learning', Blended Learning can also be viewed as a kind of symbolic

gap between 'traditional education and digital learning'. This, of course, does not implies that digital - only is the future and the ultimate incarnation of learning, which is really a short-sighted view. The point, though, is that blended learning is a mix of old and new as much as it is a mix of physical and digital learning. The real strength of blended learning can be said that it can be used as an effective tool to transform the traditional classroom based teaching into a really an interactive one.

We are living in an age where each school is striving to be more competitive and rise in school rankings, thus quality becomes very crucial. Due to the short comings of our traditional education identification of the major factors contributing in this has started. One of the major factors that have emerged in the failure of our education system is the limited scope provided to teachers to adopt and modify their own pedagogical style. By confining teacher's space to only didactic learning, we have shut down the scope of experimenting in classroom with respect to pedagogy. But with the introduction of ICT the 'dream of providing *quality education to all' it can be achieved.*

Among all the strategies introduced with the emergence of ICT, blended learning can be said to be the most likable for both teachers and students. It has provided the scope for both face-to-face as well as of ICT in classroom. It can truly be referred as the blend of computer assisted learning, collaborative teaching and of the instructions provided by the teacher. Thus, ICT mediated learning help children to master their content knowledge through classroom discussions as well as through online mode, including videos, quizzes, tests etc. However, in order to adapt blended courses, what is more crucial is the change in mode of assessment by the teachers, which will give scope and flexibility to learner to adapt to these courses and support them to be more inclusive.

**Conclusion:**

Blended learning supports developing communities of learning in the virtual world, which is one of the major advantages of blended learning, as it can be accessed from anywhere. The 'physical space' as a concept is slowly dwindling, and virtual world allows it to be accessed from anywhere. Blended learning helps one to explore the varied available e-resources and move outside the classroom and impart it with an amalgamation which is quite beneficial and is successfully used at all levels and across the globe. The teachers are the bridging link between the content and the learners and it's in this process, where interesting and meaningful content is developed.

Blended learning is a great tool, but as it is at a nascent stage in India, there are problems with respect to accessibility, speed etc. and institutional support for students and teachers. However, the challenge is related to technological access as the accessibility to computer, laptop, internet, connectivity, speed etc. is quite valid in the Indian context. Apart from it, when it comes to the delivery of classroom - that is, the place to hear audio or video content and interact freely with peers, colleagues, teachers etc. as silent zones in the library or at

home are not easily available; apart from diverse needs of our learners, language is also a constraint at times as the resource material is negligible in vernacular or regional languages like Hindi, Punjabi, etc.

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**Online Resources**


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*Research Article*

# ICT infused Print to Audio Textbooks: Studying the Effect on English and Hindi Reading Comprehension in Inclusive Classroom

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**Abstract**

*The present research attempts to study the effect of ICT based aural reading with the use of handheld device called "Smart Speak" through specially printed textbooks on the English and Hindi reading comprehension of students studying in class 5. Smart Speak looks like a thick pen which converts printed text into speech. This helps students' facing challenges in reading print to meaningfully engage with the printed text. A batch of 31 sighted students and 3 students with Visual Impairments (VI) studying in class 5, in inclusive education settings, formed the sample for this study.*

*After establishing the reading proficiency of participating students in English Braille, English Print, Hindi Braille and Hindi Print, researcher made Reading Comprehension Tests was administered as pre-test. The same reading comprehension test was used both as the pre-test and post-test. The purpose of pre-test was to establish non-familiarity of students with the text selected for the intervention. The use of the same test as post-test provided the measure of effect of intervention on the reading comprehension. The data analysis indicated that the ICT based aural reading intervention was found to be statistically extremely significant in enhancing the reading comprehension in both English and Hindi for students with and without VI studying in inclusive classroom.*

**Keywords:** Reading comprehension, Talking pen, Print to Audio, Audio textbooks, studying language in inclusive classrooms

## Introduction

For sighted persons, reading is usually understood as the skill of decoding the printed text and verbalizing the same. In the absence of sight, for Children With Visual Impairments (CWVI), reading is a tactile experience. CWVI touch the Braille script letter by letter and read it aloud. Another alternative available to CWVI for reading is, reading by hearing, which may be called as "Aural Reading".

A number of audio books in different style of production are available. Cardillo Arniew et al. (2007) discussed that the Audio Books are available in read along, single voice narration and full cast audio production format. They also highlighted that audio books would be useful for adolescent readers by providing reading time during transit, serving as model of verbal fluency and by motivating the reluctant readers.

The usage of audio books (both, school-books and books of various genres, recorded on digital media) for preadolescents and adolescents

with developmental dyslexia, during experimental research showed a significant improvement in reading accuracy with reduced unease and emotional–behavioural disorders, as well as an improvement in school performance and a greater motivation and involvement in school activities (Milani, Anna. Luisa Maria et al., 2010), and improved reading fluency, expanded vocabulary, developed comprehension and improved achievement in the adolescents sighted learners (Wolfson. Gene, 2008).

Many studies reported that audio books would be useful in enhancing the language skills of students who are either struggling to read, require special attention, need help in vocabulary building, learning English as second language and need support to stay motivated to read (Milani, Anna; Luisa Maria et al., 2010; Winqwist, Therese, 2010;Wolfson. Gene 2008; Wellner. M, 2008). However, Winqwist, Therese (2010) reported that seventh grade students without disabilities favoured reading over listening as they can read at their own speed and see the pictures in the book. Another study (Wellner M, 2010) revealed that three kindergarteners' experience with audio books varied but they definitely developed positive attitude towards books and reading.

Renee et al. (1996) explored the possibility of including audio books in the children formal reading programme and found that audiotapes could be beneficial to all students but it was indispensable for those with special needs, like, children with low vision or with visual perceptual problems and children who are auditory learner. Children with Attention Deficiency Hyperactivity Disorder (ADHD) can also benefit from audiotapes as it frees them from continuously sitting at one place to read.

The other benefits of using audio books include introduction of higher level material, including children with special needs (Hsien and Chen, 2004), motivating unwilling readers, enhancing listening comprehension, language competency and improvement in achievement (Maria and Signes, 2014). The challenges identified were accessibility of playback devices, cost involved, technical issues and production time.

No study could be located where usage of audio books was studied for CWVI.

**Problems with Braille Books**

The Braille textbook are quite bulky as compared to the printed textbooks and often needs to bound in different volumes for ease of handling by the child. It may happen that, in the absence of Braille and audio textbooks, the CWVI were bound to sit as passive recipients in the classroom. Even if children are using Braille Books seated in inclusive classroom than neither the teacher nor the sighted peers are aware of the page number in the Braille Book, of the text being focussed presently in the classroom. The text appearing in the Braille book on a particular page may not be same as the printed books.

Is Braille the only possible solution of addressing the issue of equity and equality for CWVI studying in the schools? Can the bulkiness of Braille books be reduced, so that they become student friendly? Is there a technology which allows usage of same printed material by both children with and

without VI? The present paper explores and studies the technology based solution that is usage of smart speak for CWVI, in inclusive classrooms.

### Specific Objectives

1. To study the effect of technology based audio input on Hindi language comprehension of children reading print and aurally (ICT based).
2. To study the effect of technology based audio input on English language comprehension of children reading print and aurally (ICT based).
3. To study the preferred mode of reading (Braille or aural or print) along with reasons by children with and without Visual Impairment
4. To study the usage of Smart Speak by children with and without Visual Impairment

### Hypotheses

The following were the hypothesis of this study:

1. There is no significant difference in Hindi Reading Comprehension of children with and without Visual Impairments reading from print andaural.
2. There is no significant difference in English Reading Comprehension of children with and without Visual Impairment reading from print and aural.

### Operational Definitions

- Aural Reading: It has been defined as reading the printed text by utilizing the sense of hearing. In simple words this may also be called as reading with the help of ears.
- Print to sound convertor: It is an interactive electronic device which can convert print into sound line by line or page wise. It is available in the market by the name smart speak.
- Aural reader: The printed text which is pre-coded or specially prepared for use with the smart-speak. The thickness of paper used for this text is slightly more than the normal printed paper used for printing textbooks.
- Comprehension: It is defined as the ability to understand, explain and retain the content read. This may be judged via test to be taken after the reading session is over.
- Children with Visual Impairments: For the purpose of study children with visual impairments are the ones who find it difficult to use vision for day to day activities and corrected glasses are not of much use to them. These children can't benefit from large or regular print text books. The children with blindness will form the sample of the study.

### Methodology

### Sample

Population comprised of students studying in class five in the schools of Delhi. Students with and without visual impairments studying in class 5 with similar level of education and reading efficiency in Hindi and English language

formed the sample of the study. In all, 3 students with VI and 31 students without VI (sighted) participated in the study.

**Research Setting**

The setting for this research comprised of the inclusive school. In inclusive school setting, the children with and without VI share the physical space of the classroom and study together through the teaching learning activities planned by the content teacher, engaged in the curriculum transaction. A school with 31 sighted students and 3 students with VI, studying in class 5, became the sample for the study.

**Tools**

1. Print reading efficiency test

   Printed text consisting of a poem named "छोटी सी हमारी नदी" from "Rimjhim", NCERT textbook class 5, comprised of 22 lines and 170 words excluding title and name of the poet was used for establishing print reading efficiency in Hindi.

   A text consisting of a poem titled "Sing a song of people" from "Marigold" NCERT English textbook for class 5 consisting 8 stanzas, 4 lines each, with a total of 120 words was used for establishing print reading efficiency in English.

   Each sample child was provided the photocopy of the text to read and their errors, if any, were recorded, with their names, and the time taken to read the given text.

2. Braille reading efficiency test

   Braille reading efficiency was also assessed for both Hindi and English Language. The texts used for assessing the print efficiency in Hindi "छोटी सी हमारी नदी" and English "Sing a song of people" printed in Braille served the purpose of Braille efficiency test.

3. Reading comprehension Test

   Researcher made reading comprehension test from the selected chapters from the second term syllabus in, Hindi and English for class 5. The items from the selected lessons (4 for English namely Class Discussion, The Talkative Barber, Topsy-Turvy Land and Gulliver Travel; 5 in Hindi namely एक दिन की बादशाहत चावल की रोटियाँ गुरु और चेला बिना बीज का पेड़ और स्वामी की दादी) were prepared and pilot tested. Initially the reading comprehension tests, in both languages, had more than 60 items. Pilot testing of the reading comprehension tests, and consequent difficulty index analysis, led to final selection of 35 items for each test. Each item was objective type, with four options. The respondents were requested to put a tick (√) mark indicating their choice of option as their answer.

   The same reading comprehension test was used both as the pre-test and post-test. The purpose in the use as pre-test was to establish non-familiarity of students with the text selected for the intervention. The use of same test as post-test provided the measure of intervention impact on reading comprehension.

4. Test for Preferred mode of reading

   A separate tool was developed to assess the sample students' preference for print, Braille or Aural reading. This test comprised of 7 questions, and includes both objective and descriptive type of questions. This test was also field tested before finalization.

5. Usage of Smart Speak

   During the research study the sample students were exposed to Smart Speak for the first time. Usage of Smart Speak Questionnaire gauged the students comfort level with the device used by them and to also seek suggestions for further improvements in the device and its output. Concerns related to different aspects of Smart Speak were listed in the questionnaire, such as pronunciation, pace of speech, handling the device; technology enabled printed text, tactile markings, earphone usage etc. Test comprised of 12 questions, where students were expected to rate the concerns on a 4 point rating scale as Never, Sometimes, Frequently and Always.

## Variables

ICT based aural reading was taken as the independent variable. The dependent variables were the English Reading Comprehension and Hindi Reading Comprehension. Student's age and educational level was controlled by selecting purposive sample from the population of class 5 students studying in government aided and recognized school of Delhi.

## Data Collection

The data collection, from 3 students with VI and 31 students without VI (sighted), was done in two phases, as detailed below:

- Pre-intervention phase
  - Reading efficiency Hindi (Print and Braille)
  - Reading efficiency English (Print and Braille)
  - Pre-test reading comprehension Hindi
  - Pre-test reading comprehension English
- Post-intervention Phase
  - Post-test reading comprehension Hindi
  - Post-test reading comprehension English
  - Usage of smart speak
  - Preferred mode of reading

Each child whether sighted or VI was given the same test, though the modalities varied as per the presence or absence of the impairment.

## Data Analysis

### Pre-intervention Analysis of reading efficiency of sample students

The print or Braille reading efficiency in Hindi and English, of the sample students depending on the presence or absence of impairments, was assessed. The time taken by each child to read the text, and the errors such as wrong pronunciation, omissions, additions, and require assistance for reading was recorded. Table-1 provides data for calculating the local norms for reading efficiency of the sample students.

**Table-1: Error Analysis of Print/Braille Reading Efficiency Test (English)**

| S. No. | Mispronounced | | Omitted | | Addition | | Assisted | | Total Mistakes | | Time (in mins) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Eng | Hin | Eng | Hin | Eng | Hin | Eng | Hin | Eng | Hin | Eng | Hin |
| 1. | 2 | 20 | 18 | 1 | 1 | 0 | 2 | 1 | 23 | 22 | 2 | 2 |
| 2. | 1 | 14 | 20 | 0 | 0 | 0 | 0 | 1 | 21 | 15 | 1 | 3 |
| 3. | 0 | 7 | 18 | 2 | 1 | 0 | 1 | 1 | 20 | 10 | 1 | 3 |
| 4. | 1 | 3 | 18 | 1 | 0 | 0 | 0 | 1 | 19 | 5 | 1 | 1 |
| 5. | 0 | 6 | 19 | 1 | 0 | 0 | 0 | 0 | 19 | 7 | 1 | 3 |
| 6. | 13 | 21 | 18 | 2 | 0 | 0 | 5 | 2 | 36 | 25 | 4 | 4 |
| 7. | 1 | 10 | 16 | 4 | 0 | 0 | 2 | 6 | 19 | 20 | 1 | 3 |
| 8. | 0 | 5 | 0 | 1 | 0 | 0 | 3 | 3 | 3 | 9 | 1 | 3 |
| 9. | 0 | 7 | 1 | 2 | 0 | 0 | 1 | 0 | 2 | 9 | 1 | 3 |
| 10. | 1 | 2 | 18 | 2 | 0 | 0 | 1 | 2 | 20 | 6 | 1 | 2 |
| 11. | 0 | 7 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 7 | 1 | 3 |
| 12. | 20 | 26 | 1 | 4 | 0 | 0 | 1 | 0 | 22 | 30 | 4 | 7 |
| 13. | 4 | 27 | 18 | 2 | 0 | 0 | 0 | 0 | 22 | 29 | 1 | 4 |
| 14. | 10 | 23 | 15 | 5 | 1 | 0 | 0 | 0 | 26 | 28 | 2 | 3 |
| 15. | 1 | 18 | 19 | 3 | 1 | 0 | 0 | 0 | 21 | 21 | 1 | 2 |
| 16. | 1 | 18 | 17 | 51 | 0 | 0 | 0 | 0 | 18 | 69 | 1 | 3 |
| 17. | 1 | 8 | 19 | 1 | 1 | 0 | 0 | 0 | 21 | 9 | 1 | 3 |
| 18. | 1 | 9 | 18 | 13 | 1 | 0 | 0 | 0 | 20 | 22 | 1 | 3 |
| 19. | 0 | 12 | 19 | 3 | 1 | 1 | 0 | 0 | 20 | 16 | 1 | 2 |
| 20. | 2 | 9 | 20 | 2 | 0 | 0 | 0 | 0 | 22 | 11 | 2 | 3 |
| 21. | 0 | 3 | 1 | 2 | 0 | 0 | 0 | 0 | 1 | 5 | 1 | 1 |
| 22. | 1 | 4 | 19 | 1 | 1 | 1 | 0 | 1 | 21 | 7 | 1 | 3 |
| 23. | 4 | 21 | 19 | 2 | 0 | 0 | 1 | 0 | 24 | 23 | 2 | 12 |
| 24. | 1 | 12 | 7 | 2 | 0 | 0 | 0 | 0 | 8 | 14 | 1 | 2 |
| 25. | 2 | 13 | 22 | 6 | 0 | 0 | 0 | 0 | 24 | 19 | 1 | 2 |
| 26. | 2 | 16 | 19 | 2 | 0 | 0 | 0 | 0 | 21 | 18 | 1 | 3 |
| 27. | 1 | 4 | 20 | 1 | 1 | 0 | 0 | 1 | 22 | 6 | 2 | 1 |
| 28. | 4 | 18 | 8 | 3 | 0 | 0 | 0 | 1 | 12 | 22 | 2 | 4 |
| 29. | 4 | 15 | 0 | 3 | 1 | 0 | 0 | 2 | 5 | 20 | 3 | 3 |
| 30. | 3 | 8 | 1 | 1 | 1 | 0 | 0 | 2 | 5 | 11 | 2 | 3 |
| 31. | 1 | 20 | 3 | 0 | 0 | 0 | 0 | 0 | 4 | 20 | 1 | 3 |
| 32. | ***1*** | ***0*** | ***0*** | ***1*** | ***0*** | ***0*** | ***4*** | ***4*** | ***5*** | ***5*** | ***5*** | ***4*** |
| 33. | ***2*** | ***9*** | ***0*** | ***2*** | ***1*** | ***0*** | ***5*** | ***0*** | ***8*** | ***11*** | ***4*** | ***8*** |

| 34. | *6* | *9* | *0* | *0* | *1* | *0* | *1* | *0* | *8* | *9* | *4* | *5* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average | **when N=34** 2.67= 2.7= 3 (Eng) 12 (Hin) **when N=31** 2.64 (Eng) 12.45 (Hin) **when N=3** 3 (Eng) 6 (Hin) | | **when N=34** 12.11= 12 (Eng) 4 (Hin) **when N=31** 13.29 (Eng) 3.97 (Hin) **when N=3** 0 (Eng) 1 (Hin) | | **when N=34** 0.38= 0.4 (Eng) 1.6 (Hin) **when N=31** 0.35 (Eng) 0.06 (Hin) **when N=3** 0.67 (Eng) 0 (Hin) | | **when N=34** 0.82= 0.8 (Eng) 0.8= 1 (Hin) **when N=31** 0.58 (Eng) 0.77 (Hin) **when N=3** 3.34 (Eng) 1.34 (Hin) | | **when N=34** 16 (Eng) 16.7 (Hin) **when N=31** 16.87 (Eng) 17.26 (Hin) **when N=3** 7 (Eng) 8.34 (Hin) | | **when N=34** 1.73 (Eng) 3.35 (Hin) **when N=31** 1.48 (Eng) 3.13 (Hin) **when N=3** 4.34 (Eng) 5.67 (Hin) | |

The data marked in bold in table above is for students with VI.

**Local Norms**

**English Language**

For inclusive classroom (all 34 students considered as one unit)

*Students reading the given text within 1.7 minute with less than 16 mistakes of any kind were assumed to be efficient readers.*

For print efficiency in reading English language (all 31students)

*Students reading the given text within 1.48 minutes with less than 17 mistakes of any kind are assumed to be efficient print readers in English language.*

For Braille efficiency in reading English language (3 students)

*Students reading the given text within 4.34 minutes with less than 7 mistakes of any kind are assumed to be efficient Braille readers in English language.*

**Hindi Language**

For inclusive classroom (all 34 students considered as one unit)

*The efficient reader would be a student making less than 16 mistakes and reading the given Hindi text in less than or equal to 3 minutes.*

For print efficiency in reading Hindi language (31students)

*Students reading the given text within 3.13 minutes with less than 17 mistakes of any kind are assumed to be efficient readers.*

For Braille efficiency in reading Hindi *language (3 students)*

*Students reading the given text within 5.67 minutes with less than 8 mistakes of any kind are assumed to be efficient Braille readers.*

**Inferences**

English Print efficient readers = 6 students out of 31

English Braille efficient readers = 2 students out of 3

Hindi Print efficient readers = 16 students out of 31

Hindi Braille efficient readers = 1 student out of 3

### Data analysis for reading comprehension–Pre and post intervention

Table-2 indicates that average mark scored by students in reading comprehension was 10.76 or 30 percent (English) and 10.35 or 29 percent (Hindi), out of maximum 35 marks. This average score might be due to objective nature of the test items, which has possibility of answering correctly even when the respondent is not aware or ignorant of the correct answers. Samuel B. Lyerly (1951), University of North Carolina, reported, an equation proposed by Hamilton for correction of error due to chance guessing of correct answers in objective type of tests. This equation known as Hamilton's equation is based upon the known or assumed distribution of examinee's knowledge, i.e. the distribution of scores which would be obtained if guessing were excluded and each respondent answered only those items which he/she "knew" and refrained from marking those which was not known.

According to Hamilton's formula, the estimated true score (Si) can be calculated as:

$Si = (k\ Ravg - n)\ Ri / (k-1)Ravg$

Where,

Si= estimated true score of individual 'i'

k= number of alternatives per item =4 for present research

Ri=raw score (number of items correctly answered) of individual 'i'

Ravg =mean raw score =10.76 (English) and 10.34 (Hindi) for present research

n= number of items in the test=35 for present research

Applying this formula to the individual raw scores, for reading comprehension test in Hindi and English, Si, for each responding student was generated.

The average for estimated pre-test true score (calculated for each respondent separately for Hindi and English, using Hamilton's formula) is 2.56 and 2.07 respectively, for Hindi and English. This establishes that the responding students were unfamiliar with the text planned for the intervention.

### Post Intervention

As mentioned earlier, the post intervention phase, witnessed the administration of post-test for reading comprehension in English and Hindi language, preferred mode of reading and ease of use with smart speak device and customized textbooks.

The data analysed is presented in Table-2.

**Table- 2: Average mark scored by students in reading comprehension**

| S. No. | Scores of English comprehension, Max marks = 35 | | | | Scores of Hindi comprehension, Max marks = 35 | | | |
|---|---|---|---|---|---|---|---|---|
| | Ri (Post-test) | Ri (pre-test) | Si (Post-test) | Si (Pre-test) | Ri (Post-test) | Ri (Pre-test) | Si (Post-test) | Si (Pre-test) |
| 1. | 25 | 16 | 19.55 | 3.84 | 26 | 14 | 21.37 | 2.8 |
| 2. | 16 | 9 | 12.51 | 2.16 | 23 | 11 | 18.90 | 2.2 |
| 3. | 26 | 11 | 20.33 | 2.64 | 28 | 17 | 23.01 | 3.4 |
| 4. | 19 | 16 | 14.86 | 3.84 | 26 | 12 | 21.37 | 2.4 |
| 5. | 25 | 17 | 19.55 | 4.08 | 22 | 7 | 18.08 | 1.4 |
| 6. | 27 | 13 | 21.12 | 3.12 | 25 | 10 | 20.55 | 2.0 |
| 7. | 29 | 7 | 22.68 | 1.68 | 20 | 12 | 16.44 | 2.4 |
| 8. | 19 | 16 | 14.86 | 3.84 | 13 | 11 | 10.68 | 2.2 |
| 9. | 19 | 8 | 14.86 | 1.96 | 28 | 8 | 23.01 | 1.6 |
| 10. | 27 | 14 | 21.12 | 3.36 | 17 | 11 | 13.97 | 2.2 |
| 11. | 29 | 13 | 22.68 | 3.12 | 27 | 12 | 22.19 | 2.4 |
| 12. | 20 | 10 | 15.64 | 2.4 | 21 | 9 | 17.26 | 1.8 |
| 13. | 31 | 15 | 24.24 | 3.6 | 20 | 12 | 16.44 | 2.4 |
| 14. | 16 | 9 | 12.51 | 2.16 | 21 | 7 | 17.26 | 1.4 |
| 15. | 14 | 3 | 10.95 | 0.72 | 26 | 7 | 21.37 | 1.4 |
| 16. | 11 | 10 | 8.60 | 2.4 | 24 | 12 | 19.72 | 2.4 |
| 17. | 15 | 12 | 11.73 | 2.88 | 20 | 5 | 16.44 | 1.0 |
| 18. | 9 | 10 | 7.04 | 2.4 | 20 | 10 | 16.44 | 2.0 |
| 19. | 23 | 9 | 17.99 | 2.16 | 24 | 12 | 19.72 | 2.4 |
| 20. | 14 | 7 | 10.95 | 1.68 | 27 | 11 | 22.19 | 2.2 |
| 21. | 28 | 12 | 21.90 | 2.88 | 19 | 12 | 15.61 | 2.4 |
| 22. | 23 | 12 | 17.99 | 2.88 | 22 | 8 | 18.08 | 1.6 |
| 23. | 15 | 2 | 11.73 | 0.48 | 21 | 6 | 17.26 | 1.2 |
| 24. | 21 | 4 | 16.42 | 0.96 | 27 | 12 | 22.19 | 2.4 |
| 25. | 20 | 10 | 15.64 | 2.4 | 20 | 6 | 16.44 | 1.2 |
| 26. | 22 | 13 | 17.20 | 3.12 | 26 | 8 | 21.37 | 1.6 |
| 27. | 26 | 7 | 20.33 | 1.68 | 18 | 11 | 14.79 | 2.2 |
| 28. | 27 | 15 | 21.12 | 3.6 | 26 | 10 | 21.37 | 2.0 |
| 29. | 21 | 7 | 16.42 | 1.68 | 22 | 10 | 18.08 | 2.0 |
| 30. | 25 | 9 | 19.55 | 2.16 | 23 | 11 | 18.90 | 2.2 |
| 31. | 21 | 16 | 16.42 | 3.84 | 27 | 9 | 22.19 | 1.8 |
| 32. | ***17*** | ***10*** | ***13.29*** | ***2.4*** | ***24*** | ***11*** | ***19.72*** | ***2.2*** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 33. | ***18*** | ***11*** | ***14.08*** | ***2.64*** | ***20*** | ***12*** | ***16.44*** | ***2.4*** |
| 34. | ***22*** | ***13*** | ***17.20*** | ***3.12*** | ***23*** | ***16*** | ***18.90*** | ***3.2*** |
| | Ravg (Eng Pre test) 10.76 Ravg (Eng Post test) 21.17 | | Savg (Eng pre test) 2.56 Savg (Eng post test) 16.56 | | Ravg (Hindi pre test) 10.35 Ravg (Hindi post test) 22.82 | | Savg( Hindi pre test) 2.07 Savg (Hindi post test) 18.75 | |

The average value for the estimated true vales of post-test was found to be much higher, as compared with the pre-test averages, this clearly indicates comparatively enhanced familiarity of students with the text. In other words, this indicates that students reading comprehension after the intervention was found to be much better.

**t-test**

**Table-3: Reading Comprehension English Language**

| | Pre-test | Post-test |
|---|---|---|
| Mean | 2.58=3 | 16.56=17 |
| SD | 0.92 | 4.29 |
| SEM | 0.16 | 0.74 |
| N | 34 | 34 |

t= 20.24, df=33, standard error of difference =0.69

**Confidence interval:**

The mean of post-test minus pre-test = 13.9759= 14

95% confidence interval of this difference: From 12.57 to 15.38

**P value and statistical significance:**

The two-tailed P value is less than 0.0001. By conventional criteria, this difference is considered to be extremely statistically significant. In other words, the probability of this difference in mean to occur by chance is one in thousand. Nine hundred ninety nine times, out of one thousand, the difference in mean is due to the intervention.

The null hypothesis "There is no significant difference in English Reading Comprehension of children with and without Visual Impairment reading from print, aural and Braille" is henceforth rejected.

**Table-4: Hindi Language**

| | Pre-test | Post-test |
|---|---|---|
| Mean | 2.07 | 18.76 |
| SD | 0.53 | 2.90 |
| SEM | 0.09 | 0.49 |
| N | 34 | 34 |

t=34.01, df=33, standard error of difference =0.49

**Confidence interval:**

The mean of pre-test minus post-test = 16.7

95% confidence interval of this difference: From 15.68 to 17.68

**P value and statistical significance:**

The two-tailed P value is less than 0.0001. This is statistically highly significant. Hence the null hypothesis that "There is no significant difference in Hindi Reading Comprehension of children

with and without Visual Impairments reading from print, aural and Braille" is rejected, and it can be inferred that the, 999 times out of 1000, the difference in mean is due to the intervention given, rather than the chance factor.

**Data analysis for preferred mode of reading**

All respondents admitted using the device that can read the printed text. Respondents were further probed for exposure of this device, prior to the present research. 27 sighted respondents (87 percent) mentioned that they have used this device in the classroom and the 4 sighted respondents (13 percent) indicated that they have used similar kind of device outside the classroom, that is, in fairs, home etc. On the other hand the three respondents with VI denied using similar device outside the classroom, prior to participating in the present research. This may indicate that a device that can convert printed text into audio is an upcoming technology, and is not easily available to the masses.

Further regarding comparison between the device used in the classroom as part of the research and outside the classroom, indicated that 24 (77 percent) of the responding sighted students preferred the classroom device while 3 (9 percent) students preferred outside classroom device and 4 (13 percent) chose not to respond. Majority of the sighted respondents indicated liking for the classroom device, this might be due to lack of exposure to any other similar kind of device. This part of the survey became redundant for the respondents with VI as they have denied using similar kind of device outside classroom, prior to participation in the present research.

The reasons provided by the responding sighted students for liking the device varied from- can read through hearing (13 percent), novelty of the device (30 percent), sharing with friends (13 percent) and can read even if you have difficulty in pronunciation (13 percent). The sighted students with exposure to similar device outside classroom stated that the outside classroom device was better as it had added feature of explaining the rule of the game (Ludo, snakes and ladders) they were playing with the help of device. One respondent also mentioned that if he/she had to use the device outside the classroom than they have to spend money. The students with VI liked reading with the device as it could read the printed text, in other words the printed text became accessible to them.

The pie chart presents the experience of students with smart speaks inside the classroom. 100 percent of the responding sighted students had positive experience with the device though their responses indicated that their experience varied in degrees of good, very good and outstanding.

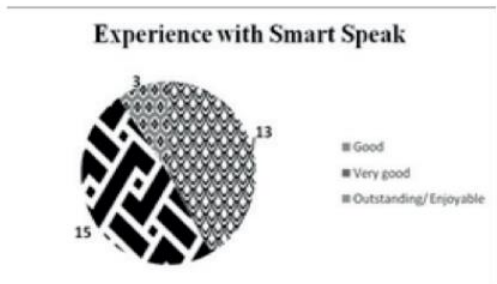


**Figure – 1**

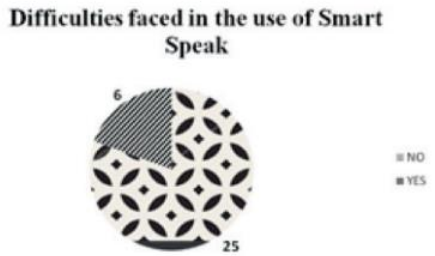


**Figure – 2**

Figure-2 is for the responses seeking the opinion of the responding sighted students' regarding difficulties faced during the usage of smart speak, wherein the majority (25/31=80 percent) said no difficulty was faced. The remaining 20 percent indicated that the difficulty faced was due to ear phone not working (10 percent) and the device got switched off in between (6 percent).

On the other hand, the 2 students with VI out of three faced no difficulty while reading with smart speaks, in inclusive classroom setting. One student with VI who faced the difficulty in the use of smart speak, mentioned that though he/she enjoyed reading with smart speak the difficulty was faced due to the earphones.

Next, the responding sighted students were asked, "If given a chance how they would like to read with smart speak or without smart speak? And why". The response analysis is presented in figure -3.

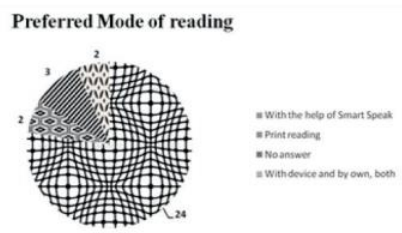


**Figure – 2 Response analysis**

Majority of the responding sighted students (77 percent), preferred reading with the smart speak. The reasons for preference varied from enjoyable to read with smart speak (16 percent), effortless reading (19 percent), ease of use (16 percent) and quick reading (6 percent). All the three students with VI, preferred to read with the smart speak. The reasons for choosing or preferring to read with smart speak over Braille, as mentioned by the responding students with VI includes reading through Braille is tough; this is more enjoyable and provides effortless reading.

## Data analysis for usage of Smart Speak

To assess the ease in using smart speak, a 12 item checklist was administered in the inclusive classroom room. Around 50 percent of the responding sighted students found the voice of the device both, in Hindi as well as in English always clear where as 100 percent of the students with VI found the voice in both Hindi and English to be always clear, with clear pronunciation and audibility. The pronunciation and audibility in Hindi (64 percent) was always found to be better than in English (58 percent), by sighted students. Ease of identification of tactile markings was reported to be (always 33 percent, frequently 67 percent) for the pictures and (always 67 percent, frequently 33 percent) for the text, by respondents with VI. All the respondents with VI felt that the tactile markings were never in excess. The opinion of sighted students were found to be mixed with respect to the ease in identification of tactile markings (always 51 percent for texts, always 54 percent for pictures)

and number of tactile points (never 13 percent, always 45 percent). All the respondents with VI opined that the speed of speech was never fast where as 35 percent sighted students found the speed of speech to be never fast, the rest of the sighted respondents' were of mixed opinion (sometimes 16 percent, frequently 12 percent, always 33 percent). The respondents with VI expressed their willingness to use the device (always 100 percent), as it was convenient to use (67 percent), all keys on the device were easy to identify via touch and convenient use of earphone (67 percent).

**Major Findings**

- The null hypothesis "there is no significant difference in Hindi Reading Comprehension of children with and without Visual Impairments reading from print, aural and Braille" was rejected as the P values at the 0.0001 was indicating the difference in mean to be statistically extremely significant.
- The intervention was found to be beneficial for enhancing the reading comprehension in Hindi for students with and without VI studying in the inclusive education setting.
- The intervention was found to be beneficial in enhancing the reading comprehension in Hindi for students with VI studying in inclusive classroom.
- The intervention was found to be beneficial in enhancing the reading comprehension in Hindi for sighted students studying in inclusive classroom.
- The null hypothesis "there is no significant difference in English Reading Comprehension of children with and without Visual Impairments reading from print, aural and Braille" was rejected as the P values at the 0.0001 was indicating the difference in mean to be statistically extremely significant.
- The intervention was found to be beneficial for enhancing the reading comprehension in English for students with and without VI studying in the inclusive education setting.
- The intervention was found to be beneficial in enhancing the reading comprehension in English for students with VI studying in inclusive classroom.
- The intervention was found to be beneficial in enhancing the reading comprehension in English for sighted students studying in inclusive classroom.
- Majority of the responding sighted students (77 percent), preferred reading with the Smart Speak.
- The reasons for preference of Smart Speak over print by sighted students, varied from enjoyable to read with smart speak (16 percent), effortless reading (19 percent), ease of use (16 percent) and quick reading (6 percent).
- Students with VI (100 percent) preferred to read with the smart speak. The reasons for preferring to read with smart speak over Braille includes reading through Braille is tough; this is more enjoyable and

provides effortless reading.

- 27 sighted respondents (87 percent) mentioned using this device in the classroom only and the 4 sighted respondents (13 percent) mentioned using similar kind of device outside the classroom, in fairs, home etc. whereas as respondents with VI (100 percent) denied using similar device outside the classroom, prior to participating in the present research.
- 100 percent of the responding sighted students had positive experience.
- Students with VI (67 percent) faced no difficulty while reading with Smart Speak, in inclusive classroom setting, while the rest (33 percent) who reported facing difficulty in the use of smart speak, mentioned that though the experience of reading with smart speak was enjoyable the difficulty was faced due to the earphones.
- 100 percent of the students with VI found the voice in both Hindi and English to be always clear, with clear pronunciation and audibility.
- The pronunciation and audibility in Hindi (64 percent) was always found to be better than in English by 58 percent sighted students.
- Ease of identification of tactile markings was reported to be (always 33 percent, frequently 67 percent) for the pictures and (always 67 percent, frequently 33 percent) for the text, by respondents with VI.
- All the respondents with VI felt that the tactile markings were never in excess.
- The opinion of sighted students were found to be mixed with respect to the ease in identification of tactile markings (always 51 percent for texts, always 54 percent for pictures) and adequacy of number of tactile points (never 13 percent, always 45 percent).
- The respondents with VI expressed their willingness to use the device (always 100 percent), as it was convenient to use (67 percent), all keys on the device were easy to identify via touch and convenient use of earphone (67 percent).

**Results**

The ICT based aural reading modality in the format of customized textbooks and handheld device was experimented in the inclusive education setting with the purpose to observe the impact on reading comprehension in English and Hindi, for students studying in class 5. The data analysis indicated that the ICT based aural reading intervention was statistically extremely significant for both languages in inclusive education setting. The intervention was also found to be effective for students with and without VI.

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*Research Article*

# A Detailed Study on Application of Mathematical Modeling Technology by Computer Sciences Research scholars in the selected Universities of Tamil Nadu State- Case Study Report

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**Abstract**

*The successful innovative process in any computer sciences research is based on effective implementation of mathematical modeling techniques. Recently, the Computer sciences research organizations in India and abroad ignored the importance of mathematical modeling techniques in their research process and gave no places in their curriculum. In the present study the investigator applied random sampling on research scholars and has tried to formulate eight hypotheses connecting the innovative and implementation variables and examined the relationships between innovative and implementation variables. By using regression analysis as well as by Scaffee's Post hoc test, the result demonstrated that innovative and implementation variables are significantly related. This implies that implementation of mathematical modeling technology in the computer sciences research was not successful. The investigator tried to identify the factors that would determine the successful implementation of mathematical modeling technology in the said research field. It is critically important that mathematically trained and technologically competent research experts should be appointed and utilized as resources in the computer research policy making bodies. Research organization with mathematical modeling facility should collaborate with those that lack those that lack them to provide all research activities and an opportunity to witness, learn from successful modeling related experiments.*

**Key Words:** computer sciences research scholars, mathematical modeling, compatibility, complexity, Spearman correlation, F-test T-test and Scaffee's Post hoc test.

## Introduction

Recently, the computer sciences research institutions worldwide ignored the importance of mathematical modeling technology practices among the research scholars and gave no place in their research curriculum. They ignored the critical input of mathematical modeling knowledge which is ultimately the key agents as regards conceptualizing and planning to make a breakthrough.

While ideally this radical departure from linear approach should have had a negative impact on computer sciences

research practices and technical viability of research process, it nevertheless enjoyed significant success. The application of mathematical modeling techniques become major problem in today's computer science research field. The investigator is concerned with lack of mathematical modeling techniques and has tried to identify the factors in order to improve the application of mathematical modeling in computer sciences research practices.

The immediate commitment of any computer sciences research organization is that all the research scholars must develop, sharpen and deepen their understanding of mathematical modeling technique and its process. For this to occur a rigorous mathematical research curriculum must be recognized, taught and assessed in a problem solving environment.

The computer science research educational system in India particularly, the research organization is viewed as the driving force in development of our county (Singh and Misra, 2011). Mathematical modeling may have an impact on major industrial problem such as cost reduction and improvement of the device performance and efficiency (Paul and Jebaraj, 2014). Creation of knowledge based technological innovation and their commercialization through technology incubation would boot scholar's participation in knowledge creation and transfer process (Awasthi, Misra and Shahi, 2006).

By quickly building human resources with key knowledge and skill, the research organizations can help to develop responsiveness in the labor market (Burkman, 2010). Studies revealed that research organizations' culture and research practices play an important role in any research process. The main issues, which emerged, have been presented here in the form of following hypotheses.

**Hypotheses of the Study**

The hypotheses of the study were stated as follows:-

Null Hypothesis - 1 There is no significant relationship between utilization with some selected independent variables compatibility, complexity.

Null Hypothesis - 2 There is no significant relationship between satisfaction with some selected independent variables compatibility and complexity.

Null Hypothesis - 3 There is no significant relationship between implementation with some selected independent variables compatibility, complexity.

Null Hypothesis - 4 There is no significant difference among different computer sciences scholars in utilization, satisfaction and implementation of mathematical modeling technology.

Null Hypothesis – 5 There is a significant difference between M.Phil., and Ph.D., computer sciences research scholars in utilization, satisfaction and implementation of mathematical modeling.

Null Hypothesis - 6 There is no significant difference among utilization, satisfaction and implementation of Mathematical modeling technology.

Null Hypothesis - 7 There is no difference in utilization of mathematical modeling by different computer sciences research

scholars.

Null Hypothesis - 8 There is no difference in satisfaction of mathematical modeling by different computer science research scholars.

## Methodology

### Research design

The investigator applied diffusion theory in order to investigate the degree of adoption of mathematical modeling by computer research scholars in the selected universities of Tamil Nadu. Thus, Roger's (1995) diffusion theory becomes the best frame work for the present study. The diffusion theory emphasize five attributes namely, attitude, relative advantage, compatibility, complexity, and observability. The same characteristics were collected from the participants using appropriate research tool (Rao, 1993) and statistical analyses are used to draw the inference and conclusion.

### Variables study

The variables are important to state the nature of expected relationship in investigation planned and carried out by the research to gather evidence relevant to the two or more variables. In the present study independent and dependent variables were taken into consideration.

### Independent variables

Independent variables were manipulated by the investigator and in the present research study five independent innovative variables namely; attitude, relative advantage, compatibility, complexity and observability were taken for study.

### Dependent variables

Dependent variables were not manipulated. It was the cause-effect of independent variables on which the effect of the changes was observed and the values were hypothesized and in the present study the dependent variables selected were utilization, satisfaction and implementation variables.

### Control Variables

Sometimes uncontrollable variables that are not manipulated may have indirect influence upon dependent variables. These may have a significant impact on the outcome of the research study. The extraneous variable considered in the present study were research scholars' familiarity with mathematical modeling, whether they are presently using mathematical modeling or not, average time spent on mathematical modeling, stage they apply mathematical modeling, training undergone, usefulness of mathematical modeling, need of mathematical modeling in their research, reference habit of journals in mathematical modeling and finally, membership in any mathematical modeling association or user group.

### Sampling Procedure

The population for the study was computer research scholars, pursuing research degree in the two (Bharathiar Uuniversity and Periyar University) selected Universities in Tamil Nadu. A non-probability sampling or judgment sampling is followed to select 95

respondents. Two criteria were followed to select the respondents. These were that they must currently pursue the research degree (M. Phil. or Ph.D.) and they must belong to computer science, computer engineering or computer applications.

**Tools Used in the Study**

For this study a questionnaire consisting of two tools was used.

1. Rao's(1993)instrumenton'Perceived Innovative Characteristics' (PIC) to measure innovative and implementation variables.
2. A tool (DAB) developed by the investigator to measure the demographic and background variables.

**Statistical techniques used in the study**

The following statistical tools were used to analyze the collected data.

- Spearman's correlation coefficient is used to find out the relationship between variables.
- F-test is used to find out the significant difference among different types of variables.
- Scaffee's Post hoc test is used to find out where the difference occurs between the variables.
- T-test is used to find out the significant difference between different types of variables.

**Delimitation of the study**

The following are the delimitations of the study:-

- The sampling was applied on research scholars from M.Phil. or Ph.D only. Research scholars from D.Sc. were not included.
- Due to limitations in time, money and administration the investigator focused on computer science discipline only. He could not concentrate on other disciplines.

However, maximum care was taken to improve the generality of results of the study to wider population of research scholars involving mathematical modeling practices.

**Summary of findings and conclusion**

The following discussion is based on the results of this study and the implication of demographic and mathematical modeling background variables that offer insights in to the research context of implementing mathematical modeling in the selected universities.

**Major findings**

The collected data were subjected to statistical analyses and the result obtained was interpreted. The following were the major findings:

**Demographical and situational profile**

Majority of the research scholars are from Bharathiar University doing M.Phil. research in Computer science.

**Control variables**

The investigator discusses the findings on control variables as follows.

## Modeling background knowledge

The data analysis showed that the research scholars are not familiar with mathematical modeling. Majority of the research scholars spend less than one hour per day working with mathematical modeling which implies poor modeling practice among research scholars. The study discovers majority of the research scholars using mathematical modeling at present. Among them a vast majority of 92 percent, combined their use of mathematical modeling to 'aid instruction', 'access research' information or 'aid research administration'.

They combined their purpose for using Mathematical modeling to access the research information, to draw research conclusion and to aid the exiting fact. Majority of the research scholars agreed that the training in mathematical modeling was either very useful or useful. The study reveals that the research scholars enrolled in modeling training program, majority was interested in the advanced mathematical modeling than basic modeling literacy.

The research scholars were eagerly expecting further training in mathematical modeling. They expect frequent modeling training program. Reading habit among the research scholars should be encouraged. Only 2 percentages of the research scholars refer more journals on Mathematical modeling. The study shows that majority of the research scholars belong to none of the mathematical modeling association or user group reflects a bad picture of membership by the respondents.

## Innovative variables

The investigator studied five innovative variables and gives the result here.

## Attitude

Majority of the research scholars strongly believed that mathematical modeling would replace traditional research process and it would make the work of research scholars less tedious. They perceived research scholars today could not escape the influence of mathematical modeling. Also they agreed that mathematical modeling would bring about a better way of life for average research scholars. They strongly hoped that mathematical modeling was a potential research tool and would create in-depth knowledge. The research scholars feared that mathematical modeling would increase our dependence on western countries and dehumanize the research community as a whole.

A vast majority of the respondents understood that mathematical modeling would bridge the educational gap between developed and developing countries. They positively viewed mathematical modeling and thought it was suitable for developing countries like India, bringing to a bright era with unlimited possibilities for modeling applications. Nearly 1/3rd of the respondents agreed they had fear of using mathematical modeling. They accepted the fact that mathematical modeling was beyond the understanding of the ordinary research scholars. The data showed research scholars need to be assured that mathematical modeling do not pose a threat to their research

skills.

### Relative advantage

Research scholars had a positive perception of the relative advantage of mathematical modeling compared to traditional method of research instruction. They perceived that mathematical modeling could enable quicker access to information and helped to overcome administrative delays. They believed that mathematical computing would be worth the investment when all the universities in the country begin to use mathematical modeling techniques.

### Compatibility

Compatibility produced most significant results. Majority agreed mathematical modeling technology did not fit well in to their curriculum goals and they had relied on books and other printed materials. They agreed that mathematical modeling would become an essential research tool as it meets their research information needs. The respondents wished they were in need of a tool like mathematical modeling in their research educational system. Majority of the respondents expressed the view that scarcity of resources in universities does not permit expensive services like mathematical modeling.

### Complexity

The study showed that research scholars faced difficulty in understanding technical function of mathematical modeling and need to refer hand book frequently to understand the modeling operations. They deeply felt mathematical modeling complicated simple research administrative function in their research process. Majority of the respondents did not think mathematical modeling enhanced their job as a researcher. Mathematical modeling background of the research scholars was very poor. They were unable to respond to their perceived complexity of mathematical modeling. The result did not show a relationship between complexity and adoption/ implementation variables.

### Observability

The research study reveals that nearly half of the respondents were unaware of mathematical modeling at research work. They had never seen modeling being used as a research tool. Majority of the research scholars found no difficulty in demonstrating the research uses of mathematical modeling.

### Implementation variables

In order to measure the degree of adoption of mathematical modeling by research scholars the investigator selected two implementation variables namely, utilization and satisfaction variables and the result is as follows:-

### Research scholars' satisfaction

The analysis of the research study showed that majority of research scholars felt that access to online information about mathematical modeling within the country was generally not good. Though they accepted access to online information about mathematical modeling worldwide was generally good. 30 percentage of the respondents

believed that online information about mathematical modeling as and when required at the national level was good. Majority agreed that at the international level it was good. They perceived mathematical modeling was reliable, accurate and meet their research information needs. Nearly 1/3rd of the research scholars accepted they were able to send online information about modeling at the national level as and when required.

They were able to respond satisfactorily that mathematical modeling was current and relevant. They strongly expressed mathematical modeling was useful research tool, helpful in increasing educational opportunities and to interact. They agreed mathematical modeling facilitates group research learning, overcomes time and place restrictions. It helps in research analysis and result outcome.

The data analysis indicated that majority of the research scholars frequently used mathematical modeling to access innovative information as well as for research instructional purposes. The study also revealed the research scholars used mathematical modeling frequently to aid research administration and to make research more accessible. Majority of the respondents also specified they used mathematical modeling to connect their discipline to mathematics in order to extract abstract outcome.

**Testing of Hypotheses**

In order to test the formulated hypotheses, the same were stated in the null form. The testing of the null hypotheses are described as follows:-

Null Hypothesis – 1: There is no significant relationship between utilization with some selected independent variables attitude, relative advantages, compatibility, complexity, and observability.

**Table-1: Relationship between utilization with some selected independent variables**

| Dependent variable | Independent variables | Correlation value (r) | Significant value |
|---|---|---|---|
| Utilization | Attitude | 0.529 | P>0.05 |
| | Relative Advantages | 0.432 | P>0.05 |
| | Compatibility | 0.612 | P>0.05 |
| | Complexity | -0.331 | P>0.05 |
| | Observability | 0.466 | P>0.05 |

Table –1 shows that the Spearman's correlation coefficient for attitude, relative advantages, compatibility, observability with utilization are 0.529, 0.432, 0.612 and 0.466, respectively. It is significant at 0.05 level of significance. It is found that there is a positive significant relationship between utilization with attitude, relative advantages, compatibility and observability. And

also the above table shows that the Spearman's correlation coefficient for complexity of mathematical modeling as - 0.331. It is significant at 0.05 level. It is also found that there is a negative significant relationship between utilization with complexity. Hence, the null hypothesis is rejected at 0.05 level of significance. This inference points out that if the attitude of the research scholars towards mathematical modeling increases, then the utilization increases, if the relative advantages increases, then the utilization increases, if the compatibility increases, then the utilization increases, if the observability increases, then the utilization increases, if the complexity increases, then the utilization of decreases and vice versa.

Null hypothesis - 2: There is no significant relationship between satisfaction with some selected independent variables attitude, relative advantages, compatibility, complexity and observability.

**Table- 2: Relationships between satisfactions with some selected independent variables**

| Dependent variable | Independent variables | Correlation value (r) | Significant value |
|---|---|---|---|
| Satisfaction | Attitude | 0.496 | P>0.05 |
| | Relative Advantages | 0.423 | P>0.05 |
| | Compatibility | 0.563 | P>0.05 |
| | Complexity | -0.452 | P>0.05 |
| | Observability | 0.396 | P>0.05 |

Table –2 shows that the Spearman's correlation coefficient for attitude, relative advantages, compatibility and observability with satisfaction are 0.496, 0.423, 0.563, and 0.396, respectively. It is significant at 0.05 value. It is found that there is a positive significant relationship between satisfaction with attitude, relative advantages, compatibility and observability. Also, the above table shows that the Spearman's correlation coefficient for complexity of mathematical modeling as -0.452. It is significant at 0.05. It is also found that there is a negative significant relationship between satisfactions with complexity. Hence the null hypothesis is rejected at 0.05 level of significance. This inference points out that if the attitude of the research scholars towards mathematical modeling increases, then the satisfaction of mathematical modeling increases, if the relative advantages increases, then the satisfaction increases, if the compatibility increases, then the satisfaction increases, if the observability increases, then the satisfaction increases, if the complexity increases, then the satisfaction decreases and vice versa.

Null hypothesis –3: There is no significant relationship between implementation with some selected independent variables attitude, relative advantages, compatibility, complexity and observability.

**Table -3: Relationships between implementation with some selected independent variables**

| Dependent variable | Independent variables | Correlation value (r) | Significant value |
|---|---|---|---|
| Implementation | Attitude | 0.421 | P>0.05 |
| | Relative Advantages | 0.603 | P>0.05 |
| | Compatibility | 0.362 | P>0.05 |
| | Complexity | -0.296 | P>0.05 |
| | Observability | 0.391 | P>0.05 |

Table– 3 shows that the Spearman's correlation coefficient for attitude, relative advantages, compatibility and observability with implementation are 0.421, 0.603, 0.362, and 0.391, respectively. It is significant at 0.05 value. It is found that there is a positive significant relationship between implementation with attitude, relative advantages, compatibility and observability.

Table-3 also shows that the Spearman's correlation coefficient for complexity of mathematical modeling as-0.296. It is significant at 0.05. It is also found that there is a negative significant relationship between implementation with complexity. Hence, the null hypothesis is rejected at 0.05 level of significance. This inference points out that if the attitude of the research scholars towards mathematical modeling increases, then the implementation of mathematical modeling increases, if the relative advantages increases, then the implementation increases, if the compatibility increases, then the implementation of mathematical modeling increases, if the observability increases, then the implementation increases, if the complexity increases, then the implementation decreases and vice versa.

Null hypothesis – 4: There is no significant difference among different disciplined scholars in utilization, satisfaction and implementation of mathematical modeling.

**Table-4: Differences among different disciplined scholars**

| Groups | Source & variance | Sum of squares | Degrees of freedom | Mean square | F | Signifi-cance |
|---|---|---|---|---|---|---|
| Utilization | Between | 96.236 | 2 | 11.23 | 14.123 | P<0.05 |
| | Within | 1256.25 | 1512 | 20.31 | | |
| | Total | 1352.49 | 1514 | | | |
| Satisfaction | Between | 163.21 | 2 | 23.02 | 13.456 | P<0.05 |
| | Within | 4145.23 | 1512 | 24.32 | | |
| | Total | 4308.44 | 1514 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Implementation | Between | 107.21 | 2 | 9.32 | 14.632 | P<0.05 |
| | Within | 2639.2 | 1512 | 12.03 | | |
| | Total | 2746.41 | 1514 | | | |

Table- 4 shows that the calculated F value of utilization, satisfaction and implementation of mathematical model are 14.123, 13.456, and 14.632 respectively, which are greater than the tabulated F value 2.99 for df (2, 1512). The null hypothesis is rejected at 0.05 level of significance. Hence, there is a significant difference among science, arts, and management scholars in utilization, satisfaction and implementation of mathematical modeling.

Null hypothesis – 5: There is a significant difference between M.Phil and Ph.D scholars in utilization, satisfaction and implementation of mathematical modeling.

**Table-5: Mean difference between M.Phil and Ph.D computer research scholars**

| Dependent Variables | M.Phil Scholars | | | Ph.D Scholars | | | df | t-value | Significance |
|---|---|---|---|---|---|---|---|---|---|
| | N1 | M1 | SD1 | N2 | M2 | SD2 | | | |
| Utilization | 1015 | 17.231 | 1.23 | 500 | 20.311 | 1.29 | 1513 | 45.09 | P<0.05 |
| Satisfaction | 1015 | 52.031 | 2.09 | 500 | 56.227 | 2.63 | 1513 | 33.65 | P<0.05 |
| Implementation | 1015 | 32.125 | 2.11 | 500 | 38.002 | 2.88 | 1513 | 44.97 | P<0.05 |

Table – 5 shows that, the calculated't' value for utilization, satisfaction and implementation are 45.09, 33.65, and 44.97, respectively and those are greater than the tabulated t-value for df (1513) is 1.96. The null hypothesis is rejected at 0.05 level of significance. Hence there is a significant difference between M.Phil and Ph.D scholars in utilization, satisfaction and implementation of mathematical modeling. And also it is observed in the table that, the Ph.D scholars mean scores are higher than the M.Phil scholars mean score. It shows that the utilization, satisfaction, and implementation of Mathematical modeling is more for Ph.D scholars than M.Phil scholars.

Null hypothesis – 6: There is no significant difference among utilisation, satisfaction and implementation of Mathematical modeling.

**Table-6: Difference among utilization, satisfaction and implementation**

| Source and variance | Sum of squares | Degrees of freedom | Mean square | F | Significance |
|---|---|---|---|---|---|
| Between | 124.033 | 2 | 23.212 | 1.236 | P<0.05 |
| Within | 4238.002 | 1512 | 423.021 | | |
| Total | 4362.035 | 1514 | | | |

Table -6 shows that the calculated F value is 1.236, which is less than the tabulated F value 2.99 for df (2, 1512). The null hypothesis is accepted at 0.05 level of significance. It shows that, there is no significant difference among utilization, satisfaction and implementation of mathematical modeling.

**Scaffe's Post hoc test**

Null hypothesis – 7: There is no difference in utilization of mathematical modeling by different computer science research scholars.

Scaffee's Post hoc test is used to find out where the difference occurs between utilization of computer science research scholars. An attempt has been made to analyze it.

**Table-7: Post hoc test for utilization of different computer science research scholars**

| Computer Engineering | Computer Science | Computer application | I-J |
|---|---|---|---|
| 14.216 | 12.089 | | 2.127 |
| 14.216 | | 11.237 | 2.979 |
| | 12.089 | 11.237 | 0.852 |

From table-7 Scaffee's post hoc test shows that utilization of mathematical modeling for Computer Engineering scholars are higher than the students of Computer Science and Computer application, Utilization of mathematical modeling for computer science scholars are higher than the Computer application research scholars.

Null hypothesis – 8: There is no difference in satisfaction of mathematical modeling by different computer science research scholars.

Scaffee's post hoc test is used to find out where the difference occurs between satisfactions of different engineering students. An attempt has been made to analyze it.

**Table-8: Post hoc test for utilization of different computer science research scholars**

| Computer Engineering | Computer Science | Computer application | I-J |
|---|---|---|---|
| 14.216 | 36.265 | | 6.511 |

| | | | |
|---|---|---|---|
| 14.216 | | 32.117 | 8.759 |
| | 34.265 | 32.118 | 1.048 |

From table-8 Scaffe's post hoc test shows that satisfaction of mathematical modeling for Computer Engineering research scholars are higher than the students of computer science and computer application research scholars satisfaction of mathematical modeling for computer science are higher than the computer application research scholars.

**Analysis on priority to constructs**

**Method of ranking to constructs**

In order to rank the construct from the most positive to least, average mean scores are calculated. These are obtained by dividing the mean scores of constructs by the number of items in each construct or scale. Then based on the earlier assertion that lower scores indicate more positive response and higher scores indicate less positive responses, the average mean scores are ranked. The construct with the lowest mean score received the 'first' rank. While the highest mean score received 'last' rank.

**Description of the calculation table- 9**

Mean responses to the constructs of (a) Attitude ; (b) Perception ; (c) Satisfaction ; (d) Satisfaction of mathematical modeling by research scholars, as well as the range of scale in each construct is also presented in the tabular form. The scores for 'strongly agree' represent the minimum of the scale, while those for 'strongly disagree' represent the maximum. Lower score indicate more positive response and vice versa. The computation is given in table 9.

**Table-9: Distribution of computer research scholars based on priority to constructs**

| S. No. | Mathe-matical modeling as (Constructs) | No. of items per scale | Mean score of constructs | Range of scales | | Average mean score | Rank |
|---|---|---|---|---|---|---|---|
| | | | | Strongly agree | Strongly disagree | | |
| 1 | Potential Re-search tool | 5 | 12.89 | 5 | 25 | 2.58 | Fifth |
| 2 | Threat | 3 | 10.61 | 3 | 15 | 3.53 | Four-teenth |
| 3 | Employment tool | 2 | 4.42 | 2 | 10 | 2.21 | First |
| 4 | Relative advantage | 5 | 13.11 | 5 | 25 | 2.62 | Sixth |
| 5 | Research instruction | 3 | 8.28 | 3 | 15 | 2.76 | Ninth |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | Curriculum needs | 3 | 7.37 | 3 | 15 | 2.45 | Second |
| 7 | Complexity | 4 | 10.6 | 5 | 20 | 2.65 | Seventh |
| 8 | Observability | 3 | 8.36 | 3 | 15 | 2.78 | Tenth |
| 9 | Research information tool | 4 | 9.97 | 5 | 20 | 2.49 | Fourth |
| 10 | Reliability accuracy | 5 | 14.26 | 5 | 25 | 2.85 | Eleventh |
| 11 | Research Learning tool | 5 | 14.52 | 5 | 25 | 2.90 | Twelfth |
| 12 | Networking tool | 2 | 6 | 2 | 10 | 3.00 | Thirteenth |
| 13 | Research administrative tool | 3 | 7.43 | 4 | 20 | 2.47 | Third |
| 14 | Research Education & Networking | 3 | 8.14 | 3 | 15 | 2.71 | Eighth |

The collected data were analyzed based on the objectives and hypotheses formulated for the study and through analysis of result and interpretation.

**Recommendations**

Mathematical modeling training for research scholars should emphasize the individual and national benefits of mathematical modeling literacy in order to retain a positive awareness. The curricula of education should address issues related to rapid changes in modeling technology, new demands of the research work force and the need for research scholars to be technologically competent. The importance of compatibility in the satisfaction and adoption process underscores the need for strategic planning in mathematical modeling training, designed to accomplish specific curriculum objectives. The literature notes that making modeling compatible with research scholar's tasks will boost its implementation by specifying its role more precisely.

Mathematical modeling practice should be configured to accomplish specific tasks such as, drawing conclusion, creative, innovative, logical thinking, abstract thinking, drawing and inter connections etc. It is important that mathematical modeling training program should emphasize the relative advantage of mathematical modeling to traditional methods of research instruction and research

education as a whole. Additional exposure to mathematical modeling is recommended for research scholars. Research scholars also must be provided with adequate opportunities to practice with modeling following their training programs.

Universities with mathematical modeling facilities should collaborate with those that lack them. So that, all research scholars get an opportunity to witness, learn from successful modeling related experiments. The curriculum should make guidelines for the effective use of modeling technology. The research educators and scholars must understand the direction of innovative scientific progress and can update their mathematical modeling technology training programs to meet emerging industrial need. It is critically important that mathematically trained and technologically competent research experts should be utilized as resources in the research decision making bodies.

## Suggestions for further research

Further, this research can be extended to establish the following statements:-

In the present study, diffusion theory is used to investigate the adoption of mathematical modeling by the research scholars. It is suggested that the same theory can be applied in other innovative technology introduced recently and the effectiveness of adoption may be examined against the conventional method. Similar studies should be undertaken in other research areas such as, medicine or sciences etc. Diffusion approach may be undertaken either at master degree level or D.Sc. level.

## Conclusion

In keeping with the philosophy of participation in developing initiative, researcher participation in the planning process is the key ensuring the successful implementation of mathematical modeling technology in the universities. Strong commitment from research scholars to embrace modeling technology is essential in attaining the country's goals for mathematical modeling use. Active involvement of research scholars who are users and non-users is a practical means of moving the initiative forward. A cadre of research scholars motivated by the potential of Mathematical modeling can ignite the interest of others to become users.

Finally, the involvement and leadership of research scholars as well as policy makers facilitate a 'buy-in' element that will guarantee the successful implementation of mathematical modeling throughout the research education.

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*Research Article*

# ICT: An emerging educational tool for undergraduate students

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**Abstract**

*In this era of technology, various techniques are adopted in teaching –learning process, which has resulted in a paradigm shift from conventional teaching to blended or flipped learning. The present study investigated the impact of Information and Communication Technology (ICT) in teaching –learning process at undergraduate level. The purpose of the study was to know certain facts and obtain opinion from the students regarding use of ICT tools in education system. An online survey was conducted utilizing Google forms. Chi-square test and Binomial Test were performed utilizing SPSS programming to analyze the data. The findings of the investigation show that the college undergraduates have promptly embraced the new techniques, and new e-assets for their learning interactions.*

**Key Words:** cyber stalking, social media, Social Networks

## Introduction

In the modern education system, e-learning has gained more importance. Modern e-learning has passed from the application of separate technologies (video, multimedia, e-mail, etc.) to system decisions, among which are the Learning Management System (LMS) and social networks (SN).Today's students can be described as digital natives or members of net generation. They have been using digital technology from their early age. While teachers are digital immigrants (Mozhaevaa, Feshchenkoa, & Procedia, 2014).Various integrated and complex ICT tools such as computers, laptops, smartphones and i-pads, etc. have become organic parts of their everyday life. Incorporation of ICT tools by teachers in teaching-learning process no longer remains new. As a result, the conventional method of teaching and learning is replaced by blended and flipped learning. Indian government also has realized the importance of integration of ICT tools in education. Ministry of Human resource development (MHRD), Government of India, has under taken the project, "National Mission on Education through ICT" to provide ICT enabled quality education to all the learners in India. MHRD, Government of India, has also launched ICT enabled learning platforms, in the form of MOOCs (Massive Open Online courses) such as SWAYAM, NPTEL and e-Pathshala etc. (Mozhaevaa, 2014). At Universities and National Institutes, ICT has turned from being a technology of communication and information to a

curriculum creation and delivery system for teachers and learners. However, at college level, the usage of ICT in teaching and learning process has become more extraordinary during these days. Before the educators adopt various e- learning strategies, it is necessary to know whether the students are familiar with this new educational tool.

Hence, the present survey was undertaken to know whether the undergraduate students of science stream were familiar with various e-learning assets.

## Objectives

The goal of the current investigation was to discover:

1. Which of the learning strategies conventional, blended or flipped, do the Learners like for learning?
2. Whether the Learners are familiar with different Open Education Resources (OERs)?
3. Which LMS are the Learners familiar with?
4. Whether the Learners are familiar with MOOC courses?
5. Whether the students are familiar with Virtual labs and Simulation Practical's?

## Method

The research includes data collection, Statistical data processing and comparative data analysis.

**Data collection:** An online survey was conducted among the undergraduate students of science faculty, to collect the data about 'Access to and use of ICT in Education'. A Self-designed questionnaire was prepared using Google forms (Sarkar, 2018) and was circulated among the target group by mail and through social media. Total 289 online responses were received, among which most of them were submitted by the students from different colleges in and around Nasik, Maharashtra, India.

## Research Hypothesis

Twenty closed ended questions were framed. For each question, other than yes-no questions, minimum three options were given. The questions were grouped in three sections. First section included 06 questions that focused on Facts, related to access and use of ICT tools by teachers and students, the second section included 08 questions that asked the opinion of students regarding integration of ICT in education and the third section included 06 questions related to e- learning information. These questions enabled to reveal the facts and problems in e-learning process. The hypothesis framed for these questions were-

Ho = The options of each question were opted in equal probabilities by the respondents.

H1= The options of each question were not opted in equal probabilities by the respondents.

## Data Processing and analysis

Data processing and statistical analysis was done using SPSS software (Back 2015 and Sidana, 2017). One sample-Chi-square test and one sample Binomial test was done to check hypothesis.

**Results of Section One: Questions related to facts**

Question 1. Which of the following is adopted by your teachers while teaching?

Options: Chalk-Board, Smart Boards, LCD, Both chalk-board and LCD.

Results of Figure 1 depict that more than 60 percent instructors make use of both, Chalk- Board and ICT tools while teaching. This shows that no longer has teaching remained confined to chalk and Talk. In this new era of ICT, educators, too, have adopted the new techniques of conveying information to the students. But the conventional technique for instructing is as yet followed by the educators.

Chi square test analysis shows that at 0.5% level of significance, calculated $\chi 2$ i.e $\chi 2$ cal (3) =288.204, p=0.00 and expected $\chi 2$ i.e. $\chi 2e$ = 72.250. Since $\chi 2$ cal > $\chi 2e$ , suggest that the options to the question are not opted in equal probabilities, hence, Null hypothesis is rejected.

**One-Sample Chi-Square Test Summary**

| | |
|---|---|
| Total N | 289 |
| Test Statistic | 188.204[a] |
| Degree of Freedom | 3 |
| Asymptotic Sig. (2-sided test) | .000 |

a. There are 0 cells (0%) with expected values less than 5. The minimum expected value is 72.250

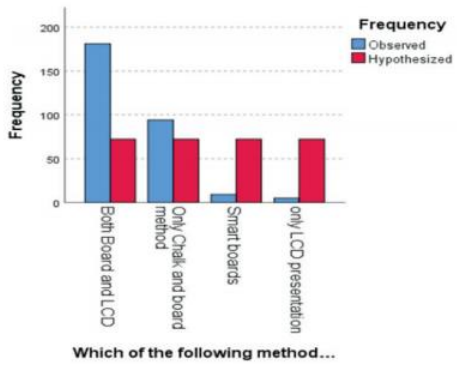


**Figure-1: Frequency graph and one sample chi square test for, 'Which of the following is adopted by your teachers while teaching?'**

Question 2. How do your educators interact with you?

Options: Personally, Through Google classroom, Social media, or through e-mail.

Results of figure 2 show that different methods are accessible for the educators to interface with their students. About 58 percent of the respondent's reacted that their instructors communicate with them, through all the accessible methods for example eye to eye during regular classes, through Google classroom, Social media, and through email. This shows that different methods of correspondence are adopted by the instructors to speak with their students.

Chi square test analysis shows that at 0.5 percent level of significance, $\chi 2$ cal (4) =326.865, p=0.00 and $\chi 2e$ = 57.8. $\chi 2$ cal > $\chi 2e$ suggest that, the alternatives to the inquiry are not picked in equivalent probabilities, hence, Null hypothesis is rejected.

**One-Sample Chi-Square Test Summary**

| | |
|---|---|
| Total N | 289 |
| Test Statistic | 326.865[a] |
| Degree of Freedom | 4 |
| Asymptotic Sig. (2-sided test) | .000 |

a. There are 0 cells (0%) with expected values less than 5. The minimum expected value is 57.800

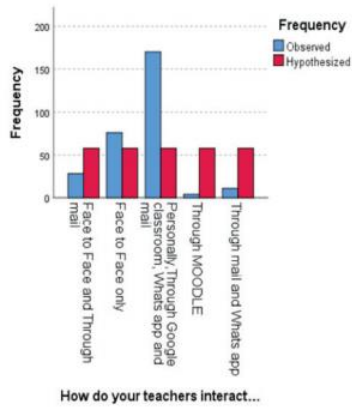


**Figure- 2: Frequency Graph and one sample Chi square test for, 'How do your educators interact with you?'**

Question 3. Which of following are accessible for you to utilize either at home or outside college, (e.g., in public library or web café)?

Options: Computer with web office, PC without web office, cell phones with web office, cell phone without web office or Laptop, I-pads or tablet.

Results of figure 3 show that over 70 percent of the students have cell phones with web office. Henceforth, web based educating and sharing e-content with the students is possible for the instructors. Less than 10 percent students do not have web access.

Chi square test analysis shows that at 0.5% level of significance, $\chi 2$ cal (4) =524.685, p=0.00 and $\chi 2e$ = 57.8. $\chi 2$ cal > $\chi 2e$ suggest that, the alternatives to the inquiry are not picked in equivalent probabilities, hence, Null hypothesis is rejected.

**One-Sample Chi-Square Test Summary**

| | |
|---|---|
| Total N | 289 |
| Test Statistic | 524.685[a] |
| Degree of Freedom | 4 |
| Asymptotic Sig. (2-sided test) | .000 |

a. There are 0 cells (0%) with expected values less than 5. The minimum expected value is 57.800

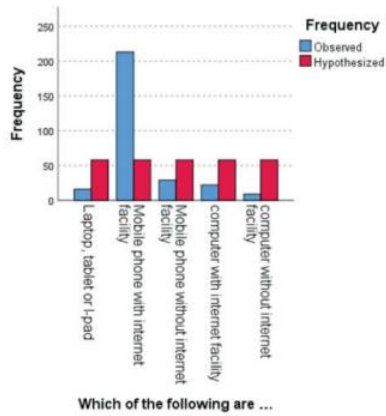


**Figure- 3: Frequency Graph and one sample Chi square test for, 'Which of the following are accessible for you to utilize either at home or outside college?'**

Question 4. How frequently do you use ICT gadgets for learning purpose?

Consequences of Figure 4 show that 40 percent of the undergraduates use ICT apparatuses consistently for learning reason, while practically 24 percent undergraduates use it once every week and 25 percent use it a few times each month. Practically 90 percent of the undergraduates are utilizing ICT devices for learning reason. Subsequently, web based instructing and sharing e-contents to students is doable for the instructors, which encourages better educating learning measure.

Chi square test analysis shows that at 0.5 percent level of significance, calculated $\chi 2$ cal (3) =55.014, p=0.00 and expected $\chi 2e$ = 72.250. Calculated $\chi 2$ cal < $\chi 2e$ suggest that, the alternatives to the inquiry are not picked in equivalent probabilities hence, Null hypothesis is rejected.

Since all the alternatives are not picked in equivalent probabilities by the respondents, Null Hypothesis is dismissed.

**One-Sample Chi-Square Test Summary**

| | |
|---|---|
| Total N | 289 |
| Test Statistic | 55.014[a] |
| Degree of Freedom | 3 |
| Asymptotic Sig. (2-sided test) | .000 |

a. There are 0 cells (0%) with expected values less than 5. The minimum expected value is 72.250

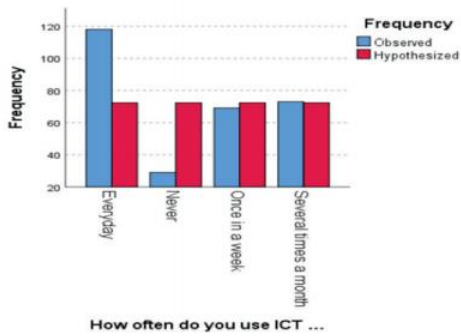


**Figure- 4: Frequency graph and one sample Chi square test for, 'How frequently do you use ICT gadgets for learning purpose?'**

Question 5. How would you think, ICT gadgets help you in learning?

Options: Sharing Study material and notes, searching pertinent data, acquiring new abilities, communicating with educators and classmates.

Results in Figure 5, show that for 70 percent respondents ICT gadgets are useful in sharing investigation Notes/ material, looking through applicable data, learning new abilities, and communicating with educators and classmates.

Chi square test analysis shows that at 0.5 percent level of significance, calculated $\chi 2$ cal (4) =477.799, p=0.00 and expected $\chi 2e$ = 57.8. Calculated $\chi 2$ cal > $\chi 2e$ suggest that, the alternatives to the inquiry are not picked in equivalent probabilities hence, Null hypothesis is rejected.

**One-Sample Chi-Square Test Summary**

| | |
|---|---|
| Total N | 289 |
| Test Statistic | 477.799[a] |
| Degree of Freedom | 4 |
| Asymptotic Sig. (2-sided test) | .000 |

a. There are 0 cells (0%) with expected values less than 5. The minimum expected value is 57.800

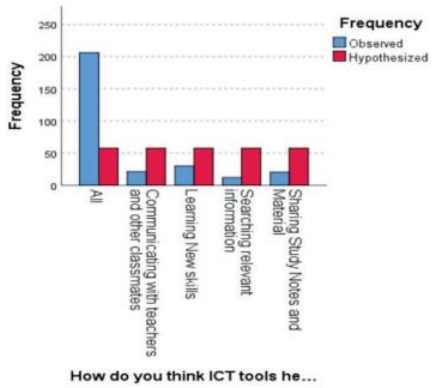


**Figure- 5: Frequency graph and one sample Chi square test for, 'How would you think ICT devices help you in learning?**

Question 5. How would you think, ICT gadgets help you in learning?

Options: Sharing Study material and notes, searching pertinent data, acquiring new abilities, communicating with educators and classmates.

Results in Figure 5, show that for 70 percent respondents ICT gadgets are useful in sharing investigation Notes/ material, looking through applicable data, learning new abilities, and communicating with educators and classmates.

Chi square test analysis shows that at 0.5 percent level of significance, calculated $\chi 2$ cal (4) =477.799, p=0.00 and expected $\chi 2e$ = 57.8. Calculated $\chi 2$ cal > $\chi 2e$ suggest that, the alternatives to the inquiry are not picked in equivalent pro

**One-Sample Chi-Square Test Summary**

| | |
|---|---|
| Total N | 289 |
| Test Statistic | 235.626[a] |
| Degree of Freedom | 2 |
| Asymptotic Sig. (2-sided test) | .000 |

a. There are 0 cells (0%) with expected values less than 5. The minimum expected value is 96.333

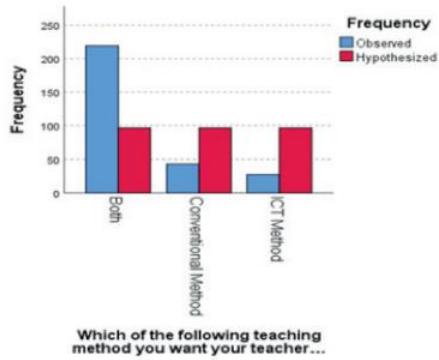


**Figure- 6: Frequency graph and One sample Chi square test for, 'Which of the following technique do you need your instructor to follow?'**

**Results of Section Two: Opinion based Questions**

Question1. Do you feel certain concepts are clarified only after visualizing audio/ video presentations?

Results in Figure 7 depict that for practically 60 percent respondents just once in a while certain ideas are

explained by audio/video presentations.

Chi square test analysis shows that at 0.5 percent level of significance, χ2 cal (4) =136.242, p=0.00 and χ2e = 96.333. χ2 cal > χ2e suggest that, all the choices are not picked in equal probability by the respondents, Null hypothesis is dismissed.

**One-Sample Chi-Square Test Summary**

| | |
|---|---|
| Total N | 289 |
| Test Statistic | 236.242[a] |
| Degree of Freedom | 2 |
| Asymptotic Sig. (2-sided test) | .000 |

a. There are 0 cells (0%) with expected values less than 5. The minimum expected value is 96.333

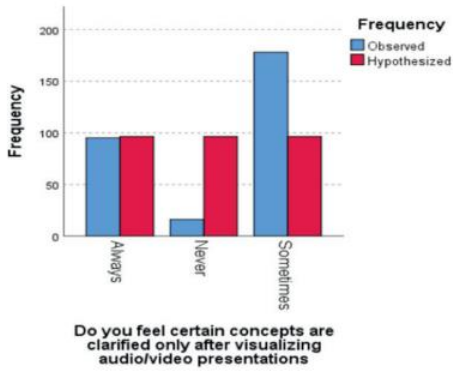


**Figure- 7: Frequency graph and one sample Chi square test for, 'DO you feel certain concepts are clarified only after visualizing audio/video presentations.'**

Question 2. Which ICT way of learning do you like?

Result in Figure 8 Show that these outcomes are at standard with the consequences of Q6. Around 36 percent students lean towards blended learning, other 34 percent favor flipped learning while 30 percent incline towards versatile learning.

Chi square test analysis at 0.5 percent level of significance shows that, calculated χ2 cal (2) =2.415, p=0.299 and expected χ2e = 96.333. Calculated χ2 cal < χ2e suggest that, the alternatives to the inquiry are picked in equivalent probabilities hence, Null hypothesis is accepted.

Since two of the three learning styles are chosen at almost same frequency by the respondents, Null hypothesis is accepted.

**One-Sample Chi-Square Test Summary**

| | |
|---|---|
| Total N | 289 |
| Test Statistic | 2.415[a] |
| Degree of Freedom | 2 |
| Asymptotic Sig. (2-sided test) | .299 |

a. There are 0 cells (0%) with expected values less than 5. The minimum expected value is 96.333

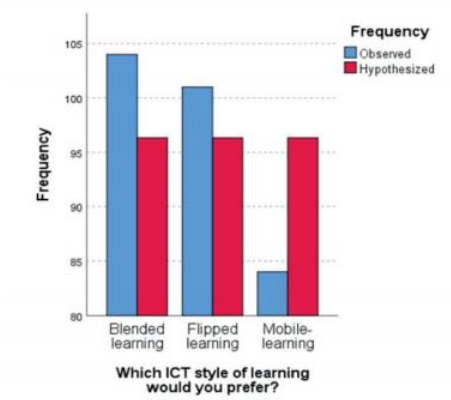


**Figure- 8: Frequency graph and one sample Chi square test for, 'Which ICT way of learning do you like?'**

**Table- 1: Percentage frequency of questions related to opinion of respondents for ICT teaching and then learning**

| Question No. | Questions | Option/Yes (%) |
|---|---|---|
| 3 | Is internet access permitted to you in your college library | 86.15% |
| 4 | Do you think on-line teaching- learning is the most ideal choice in certain unavoidable conditions? | 76.12% |
| 5 | Do you think test design which demands repetition learning ought to be changed to online tests, open book tests, research activities, or summer training? | 76.47% |
| 6 | If the syllabus is provided to you and e-content related to it is transferred, do you think you are skilled to learn without the guide of instructor or anyone else? | 54.67% |

For all the mentioned questions (Table-1), to check the hypothesis, binomial test was performed, since the 'yes' option was opted, null hypothesis is rejected.

**Results of Section Three: Information related to e-learning**

**Table- 2: Percentage frequency of the options opted in majority, for yes-no questions related to e-learning**

| Questions | Options opted in majority |
|---|---|
| 1. Do you know what MOOC is? | Yes (50.17%) |
| 2. Have you completed any MOOC? | No (79.58%) |
| 3. Have you performed any simulation experiments or experiments using virtual labs? | No (60.53%) |
| 4. Which search engine do you browse the most? Google, You tube, both or none | Both (60.55%) |
| 5. What is your opinion about e-learning? Should be adopted, should be supplementary to traditional, should not replace conventional method? Should be supplementary? | (40.83%) |
| 6. Which of the OERs are you familiar with? | NPTEL (30.89%) NME-ICT (31.14%), NPTEL, NME-ICT, NROER, KHAN Academy |

The consequences of section three (Table 2), portray that about half of the respondents knew about MOOCs but most of them had not studied any MOOCs, the likely explanation might be that college students study in a closed frame of university designed curriculum. Advantageous learning through online courses is an arising idea for these students.

About 60 percent respondents didn't know about simulation experiments or experiments using virtual labs. In colleges, the student strength is high and principally, experiments are performed in laboratories, or in fields. To perform Simulation investigations or experiments utilizing virtual labs, every college needs to have grounded PC labs. Absence of these facilities in colleges restricts the learning process.

Over 60 percent students perused both Google and YouTube, for gathering data. This shows that library books are not by any means the only wellspring of data for the current students rather an instant source is accessible at the tip of their fingers, in the form of internet.

Barely 30 percent of the students knew about OERs like NPTEL and NME-ICT. This shows that the instructors ought to advise the students about OERs. Simply accessibility of web office isn't sufficient the students should have the information about its utilization for their advantage.

For all the above inquiries, to check the hypothesis, Binomial test was performed.

The results of table 2 show either more or less than 50 percent acceptance for a particular option, the null hypothesis is rejected.

**Discussion and Conclusion**

The results of the survey show that though ICT tools are being widely used in educational field, thousands of computers cannot take place of a single knowledgeable teacher. Teaching is an art. A good teacher knows how to make use of various ICT tools to make teaching more effective and learning more interesting. The results of this study show that technology-based teaching and learning is more effective in compare to traditional classroom. This is because, using ICT tools and equipment will prepare an active learning environment that is more interesting and effective for both teachers and students. The results are in line with a research finding by Macho (2005) that proved using ICT in education would enhance students' learning. The results of the present investigations are also at par with Kankan Sarkar (2018) that proved that ICT enhances teaching and learning practices at college level in Mathematics. Research Blended learning or flipped learning or mobile learning styles are learning styles adopted by the tech savvy students of this technological era. They are quick in adapting to new technological changes and are also acquainted with various ICT tools. Hence are willing to accept the paradigm shift from offline teaching to online teaching –learning process. But various technical problems such as irregularity in network availability and current supply may bring hurdles in online teaching. Findings of the present survey shows that simply access to ICT tools is not enough, teachers need to give their students an exposure to various e-learning techniques such as

virtual labs or simulations and also guide them in choosing various OERs and MOOC courses.

*(Acknowledgement: The Author would like to thank all the respondents from various colleges to share their opinion through this survey. The author is grateful towards the teachers of various colleges for sharing the Google form link to their student.)*

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*Research Article*

# Relationship between Parental Child Safety Measures and Technology Usage Among Children

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**Abstract**

*The aim of the study was to find out the level of child safety measures used by parents of 6th - 9th grade children and the level of technology usage among 6th - 9th grade children. It also focused on studying the effect of family earning type on Parental Child Safety Measure. Relationship between technology usage of children and Parental Child Safety Measures was another aspect that was explored. The study was conducted in Mumbai with a sample of 110 Parents of 6th - 9th grade children, using Purposive sampling technique. A self-structured questionnaire with a reliability of 0.78 was used. Parents used moderate level of safety measures with their children. Mostly children used smart phones for less than two hours and especially for the entertainment purpose. The results indicated that dual earner families used more safety measures (t=8.57**, p=.00) as compared to single earner families. Results also suggested no statistically significant correlation between Child safety measures used by parents and technology usage of children.*

**Keywords:** Child Safety, Child Sexual Abuse, Technology Usage, Awareness, Prevention, Single and Dual Earner Families

## Introduction

Traditional families have changed over time, though men still play an instrumental role in the family, women have shifted from an expressive role to a more instrumental one. The economic system has facilitated this freeing of women from household chores and their entrance to the labour market. Therefore, women's share of the labour force has increased in almost all the countries. Along with this the family structure has changed over time, where more Indian's are moving into nuclear households. Hence, the world has seen an emergence of dual earner nuclear families.

The world, has not just witnessed a change in family structure, but also the rapid proliferation of information and communications technology (ICT), is an unstoppable force, touching virtually every sphere of modern life and childhood is no exception. With close to 3.5 billion users worldwide, the Internet has become a key public infrastructure that has the potential to connect people (Roser, Ritchie, &

Ortiz-Ospina, 2020). While bringing many benefits to the society and being conducive to innovation, children's learning and development, the fast paced technological innovation and increasing accessibility of ICTs also provide new pathways to sexual abuse and exploitation of Children.

There is evidence that these crimes are continuing to increase and develop in step with technological advances. Changing the behavior of both perpetrators and victims is both challenging and expensive and there is little evidence of what works to reduce these crimes (Quayle, 2020). Online predators now have a wide range of new and easier options for committing serious violations against the rights of the child (UNICEF, 2017).

According to the Internet Watch Foundation (IWF), in 2020 1,32,676 uniform resource locators (URLs) contained child sexual abuse material. IWF analysts, in the year 2020, processed about 2,99,600 reports, a 15 percent hike from 2019 (IWF, 2021). Child Sexual Abuse (Hereafter, CSA) is "any completed or attempted (non-completed) sexual act, sexual contact with, or exploitation (i.e., non-contact sexual interaction) of a child by a caregiver, according to the US Centers for Disease Control and Prevention (CDC) (Murray, Nguyen & Cohen, 2014). When this material is videotaped or picturised, it is called child pornography. The accession, possession, distribution, production, advertisement or making available child pornography or child sexual abuse material; or procuring or grooming a child to engage in sexual activity; or sending indecent communication, is considered as Online Child Sexual abuse (Capaldi, 2017).

In 2019, 46 percent of the victims of such abuse were 10 years old or younger (IWF Annual Report, 2020). Over the past decade, the role of technology in facilitating sexual offences against children has significantly evolved; as has the world's understanding of sexual offending behaviour and the manifestation of these activities on the Internet (Cybertip, 2016). Although there has been increased attention to victim services, investigation, prosecution, and incarceration, there is a need for all sectors of society to demonstrate an increased commitment to, and investment in, the primary prevention - activities that are directed at the general population and attempt to stop maltreatment before it occurs - of child sexual abuse and exploitation. (National Coalition To Prevent Child Sexual Abuse And Exploitation, 2012).

The universal approaches to primary prevention for child safety include parent education programs and self-help and peer groups, 24 hour crisis care programme (Prevent Child Abuse North Dakota, n.d.). Parents are the immediate family of the child and thus, his/her primary stakeholders and they constitute an important target audience of primary prevention of CSA. Studies have found that parents who participate in prevention programs are more likely to discuss CSA with their children and those discussions are more positive (Rudolph, Zimmer-Gembeck, Shanley, & Hawkins, 2018).

As abuse today, happens on a virtual platform, with realistic harms, the

prevention also needs to be at par. In India, many applications and softwares, aid parents to create a safe environment for the child online, like eKavach, IT Act, 2000 & Cyber Law India and Safe Browser. Also apps like CHIRAG, Shishu Surakhsha and Child Rights Monitor have been launched by various state governments across the country, to safeguard children.

In 2020, CyberTipline received 21751085, an increase of 28 percent from 2019 (National Centre For Missing And Exploited Children, 2020). As per a review conducted by Kloess and colleagues on "Online Child Sexual Exploitation" in 2014 found that Eighty-two percent of young children between the ages of 9 and 11, as well as 95 percent of adolescents between the ages of 12 and 16 have used Internet in Sweden in 2006, of which 32 percent reported to have received online sexual solicitations.

As per the IAMAI & Kantar IMRB survey as on December 2016, the overall internet penetration in India was around 31 percent presently. Analysis of 'Daily Users' revealed that both in Urban and Rural India, the younger generations were the most prolific users of internet. As per a more recent report India has 504 million active internet users and of the total internet population 71 million were between 5-11 years of age (Livemint, 2020).

## Rationale

The world in the past few decades has witnessed digitalization; however, the anonymity of the internet has led to its own share of adverse effects. It helps its users to have a wider reach, and thus the abusers have moved to an online platform, to share images and videos of CSA and also groom children online. As internet usage amongst the youth is experiencing a sharp growth, they have become more vulnerable to online CSA. It thus becomes important for parents to take due measures to safeguard children online. The traditional roles of women have also shifted, thus leading to the emergence of dual earner families. Therefore, the study focused on exploring the parental child safety measures against online CSA with respect to family earning type and also the its relationship with technology usage of children.

## Objectives

1. To find out the level of Parental Child Safety Measures of 6th to 9th grade children
2. To know the usage of technology among 6th to 9th grade children
3. To find out the effect of family earning type on Parental Child Safety Measures for CSA with use of technology
4. To observe the relationship between Parental Child Safety Measures for CSA and technology usage among children

## Hypothesis

H01: There is no statistically significant difference between the level of Parental Child Safety Measures with respect to single and dual earner families

H02: There is no statistically significant correlation between Parental Child

Safety Measures and technology usage of children

## Methodology

### Operational Definitions

Parental Child Safety Measures: The strategies parents use to safeguard children against online child sexual abuse.

Single Earner Families: The families in which only one partner is earning.

Dual Earner Families: The families in which both the partners are earning.

Children: Children who are studying in 6th to 9th Grade

Technology Usage of Children: Reported time of technology usage by children, per day. Like access to smart phones, tablets and computers etc.

### Sampling procedure

The study was conducted in Western Suburbs of Mumbai. A self-devised questionnaire was administered to 110 parents of 6th -9th grade children using purposive sampling technique.

### Tool

A self-structured questionnaire with a reliability of 0.78 was used to assess the Parental Child Safety Measures and the technology usage of 6th -9th grade children. It was validated by three experts from the field of Child Sexual Abuse and who had research experience.

### Data analysis

Data was analyzed using a statistical software. Statistics such as percentage, Mean, Standard Deviation, independent samples t-test and Bi-variate correlation (Pearson's correlation) were used to analyze the data and draw inferences.

## Results and Discussions

### Demographics of the participants

The average age of the children in the sample was 12.8 years. Majority, i.e. 73.63 percent & 53.63 percent of the mothers and fathers respectively belonged to the age group of 35-45 years. Majorly (36.36 percent) monthly income of the sample was above 75,000 rupees. Most i.e. 37.27 percent & 36.36 percent, of the fathers and mothers, in the study were graduates, respectively. Almost half (50.90 percent) of the participants were belonged to nuclear families. More than half of the families were single earners i.e. 54.5 percent, whereas 45.4 percent were dual earners.

### Parental Child Safety Measures

Figure-1 suggests that majority of the parents used moderate level of child safety measures to prevent online child sexual abuse i.e. 66 percent of them. A review by Wurtele and Kenny (2010) stated that number of studies have been conducted which showed that parents tried to educate their children about Child Sexual Abuse.

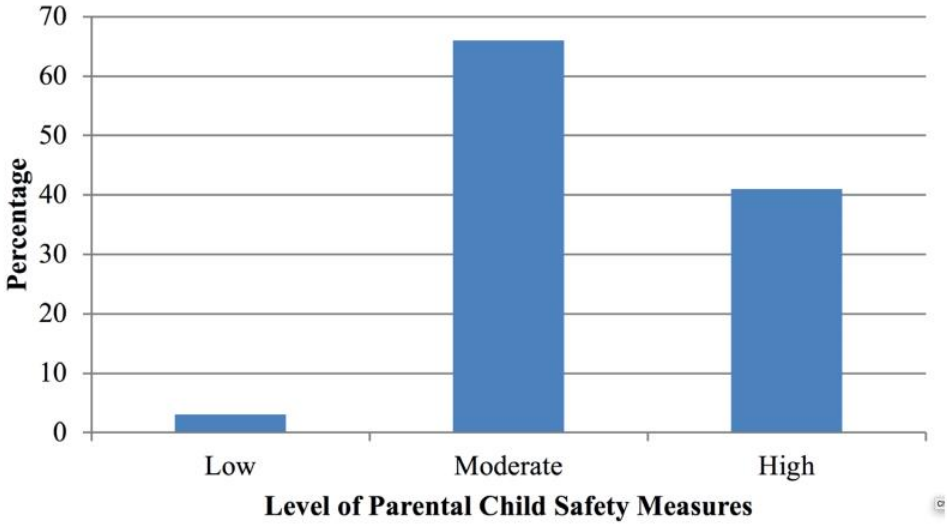


**Figure 1: Percentage of the Level of Parental Child Safety Measures**

Yet another review by Rudolph (1027) and colleagues stated that two studies have focused on parental protective behaviours, other than communicating with children directly about CSA risks. These two studies demonstrate that parents use a variety of protective practices (e.g., supervision, monitoring, and involvement) to create the external barriers that may keep their children safe from CSA, of which direct discussions of abuse prevention in the home are only a small part.

**Level of Technology Usage**

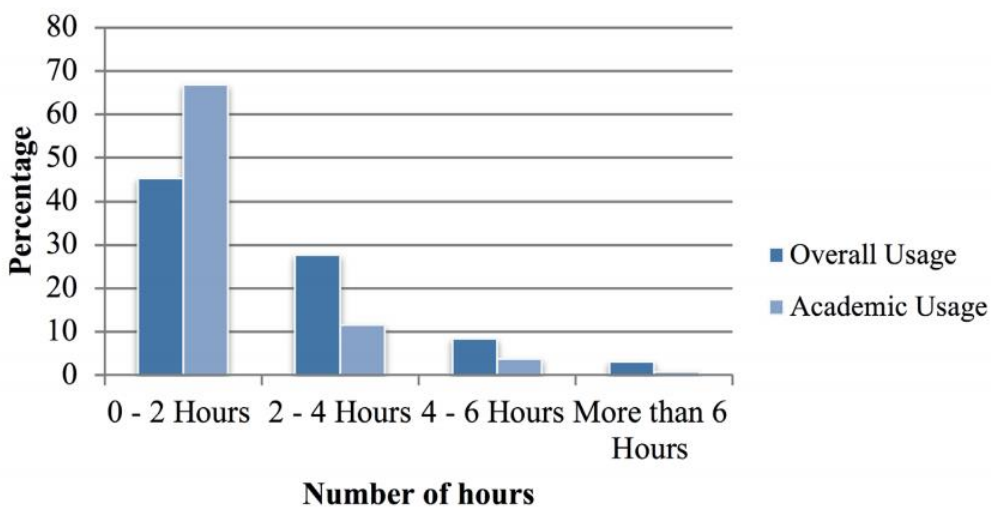


**Figure 2: Percentage of children using smart phones for academic and other purposes per day (in hours)**

Figure-2 suggests that most children used smart phones for less than 2 hours. More academic usage was seen for less than 2 hours, whereas overall usage was dominant between 2-6 hours. A study conducted at the Aligarh Muslim University, on college students, showed that 63 percent respondents used their phones for 4-7 hours daily, thus supporting the current findings (Agha, 2018).

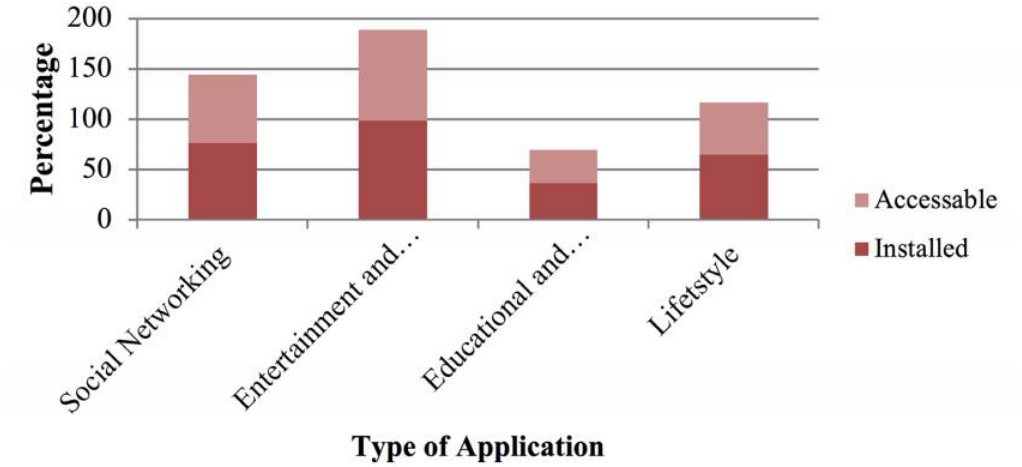


**Figure 3: Percentage of children having various types of applications openly installed and accessible in their smart phones**

Figure-3 suggests that most children had entertainment applications both installed as well as openly accessible, followed by social networking applications, followed by lifestyle apps. The least used applications were the educational applications. However, the difference between the application in terms of being installed and accessible wasn't stark.

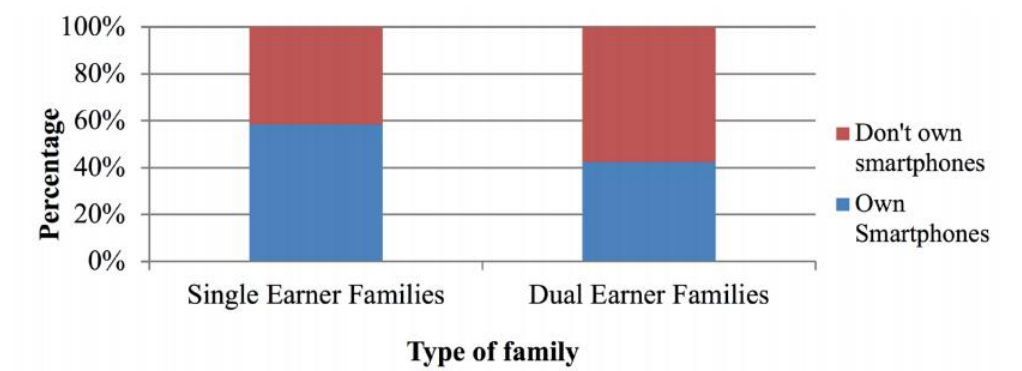


**Figure 4: Percentage of ownership of smart phones among children of single and dual earner families**

However, Figure-4 suggests that more than 50 percent children owned smart phones in single earner families, whereas only 42 percent children in dual earner families owned smart phones. This might be due to less availability of the parents at home most of the time in dual earner families. Also many a

times parents use too much of digital tool to manage time with their children right from the early years, which is also reflected in the study done by Kabali et al (2015), who stated that 70 percent of parents gave children digital devices when doing house chores, 65 percent to keep the child calm in public places, 58 percent to keep their child occupied while they ran errands and 28 percent parents used mobile devices to put their child to sleep during early years.

**Table-1: Mean, SD and t-value of Parental Child Safety Measures with Respect to Working Status of the Family**

| Working Status | | N | Mean | SD | t value | Level of Significance |
|---|---|---|---|---|---|---|
| Single Earner | | 84 | 32.59 | 5.49 | 8.57** | .00 |
| | | | | | | |
| Dual Earner | | 26 | 36.00 | 3.98 | | |
| | | | | | | |

**Significance at p< .00 level

Table-1 suggests that there was a statistically significant difference in parental child safety measures with respect to family earning type. Thus, null hypothesis has been rejected. The mean difference suggested that dual earner families use more child safety measures, to safeguard their children against online CSA, as compared to single earners. Although, figure 4 depicted that more smart phones were owned by children in single earner families, single earner families used less safety measures. The reason for the same might be the dual earner parents are exposed more to the changing world. A study conducted by Preethy and Somasundaram in 2020 found that Majority of the working parents were aware of the various factors that could result in child abuse and nearly half of them had taken proper steps to prevent such untoward occurrence in their families. Another study conducted by Alzoubi, Ali, Flah & Al-Natour in 2017 found that employed mothers had a higher awareness of CSA and recognized signs and symptoms of CSA more than other mothers. The higher awareness and unavailability both could possibly put them more on guard as they are not able to supervise the child all the time.

**Table-2: Pearson Correlation Coefficient and p-value between Parental Child Safety Measures and Technology usage by 6th -9th grade children**

| | Parental Child Safety | Technology Usage |
|---|---|---|
| Parental Child Safety | 1 | - .02 |
| Technology Usage | - .02 | 1 |

*Significant at p<.05 level

Table-2 suggests that there was no statistically significant relationship between parental child safety measures and technology usage. There was a very weak negative correlation which suggests that as parental child safety measures increases, the technology usage of children decreases. Thus, the proposed null hypothesis had been accepted. As seen in figure-2, children spent more time using smart phones, for purposes other than academic and as indicated in figure 3, there wasn't much difference between the mobile applications being installed and the ones being accessible by children, which suggests that parental controls might not be as stringent, and thus didn't increase with increasing usage of technology. The findings of a research by Shin and Li, in 2017, suggested that parental mediation was not a function of the time spent by children on digital technology, thus supporting the current study. It alternatively, suggested that parental engagement in digital activities might be related to the mediation they provide, as they then understand the potential hazards of technology usage along with the barriers that they might face.

## Conclusion

The current study suggested that most parents used only moderate level of child safety measures. The children in the current study had more overall technology usage i.e. for entertainment and social purposes, as compared to academic usage. The second highest applications accessible to children were those of social media. The results also suggested that there was no significant correlation between technology usage of children and parental child safety measures. However, it was found that dual earner families used more parental child safety measures, as compared to single earners.

## Limitations

The Sample size and inclusion criteria in the study, limits the ability to generalize the research findings. More importantly, as all the participants lived in Mumbai, the results had geographical limitations. Moreover, there can be a possibility of gender bias as majority of participants were females. The technology usage of children has been reported by parents, however, in dual earner families, parents might not be able to supervise their children's screen time, all day, which might lead to inaccurate reporting.

## Recommendation

A larger representative sample with equal number of male and female participants would be suggested for a further research in order to make generalization possible and minimize gender bias. Also, participants from various socio economic backgrounds must be considered. Semi structured interviews and other qualitative data must be considered to justify the results. Inclusion of parental engagement with technology and the data about child's technology usage must be collected from the child as a self-report.

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*Review Article*

# Edu-2.0: Social Media as Tool of Quality Learning for Underprivileged

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**Abstract**

*Choice of social media as a medium for instructions makes it a political weapon for the underprivileged. Impregnated with rigid social hierarchy, where access to quality educational content is inaccessible for the underprivileged people; social media provides enormous 'situations of power' that entail quality content delivery to every doorstep. The co-production of educational contents by millions of users on YouTube, Facebook, blogs, Wikis, and various other platforms require fine-tuning instructional methods and redefining the premises of peer reviewed contents produced by experts and professionals. This review article explores how social media create Edu-2.0 in India; a neologism used in this review article that signifies the proposition that the underprivileged citizens' access to quality educational content has a direct correlation with the co-production of user generated contents on Internet platforms. At present, access to education is worse in India since the logic of a pre-modern social system arbitrates access to education at least for the underprivileged population, say- women, religious minorities and belonging to Scheduled Castes (SCs). This access increases once content delivery significantly endorses social media.*

**Keywords:** Edu-2.0, Social Media, Learning, Instructional Medium, Pedagogy, Co-production of Knowledge.

## Introduction

Social media platforms, particularly, Google Meet, Google Classroom, zoom, Telegraph, Webex and others have become widely sought after tools of content delivery in educational scenarios. Their significance increased predominantly in the COVID-19 affected world. Blogs, Facebook, and others have been in vogue for couple of years in the educational world. However, more than being a medium used for instructional purposes, social media's use in classroom settings helps people negotiate with the logic of a rigid hierarchical social structure in India that thwart poor people's access to education. This correlation between social media and learning needs investigation.

## The Problem

Can educational content generated on social media and its user generation bypass traditional ways of content delivery where trained professionals and experts hold sway over production and dissemination. This is an important question regarding education, since access to the same in India seems impeded by factors that are unique to the social system in India.

In a time, user generated contents hold influence over most of the social realms,- say, political campaigns, healthcare, business, and others, its significance on the educational sector demands more attention. In this background, now, a new pedagogy works for the teeming millions: the pedagogy of the oppressed.

This paper calls the Edu- 2.0, the pedagogy of the oppressed. So neologism helps us to understand the question: Can social media help overcome the apparent structural constrains to education in the Indian society? Will it help those who have no access to quality education? Whether use of social media as an educational tool finds resolution to the questions of access, quality, cost, time, geography and parity, which conventionally remains a challenge to policy makers, government and stakeholders? Will the content produced by users on various social media platforms cause a re-definition of educational content vis-à-vis those generated by experts and professionals? These are specific questions addressed in this study.

## Literature Review

There are works that remind us of the need to reconsider educational content in the age of social media (Standish, 2008). Allan Collins and Richard Halverson (2009) recounted that educators must think about rethinking education in the age of connected platforms. Some writers argue that self-directed activities, collaborative productions, mass publications and technology-based learning are significant at present (Crook, 2008). Other writers would argue that learners should be 'active co-producers' of knowledge rather than 'passive consumers' of content (Lee and McLoughlin 2010). Many educators maintain social media is successful in incorporating what Goodyear and Ellis (2008) call 'serious student-centred learning'. There are arguments to develop' pedagogy 2.0 implying 'innovative pedagogies that facilitate learner choice and autonomy' (Lee and McLoughlin 2010: 1).

The 1,800 open courses at MIT are open to free access from anywhere. What does it signify? Educationalists have compelling reasons to re-examine entirely the nature of learning in the light of social media. The constructivist and socio-cultural learning theories substantiate this. Douglas Thomas and John Seely-Brown's (2011) have recounted that learning based on the principles of collective study, play and innovate rather than individualized instruction keeps going on change (McHugh, 2011).

There is growing logic that most powerful learning is social rather than individual (Kalantzis, and Cope, 2008). Current learning theories emphasize the importance of social involvement for motivation, construction of knowledge

as a source of support (Schaffert, and Hilzensauer, 2008). The co-construction of knowledge through group action leads to deeper understanding and collaborative learning develop critical thinking, shared understandings and lead to long-term retention of learning materials compared to more traditional knowledge transfer models (Kreijins, Kirschner, and Jochems, 2003). Feedback is essential for learning whether from teachers to students, between students, and from students to teachers, says Hattie (2009).

George Siemens (2004) has put it aptly that learning needs to be conceived in terms of the 'capacity to know more' through digital media platforms rather than relying on the individual accumulation of prior knowledge in terms of 'what is currently known' (Chatti, Amine, and Quix, 2010: 80–99).

Teachers become designers, coordinators, moderators, mediators and mentors, rather than instructors or lecturers. Students not only have to assume the role of supporting each other in their learning endeavours, but also jointly create both the learning content and context, developing their own rules and strategies for cooperation and content production while endorsing inclusion and equity (Redecker, et al., 2009).

The importance of blogs in the fields of education has increased because of the changes in the classroom dynamics, says Mora and Espinosa (Juana-Espinosa, 2007). A study by Nardi and team (2004: 41-6) has recounted five major motivations for blogging: documenting one's life; providing commentary and opinions; expressing deeply felt emotions; articulating ideas through writing; and forming and maintaining community forums.

In the educational sector, blogs are being used to satisfy a variety of communication needs to favour e-learning practices. In a study by Leslie (October 2003), a matrix of the possible uses of weblogs in education is shown. These possible uses are analyzed in a two dimension space: who uses the weblog (instructors or students) and for what (writing or reading). While following this same matrix, a list of possible uses is provided in a study by Lowe (Lowe, A.J. Blog use in teaching): improving writing skills, encouraging reflective writing, reading student weblogs for assessment, sharing resources and ideas, recording progress and process, course administration, group work, etc.

Juhasz's (2008) "YouTube only" classroom pointed out that mainstream reports did not take the idea of a YouTube classroom seriously, portraying the class as undeveloped. Mainstream media's biases treated the class and YouTube as a joke. Several studies have documented the YouTube and its educationally applicable dimension (Burgess, and Green, 2009; Manovich, 2008; Cheng, Dale, and Jiangechuan, 2007 and Lange, 2008).

The literary survey above found that pedagogy requires some kind of fine-tuning, as there is growing use of social media in learning environment. The literature cited and reviewed above point to some important changes in educational world. We move away from thinking of knowledge as a substance

that we transmit from student to teacher, to a social view of learning. Participation and collaboration is going to be the basis of learning. Content creation is becoming participative. In this background, the survey has found that a growing literature gap in India about the relationship between social media and educational scenario is mounting up. This review article caters light to that aspect.

## Conceptual Definition

The label Edu-2.0 used in this article refers to an array of online platforms that can be educationally applicable for learning atmosphere. There are blogs, Facebook, Twitter and YouTube. Many people share content on Facebook, and Twitter. People create and share content on YouTube and text on chat forums. People post about academic events on Internet platforms. They share news about an educational conference, or mark a like on an educational event on social networking sites. It is also done no matter where you are in a train, a bus or flight or by some other means. These are all about Edu-2.0. The term 'Edu-2.0' refers to a range of integrated online tools that can be either internet-based or networked. The political significance of the term is that it can measure whether social media embedded learning processes bypass traditional barriers such as access to education for the underprivileged.

## Background of the Study

In 2009, authors of this review article started a teaching blog. We posted assignments and seminar topics, lecture notes, and official seminar notifications. Students from different places connected with the blog in the meantime. The comment section was growing, with over 500 shares for many posts on an average; the blog was useful in terms of user traffic. But now that situation changed. Blogs have become outdated. YouTube and other video streaming platforms have occupied its place. The business model YouTube represents is such that content creators are desperate for subscriptions, views, and likes. YouTubers compete for creation of quality contents that attract audience instantly. The benefactors of this competition on video streaming platform are certainly useful.

If one goes to educational platforms on YouTube, quality contents are aplenty which attract a vast audience, and the success of which depends on the business model YouTube represents. Civil service aspirants access content on various YouTube channels where free classroom lectures on various topics are available. There are YouTube channels that provide free classroom lectures for CBSE (Central Board of Secondary Education) students at all levels. Plenty of contents free on channels from physics and political science to languages and literary theories caters to college and university students.

WhatsApp has taken the old role of blogging sites for content sharing, by which educational institutions are now instantly connecting with seekers of information alternatively. Schools and colleges have created WhatsApp groups for every batch and class, where instant sharing of information and educational content has revolutionized the very foundation of traditional instruction

methods.

A new entrant in to this scenario is online webinars and online courses. Zoom, Microsoft Teams, Google Meet and Cisco WebEx have brought in a recent addition to physical classrooms. One need not to go in to a physical place for education. Universities offer short-term courses for faculty development in higher education, which helps teachers, particularly women who find it difficult to attend courses because of family constraints. Courses come to your doorsteps. Assignments, class tests, and class activities have taken over by Google Classroom, Telegraph and Moodle platforms.

The medium that guided young academics to new ideas a generation ago were few, with higher levels of abrupt and unwritten formalities, and were exclusionary. Nowadays, the best students are using social media to scavenge for the information that matters to them. Schoolchildren explore the web for study materials. Academicians need not to indulge in library, while browsing for massive volumes to take plentiful notes. Education experts say Internet has been facilitating guaranteed access to information. Now Internet has altered the conventional parameters of knowledge production, dissemination and sharing. Knowledge is not just confined to reading and printing. Many educationists believe educational arena is in a good position to use social media based tools to support the collective creation of knowledge amongst students and the wider community (Kimmerle, Moskaliuk, and Cress, 2009). Many universities are now striving to develop ways of using social media to support these new forms of learning (Conole, and Alevizou, 2010).

Leading western universities have found social media useful for extending its classroom and learning process through networking. The courses and classroom settings of such Universities are also available at the streaming videos. Harvard University, for example, has their classroom and curricular aspects on social media. See, Posterous <harvardsocial.posterous.com >, Facebook <www.facebook.com/Harvard>, YouTube <www.youtube.com/user/Harvard>, iTunes <itunes.harvard.edu>, Twitter <twitter.com/#!/Harvard>, Foursquare <https://foursquare.com/harvard>, Social Media Group <abcd-socialmedia.scribo.harvard.edu>. This is just an example of one university. Imagine the number of educational institutions, that all maintain social media policies like this!

Any modern university, educational institutes and research centres maintain its own social media policies and maintain social media accounts. Here they tag links, share, and upload information pertaining to courses, lecture notes and videos of classroom lectures. Students apply for admission online, which chop off paperwork and amplify administrative effectiveness. Applicants receive e-notifications regarding admission, course schedules, billing procedures, and other useful information. One can pay fees online and seek their examination results. Teachers prefer to receive tutorials online, which not only lends itself to faster transmission but also avoids the difficulty in reading a manuscript. In the

same way, some faculties not only put up their course material on the website, but their lectures also, which attract widest potential audience. Students who could not attend lecture classes can also benefit from them. Assignments, term papers, etc., are useful for submitting online and teachers can share such submissions through social media platforms so that it can reach out to a larger audience instantly. The faculty and students remain connected through email and social media sites on which students receive instructions, fix appointments, send essays or assignments, etc. In fact, students who have access to Internet will facilitate a round-the-clock classroom experience.

With the availability of new technologies, common access to Internet and to information, new types of social interactions mediated by technology, these cause a shift in how we learn and teach. Obviously Online platforms for higher education have two important advantages, learners can take a more active part in their education; and second, learning platforms offer 'anytime, anywhere learning' (Becta 2007). The aim of online learning platforms is to provide an online learning environment that supports quality learning and teaching, and connects students, teachers and parents, anywhere (DEECD 2010).

Education remains unattainable for a large section among young people. Women, tribes, minorities and SCs are still out of the game. Besides this, barriers to education such as quality, access, and cost are still lingering the prospects of quality education to many sections. Here comes the significance of social media in education.

**Blog for Class Room**

On the blog link indianbloggers.org/, one would get a list of popular bloggers in India. From an educational point of view, blogs are the development of traditional learning logs for students and teachers, whether as a complement to traditional lectures or as an e-learning tool. The blog http://education.trak.in/, for example, says everything about Indian Education, colleges, universities, guidance, and information.

Consider the blog links of educational institutions offering educational content below. Department of Economics, MG College, Trivandrum- http://mgceconomicsdept.blogspot.in/, Kerala University Youth Festival- http://keralauniversityyouthfestival2014.blogspot.in/, UNIZOA, the alumni association of Department of Zoology, University College, Trivandrum, Kerala, India- http://unizoa-unizoa.blogspot.in/, A blog that disseminates information on social science conferences, jobs, courses, etc. in India and abroad- http://thesocialscienceinformer.blogspot.in/, Research in Centre for Studies in Science Policy- http://cssp-jnu.blogspot.in/, Swaraj Musings- http://gandhimgu.blogspot.in/.

The blogs listed above have widely scaled for reflective journaling; summarizing class room discussions, reflecting on what students learned during a class activity or project, sharing ideas for applying what they have learned to their own practice, and so on. These blogs promote reflection and analysis. The blogs listed

above promote a habit of writing. Further, using blogging for educational purposes enables an opportunity to take advantage of the social media tools which students are using in their personal and often professional lives. Another benefit of blogging to students who are in education is that it gives them an opportunity to learn to use tools as aids to instruction with their own students. Finally, blogging is used to introduce students to social media tools. Blogs triumph over the traditional social barriers impregnated with the lives of marginalised people with access to education. This forms the political value of blogs in a society that has social cleavages.

**Facebook for Learning**

Room to Read, a global organization seeking to transform the lives of millions of children in the developing world through a focus on literacy and gender equality in education, is a case in point. Facebook profile says that "we partner with communities across Asia and Africa to support literacy and gender equality in education" <facebook.com/roomtoread/timeline>.

Facebook helps students develop relationship skills by gaining a better understanding of the feelings of other people and their social system. When they see others sharing their personal feelings online, it is easier for them to empathize and identify with their experiences and comment with support. Facebook provides many other pedagogical advantages to both teachers and students. Facebook as a networking platform connects students with each other, indirectly creating a learning community, a vital component of education. It provides instructors opportunities by which students can help and support one another by building their courses atop the community already established by the students themselves. Facebook also increases both teacher-student and student-student interaction.

The nature of social learning has been changing at a moderately rapid pace in India, precipitated in part by the widespread use of Facebook. Sharing photographs, revealing demographic information, displaying interests, and conducting online conversations are just a few of the features utilized on Facebook. The following list summarizes the different ways how Facebook integrates into a course.

Profile Page: An instructor creates a profile page for him or her.

Group Page for a Class: A separate page created specifically for a course.

Replacing/Duplicating web courses functions on Facebook: Discussions that traditionally have taken place on web course can also occur on Facebook discussion boards.

Integration of Facebook Applications: There are several useful applications that will expand the functionality of Facebook for class.

Facebook is not only a great way to find old friends or learn about what is happening on weekends; it is also an incredible learning tool. One could utilise Facebook for class projects, for enhancing communication, and for engaging students in a manner that might not be entirely possible in

traditional classroom settings.

**Twitter for Learning**

Twitter hashtag #classroom20 takes users to a community level feature hosted by the website www.classroom20.com/, which introduces that it is a social network for those interested in Web 2.0, and participative technologies in the classroom. If you follow the hash tag at #ProfessorV1, one would get the whole updates on the activities at Professor V's Teaching Café <teachingcafe.ning.com>, which is also one of the interactive communities for the cause of education.

The hashtags #Edchat is a weekly Bammy Award winning Twitter conversation that any educator can join to discuss and learn about current teaching trends, how to integrate technology, transform their teaching and connect with inspiring educators worldwide.

Twitter's classroom capabilities are limited only by an educator's imagination. Twitter can perform a useful educational tool, giving students and teachers a simple way to communicate that goes beyond office hours and classrooms. With the use of a simple hashtag (#), it becomes incredibly easy to curate tweets, giving students a simple way to follow the information that is associated with a specific class. Alternatively, teachers can create accounts or Twitter lists specific to a course that students can then follow, making it easy for them to find each other on Twitter.

There are loads of great educational hashtags that have been created that one can search out and see what other educators are providing. If you are a social studies teacher or need history resources, check out #sschat. Maybe English is your taste, and then there is #engchat. Maybe you are looking for just general education resources. Then one should do a search for #edchat. If you just log in to Cybrary Man <www.cybraryman.com/edhashtags.html>, one can get plenty of educational hashtags. Twitter can be used in novel ways to make classroom interaction in an unprecedented manner. A lot of Twitter application has educational values. Especially tweets and retweets are powerful instruments for making classrooms beyond the walls of the institution.

Twitter could be more effective to send reminders to students about homework and assignments, and provide relevant information for their next class. Using Twitter on a smart phone ensures that students receive notifications and can keep pace with the latest class news. This is where Twitter's SMS service can also come in use. Teachers can use this to their advantage by tweeting interesting educational links for their students to read. Sending out a tweet to give students a reading assignment is an instantaneous way to keep them prepared for their class ahead of time. Teachers can easily collaborate with each other on Twitter too, exchanging ideas and teaching tools. With the use of a hashtag, it is easy for any group of people to connect on Twitter, so why not teachers? The hashtag #edchat, #edtech and more give instant access to links, thoughts and tweets from educators from all over the world.

History teachers can use Twitter to

communicate with students using the voice of a historical figure, by creating a Twitter account in that person's name. Students can get a feel, for it used what kind of language, interactive way. It can even encourage them to interact with the historical figure, using the same language and style.

Creative writing professors can use Twitter to encourage student creativity in a challenging format. Writers and poets use Twitter to share their micro poems with the world, using hashtags like #poetweet or #micropoem. The social network could be great for encouraging students to write haikus or six word stories, a concept that began when Ernest Hemingway was challenged to write a story in six words. Twitter is the perfect tool to convey a concept or story with as few words as possible.

In a classroom setting, Twitter use contributes to a discussion and gives students and teachers a way to keep the conversation going long after the class is over. Professors have already used this method in large classrooms, with a projection screen at the front of the class, displaying the search results for the chosen hashtag for the discussion. Using an application like Tweet deck, or any desktop app with a self-updating feature, is the ideal way for the tweets to be displayed during class.

Hashtag learning experiences could extend learning practices beyond the 'walls' of the classroom and it could bring about far-reaching implications since access and equity in education is disadvantageous to marginalised communities in India. It helps in bringing change in current events to the curriculum, and students can become more engaging and participative than ever before. As it could connect students from across multiple sections or institutions and streams of education, indeed the political significance of Twitter in educational practices far exceeds the basic function it was thought of. Reach out to experts in the field just by a click. As it can pull the world into your classroom, the power of Twitter is unbelievable.

### Video Streaming for Learning

Kevin Kelly, (21 November 2008) the founder of Wired Magazine and Lawrence Lessig, Stanford law professor and Creative Commons founder, says our cultural shift today as one from book literacy to screen fluency. Here what they mean is video formats, which a new vernacular is developing in motion. It is a 'world beyond words', where TV, movies and all audiovisual work will find themselves with a table of contents, abstracts, indexes and rendering them searchable within a short span of time. Lessig predicts that television and movies will be "bookified (Lessig, 2008).

Video is not new to education, but they offer new capabilities for educational practices. Professors use YouTube content that can be useful teaching aid in the classroom atmosphere. Indeed, educationalists believe universities are in a good position to use social media practices to support the collective creation of knowledge amongst students and the wider community. Several universities are now striving to develop ways of using social media to support these alternative forms of

learning. Leading Universities have their classrooms on YouTube. For example, there are YouTube pages for universities such as MIT <outube.com/user/MIT>, Yale University <www.youtube.com/user/YaleCourses>, Harvard Kennedy School <www.youtube.com/user/HarvardKennedySchool>, Princeton University <www.youtube.com/user/princetonuniversity/videos>, Columbia University <www.youtube.com/user/columbiauniversity>, and Stanford University <www.youtube.com/user/StanfordUniversity>.

EduCanon <www.educanon.com> is a free web platform that simply let teachers to slot in online video content into their lessons. Using videos from YouTube, Vimeo, or TeacherTube, now teachers can make assignments directly on the pinnacle of that video content. In fact, screen learning makes students more interested in a learning activity. More obviously, video content sharing is significant to a generation who are unnecessarily put attention to the screen of various sorts, be it touch, swipe, or any other of that sort.

In 2012, Google launched YouTube for schools, which aimed at giving teachers easy access to YouTubeEDU. It was an educational library replete with free, high-quality educational videos, which sort out the enormous video contents, uploaded to YouTube by different educators at different points of time from different parts of the world. YouTubeEDU promoted by the company officials is a YouTube section devoted to academic content. Calling this new site 'a free, self-organizing, the democratic website containing the entire world's knowledge', YouTubeEDU promises an environment in which 'any qualified teacher can contribute and absolutely anyone can learn'. It features lectures and other materials from hundreds of colleges and universities, including Stanford, Harvard, and the Massachusetts Institute of Technology (MIT).

YouTube is not the only Internet site offering higher education lectures and courses. One competitor is Big Think. TED Talks, and Talks at Google, Zeitgeist are other examples of video platforms that provide rich but free educational content.

Another website, Education for All, offers more than video with its courses. The site provides syllabus materials that accompany courses, plus reading lists. The link for a course on financial markets, taught by Robert Schiller, a professor of economics at Yale University, even added copies of the exams and solutions as well as a discussion forum for viewers. The site also includes a complete set of four Chinese- language courses available with a package of downloadable textbooks and audio recordings of dialogues.

Then there is Academic Earth, a site that also offers video courses and lectures from top scholars. Founded by Richard Ludlow, a Yale graduate, Academic Earth's mission is to "give everyone on earth access to a world-class education". It draws material from Harvard, MIT, Princeton, Stanford, Yale, and Berkeley and says that 50 percent of users come from outside the United States. Like many other educational sites, it has a Facebook page and a presence on Twitter.

Indeed, video offers more mobility, ensures distance learning easy, and increased access ensures YouTube and other video hosting services more apt for education at door steps in a society that traditionally denied access to its majority. Certainly, YouTube based educational practices offer a ray of hope to communities on the social walls of social hierarchy. It is a more political choice.

**Edu- 2.0: Indian Scenario**

A study by Sunil Tyagi (2012: 28-43) in the National Capital Territory of India about the use of social media among faculties found that user generated content holds implication to the stratified society in India. It gains a role in quality enhancement. It brings down quality disparity between rural and urban India. Indira Gandhi National Open University (IGNOU) uses radio, television, and Internet technologies.

For instance, students can subscribe:-

E-Resources <www.ignou.ac.in/ignou/footer/Subscribed%20E-Resources>
IGNOU Homepage <www.ignou.ac.in >
Virtual Classrooms <www.ignouonline.ac.in/VirtualClass.htm>
IGNOU Online <www.ignouonline.ac.in>
IGNOU WIKi <ieg.ignou.ac.in/wiki/index.php/Main_Page>

Using Internet and television, the Government adopted National Programme on Technology Enhanced Learning (2007) (NPTEL): a concept similar to the open courseware initiative of MIT and is an initiative of seven IITs and IISc for creating E-contents. It hosts a YouTube Channel <www.youtube.com/user/nptelhrd> and a Facebook page. Eklavya initiative; has been using Internet and television channels to promote distance learning. Consider EKLAVYA Technology Channel <www.tv14.net/eklavya-technology-channel> India 2007. It is a distant learning joint initiative between the IITs and IGNOU. It hosts a Facebook page.

Premier educational institutes in India are not away from social media for content dissemination, especially IITs, IIMs and NITs. For instance; IIT Gandhinagar has Facebook, YouTube, and Twitter pages. IIM Calcutta has been managing YouTube, Facebook, Twitter, and LinkedIn pages. Libraries in India also have developed collaborating and publishing platforms on social media sites. A library blog has created to keep update the students, faculty and other staff members of BUEST (Baddi University of Emerging Sciences and Technology).

Seminar, symposium, workshop and academic events have been updating through social media sites. Blogs are popular, for example, Blogger titled The Social Science Informer <thesocialscienceinformer.blogspot.in>. Admission to various colleges are notified by specific blogs, for example, 'Admissions to various Courses in India' <admissionsindia.blogspot.in>, i.e., a blog that collaborate and network for latest admission notification to various courses in India, offered by Universities, Colleges and other higher education Institutions.

In addition, M-learning has been sweeping Indian educational scenario. Mobile devices, tablets, and Symbian are popular for teaching-learning

purposes. It makes education portable, impulsive, efficient and thrilling. By this, students can record the lectures, provide feedback, read E-books, access Internet and practical exercises and use software for educational activities.

The Government of Rajasthan had extensive infrastructure building for Information and Communication Technology. The State's Information Technology Department launched its own education social network for learning. Educational institutions such as HLC International, St Patrick's School, Chennai Public School (CPS) and Rosary Matriculation Higher Secondary School are using YouTube, Facebook, Twitter and Ustream to interact with students, parents, alumni and well-wishers, says Times of India report (Mathai, 22 August 2011). Portals such as Studyplaces.com and Tutorvista are functioning as information exchanges for students. Web portals such as 100percentile.com provide online examinations. The mathguru.com offers solved questions on the CBSE Mathematics curriculum.

India benefits from the Internet and social media platforms, since they hold power to cut across a plenty of variables that historically turned hostile towards the educational opportunities of a very large segment of its population. The Edu- 2.0 beseems realisable in the Indian context by a wider application of the following social media platforms. They are Facebook, Twitter, YouTube, and blogs. In recent times, WhatsApp has become a leading take among educators and learners.

Fostering networks and communities is an essential element of a learning platform. It has been recognising for some time that principals, teachers, students and parents can connect and form communities organised around relationships and ideas. Through an online community, members can reflect, comment, and contribute to conversations, equally. The conversations become 'learning activities' that can involve 'experts', as well as all members of the community.

The need for communication tools in the learning process has often been underestimated by educators. Especially those who feel comfortable with the traditional ways of teaching should come of age. More recently, an increasing number of learning environments have been transforming into digital forms in the education scenario.

**Conclusion**

This review article reads that the co-production of content by ordinary social media users has political significance. Content delivery on social media helps bypass traditional barriers to access quality education for poor people. Online video conferencing platforms such as Webex, Google Meet and Zoom platforms can be added value which helps people bypass barriers to access educational content. YouTube lecture contents for beneficiaries across all levels of learning available free benefit not only society, but it helps people overcome social hierarchy that prevents access to quality education.

It is apparent that Edu- 2.0 seeks to answer challenges that the educational domain in India has faced for decades.

More than that, new media embedded education destroys a range of variables that impedes the attainment of education. Minority social groups in India because of social factors such as gender, caste, geography, quality, access, and cost cannot leverage opportunities of higher education. Digital media gives the potential to wipe out the structural barriers to the educational setting in India. The internet has no caste, gender, race, class, etc. This means Edu- 2.0 has political potential since it reflects the pedagogy of the oppressed. This form of education has more reasons to be popular among marginalized communities than the mainstream.

Colleges and universities are fast embracing social media for academic purposes. In the age where crowd, mass participation, producer public and user contents shape the knowledge system, any attempt at reforming the educational system could not bring in excellent result until and unless it properly addresses an attempt to reincorporate social media into curricular and pedagogical aspects. Schools are developing connected learning methodologies to enhance erudition among kids; they are fast adopting social networking sites in their everyday learning activities.

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*General Article*

# Covid-19 and Higher Education Learning Ecosystem: Challenges and Way Forward

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**Abstract**

*In the history of humankind, interruption to education has been noticed earlier, however, the disruptions caused by COVID-19 pandemic are unprecedented. Affecting the whole world, it has halted our movement, which has been necessary to put a tab on the spread of virus. This also affected parents, teachers and students. World student and teacher population is facing challenging times in keeping pace with these happenings with the purpose of continuation of teaching learning during pandemic times. This paper discusses such challenges arising out of COVID-19 pandemic and proposes some way forward in dealing with this crisis.*

**Keywords:** COVID-19, Higher Education, Pedagogy, Online Teaching, Web Conferencing, Access, Social Distancing, Emotional Tenor

## Introduction

We are living in terrible times dominated by COVID-19 virus, which has locked down all economic activity in the world and forced people to live inside their homes. In fact, most National Governments are advising, and some are forcing, their people to stay at home to be safe. Though the fight is between unequal-the mightiest of all natural creations (humans) and the non-living microscopic entity (virus), no country on this planet has remained untouched by the devastating impact of the pandemic. Even those nations which have constructed missiles and nuclear devices that can destroy our planet in a matter of minutes and changed world order to satisfy their prejudices, dominated space and boast of conquering the cosmos, built airplanes that can travel at supersonic speeds and transport hundreds of people several thousand kilometers, are failing to win the battle against the enemy which is so tiny that we need the most powerful microscopes to view their structures or cannot travel more than a few feet at a time by itself. (It is another matter that we have aided to make its presence universally.) Globally, as of 26 November 2020, there have been 60,074,174 confirmed cases of COVID-19, including 1,416,292 deaths, reported to WHO (2020). In case of India, as of 27 November 2020, there have been 93,09,787 infected cases out of which 4,55,555 are active cases and 87,18,517 are discharged (mygov. in data dashboard). Number of deaths

in India stands at 1,35,715 as on 27 November 2020 (08:00 am) (MyGov. in, 2020). These precious lives have been lost the world over due to lack of reliable treatment (medicine/vaccine). The numbers continue to increase with every passing day because of confusing findings of researchers on mutating virus. In the present scenario, no one is sure about the origin of the virus, though allegations are flowing thick and fast between the affected and the accused.

As we know, the international air, water and land borders were sealed by almost every country. We witnessed complete and partial lockdown on global scale. No physical movement was allowed even in places of worship by the most ardent practitioners of religion or believers in free trade. Economy came to stand still in most countries and loss of jobs led to mass employment. In India alone 27 million youth were unemployed in April 2020. Keelery (2020) reported that the unemployment in India went up to 24 percent on 17 May 2020, possibly due to a decrease in demand as well as disruption of workforce employed at companies. But, it is a well-accepted fact of life that the world is made of opposites: day and night, good and evil, donor and acceptor and necessity is the mother of invention. This is true even in COVID-19 pandemic, which has thrown several positives as well. We are witnessing research collaborations between scientists and researchers of developed and developing countries for a vaccine to check COVID-19 infections and minimize loss of precious human lives. Rich are making donations the world over in cash and kind (food, medical kits and hospitals) to help the less fortunate. This is evidence of their faith in the philosophy of sharing and caring, seeking joy in giving, brotherhood and togetherness, values forgotten by mass consumerism. This is notwithstanding the fact that some devotees still believe that the Almighty shall come to their rescue and man has no right to interrupt His scheme of things. Other subsidiary positives include distinct improvement in environmental pollution (of air and water). Air quality index in metropolitan cities came down below the normal mark. People in Kolkata and Bareilly claim to have seen the ice capped mountains of Himalaya several hundred miles away with unaided eye (Picheta, 2020). Birds are chirping and flying without fear.

**Opportunities by technologies**

In these gloomy times, several variations of the use of electromagnetic waves (Internet) have come to our aid. On the economic front, financial transactions have been facilitated by different stakeholders using online banking or use of apps like Bhim (BhimUPI, 2020). On the social front, connection with the loved ones across oceans and mountains was facilitated by ICTs. Even administrative decisions were taken by national governments via video-conferencing. However, in these difficult times, private technology companies thought of harnessing the opportunity for monetary gains and began to poach the uninitiated to take advantage by extending solutions for activities such as on-line teaching, conduct of on-line continuous and term-end examinations, among others. This is notwithstanding

the fact that several universities used their internal expertise to train their staff in the pedagogy of online teaching and recording the details for use by the learners using applications such as Google Meet, Cisco WebEx, zoom, etc. Moreover, almost every progressive university conducted webinars to create general awareness about how to cope with the impact of COVID-19 on higher education.

Probably the most important and positive development of pandemic seems to be in transaction of teaching-learning through on-line mode. As we know, most of the world's universities were forced to close campuses and send their learners home for safety and to control the spread of infection. Many countries and F2F institutions moved directly to online provision in the face of campus closures (Bozkurt & Sharma, 2020). Since development of technologies in all countries is not uniform, online learning cannot be seen as the only solution for remote, rural and resource-starved communities. This is notwithstanding the fact that since 1970s ODL institutions have shown that quality teaching-learning at a distance is possible using a range of tools and technologies. Developments in web technologies and increased access to mobile applications have opened vast new possibilities. But, only those solutions prove effective that are tailored to specific needs and contexts.

In COVID-19 time, Internet put on-line education on the forefront and continuing the tradition of advanced teaching-learning. F2F teachers adapted to the new mode and imparted instruction while students learnt in the safety of their homes. The myth that education can be transacted most effectively within the four walls of the university has been exploded within a few months (though open education providers could not achieve it in decades). Even the purists in academia, who had been most ardent critics of ICT supported transmission of knowledge and criticized, even ridiculed it as less effective and secondary mode of learning have become its admirers/ advocates. (This is in spite of the fact that ICTs have revolutionized the mode of transacting education and brought about synergies: live lectures, once recorded, could be shared with the learners, who can learn details as suited to their convenience.) On-line education is synonymous with quality and is now considered as wave of future. A group of researchers reported that emergency remote education has been a very viable option in this time of crisis with various offline and online resources available (Bozkurt, et al., 2020).

The question that presents itself: Is the pandemic a watershed for higher education? The ramifications of COVID-19 crisis for higher education seem to be serious and varied; in fact, unprecedented where various stakeholders have been affected in different ways. It is argued by many that post COVID-19, the world of teaching-learning will change for forever while some feel that impact of crisis shall be temporary (Harris, 2020; Inside Higher Ed, 2020). We here discuss some challenges presented by the COVID-19 pandemic to higher education.

**Challenges to Higher Education in COVID-19 Crisis**

1. **Extend Access to and Success in Learning in these challenging times:** We now know that all educational institutions—from play schools to universities and training centers—have been shut down in every country to avoid the spread of virus. UNESCO (2020) estimated a disruption of education of 290.5 million students globally. But, it is being increasingly believed that the pandemic has greased the wheels for big tech's entry into higher education. Will post-pandemic future entail partnerships between the largest tech companies such as Facebook, Google, Infosys, TCS, etc. and leading universities? Will these partnerships help collaborating universities to increase enrolments and hence GER by offering highly valued online-offline programmes and alter the landscape of higher education to sustainable inclusion? In the Indian context, collaboration between open universities (national and state), premier conventional universities/ IITs/IIMs/national centres of eminence and tech companies should do wonders in respect of access and quality of education since each partner would strive to contribute its best.

2. **Social distancing,** as a mandatory regulation is bound to throw big challenge to every educational institution as far as accommodating learners in full strength is concerned till we develop herd resistance or go back to pre-Jan 2020 times. In fact, its observance shall generate huge pressure particularly on institutions of professional education as effective class strength will have to be reduced to almost half (or even less) of sanctioned strength for giving hands-on practice . Therefore, handling a theory class through online teaching-learning in general and providing hands-on experience in particular would pose pragmatic problems.

3. **Training Teachers in on-line pedagogy** poses herculean challenge since their numbers are astronomical though some leading experts are of the view that on-line education should be thought of as stop gap arrangement to F2F classes. Even if that is taken as valid for argument sake, experience so far suggests that F2F teachers have little liking for on-line teaching. Moreover, they are to be trained in the use of technology and requisite e-technology infrastructure is created by every institution located in metropolitan to rural settings in the country, the quality of academic transactions may not meet acceptable standards. As pointed out by the National Knowledge Commission (n.d.), it would involve huge investments in a country of the size of India. Since economic activities are under distress and there are several social constraints, it may not be possible any time soon in majority of higher education institutions.

4. **The emotional tenor of COVID-19** conveys a sense of fear, uncertainty and loss to a large majority due to huge loss of lives and infections the

world over. The education fraternity is worried about institutional safety and learners' health. There is a growing and urgent need of a contextualized system which can help the universities and training centers in identifying possible existing gaps and verify preparedness measures to prevent COVID-19 infections. Moreover, constituting COVID-19 Task Force comprising a medical expert, administrative staff and a teacher by each institution would be essential. Otherwise, this challenge would not be easy to resist.

5. **Technology Infrastructure:** It is said that availability is not accessibility. Therefore, even if Internet based technologies become available, there would be wide gaps in moving from hand holding to screen holding and a lot of effort would be required to plug these by training competent human capital and quality of infrastructure till such time normalcy is restored. An extremely limited use of exclusive educational satellite EduSat launched by Ministry of Human Resource Development (MHRD) now, Ministry of Education in collaboration with ISRO in 2004 explains this well.

6. **Assessment:** It is a well-established fact that academic development and learning curve of learners is based on the quality of testing and certification. As of now, not many institutions have reliable experience in conducting on-line examinations, though a few institutions offering open education have started on-demand examinations. However, private IT corporate are trying to pitch in and make money. Formative assessment has been strongly recommended over summative assessment during this pandemic situation (Liberman, Levin, & Luna-Bazaldua, 2020).

7. **Dynamics of employment:** Employer groups will be required to change their mindset as far as acceptability of learners is concerned, if education is imparted predominantly through technology. And it is widely agreed that managing change is a great challenge.

8. **Parents as first education responders:** COVID-19 pandemic has created a unique role for parents as first-line responder for children's survival, care and learning because they are most vulnerable group (Devercelli 2020). Various initiatives in this direction like Emerge Reading Program in Kenya provides books in local languages which the parents read to their children at home, RISE Interactive Audio Instruction Program in Zanzibar offers help for English, Maths and Kiswahili; promoting early learning in East Africa using Sesame Workshops; and Cash transfer programs to help parents in Uganda, Colombia and Mexico etc.

## Educational Technology: Impact on Education in Post-Covid-19

We are currently observing two biggest phenomena: 4th Industrial Revolution and 4th Educational Revolution. World Economic Forum (2019) in its White Paper, "Fourth Industrial

Revolution Beacons of Technology and Innovation in Manufacturing", identifies three technological megatrends as principal drivers for transformation: connectivity, intelligence and flexible automation. The Forum suggested some principle-based actions to provide maximum positive benefit to the society like investment in capacity-building and lifelong learning, diffusing technologies throughout geographical areas, protecting organisations and society through cybersecurity, and collaborating on open Fourth Industrial Revolution platforms and handling data carefully (p.7). However, for educational institutions we need to see how the adoption of Fourth Industrial Revolution technologies at scale can have a meaningful impact. Currently, there is big gap in the institutions adopting and absorbing artificial intelligence, some are frontrunners while many are lagging behind. If we compare the impact for the early adoption of technology and wait time for decreased technology and transitions costs, the institutions who are quick to implement the technology will realise greater benefits. World Economic Forum (2019) highlighted some use-cases; let us have a look at them.

### Up-skilling employees through digital transformation

Using end-to-end supply chain synchronization, automatic changes to products, in-process quality control, digital direction setting, modelling and simulation through digital transformation for digital college and SMART Lab as a way for capacity building leveraged to upskill employees to a good extent.

### Workforce engagement

Strategies like digital dashboards for monitoring, sensor-based KPI (Key Performance Indicators) reporting, cost modelling, additive manufacturing (3D printing) ensures a high level of workforce engagement.

### Operator Involvement

A high level of operator involvement can be achieved using parametric design, business intelligence platforms, real-time process control systems and digital thread through production process.

### Data Science and Robotics

A collaboration of universities to develop a dedicated program for specialists in data science and robotics lead to reduction in environmental waste by using unmanned vehicles for inspection, increase in energy efficiency through assess predictive analytics, increase in reliability using asset performance management and reduction of maintenance cost using analytics and artificial intelligence applications.

### HyFlex (Hybrid Flexible) Method

This is an instructional approach where we combine face-to-face method and online learning (Ferrero, 2020). The teaching and learning is carried out by the teacher in-person, or online synchronously or online asynchronously. The students have the flexibility on how they wish to participate. Given the restrictions COVID-19 Pandemic has put on all of us, it looks this method will be a preferred

mode of educational delivery being an alternative to fully traditional and fully online teaching. This approach was created by Brian Beatty (San Francisco State University, USA) by creating a hybrid class involving blending of online and on-site participation class (Beatty, 2019). Marquart et al. (2018) shared its successful use case at Columbia University in the City of New York, at the School of Social Work, recommending its benefit when technology fails or students have issues with Internet access. Other examples of its use cases are at Northern Illinois University, USA (NIU, 2020); University at Buffalo (Buffalo.edu, 2020), University of South Carolina (sc.edu, 2020), and University of Nebraska–Lincoln (unl.edu, 2020). There are still some challenges with this approach, like to performance based courses or lab based courses, alongwith issue of Internet access to teachers and students.

## Blockchain technology

Sharma, Yildirim & Kurubacak (2020) reported that Blockchain Technology Applications in Education are gaining popularity because of being open, distributed, decentralised and highly secure. Liu (2020) estimated a phenomenal growth in the global blockchain technology market, a jump has been recorded from 1.2 billion US Dollars i 2018 to USD 3 billion in 2020, which is further poised to reach USD 39.7 billion by 2025, at a Compound Annual Growth Rate (CAGR) of 67.3percent. Adoption of Internet of Things (IoT) and Supply Chain Manangement in educational institutions and other 4th industrial revolution technologies have increased interest and adoption of blockchain in educational institutions. Universities like, Open University of United Kingdom, MIT, and University of Nicosia and in Malta have worked on educational implications of blockchain. In India, the National Institute for Smart Government (Mahankali & Chaudhary, 2020) has proposed a national strategy on blockchain. Given that blockchain eliminates centralization and reduces the need for intermediaries, it would be interesting to note how will the role of teachers or schools be affected? Time will show us if blockchain is just a faster and more secure protocol of sharing assets online or "the next big thing"?

## Conclusions and the Way Forward

The pandemic situation has forced all of us to go online. Most of the classes are now being held using various web conferencing tools for synchronous applications like, zoom, Google Meet, MS Teams or Cisco WebEx prominent among many. Various kinds of Learning Management Systems like, Moodle or Google Classroom are being used by teachers to mount their eContent and courses. Further, while we adopt technology solutions, we need to be aware of ethical issues, data privacy and surveillance issues (Prinsloo, Slade, & Khalil, 2019; Davey, 2020; Manskar, 2020). Even the examinations are being conducted online using various technology applications (Liberman, Levin and Luna-Bazaldua, 2020). The trends indicate that the usage of technology will continue to a great extent even post COVID-19 phase. However, we wish to caution our readers about going in for purely technology-centric

solutions (Bozkurt & Sharma, 2020). The good approach would be learning with technology rather than learning from technology. The World Bank (2020) forewarns us that:

*"education systems must confront issues of inequity front and center. They must also prepare multi-modal responses, capitalizing on existing infrastructure and utilizing a combination of different learning mediums to ensure students are engaged and learning. [emergency remote education] can ensure that students continue learning through a variety of avenues. While digital technologies can offer a wide set of capabilities for remote learning, most education systems in low- and middle-income countries, including schools, children and/or teachers, lack access to high-speed broadband or digital devices needed to fully deploy online learning options. As such, education systems need to consider alternative ways for students to continue learning when they are not in school, like in the current Covid-19 crisis" (p. 1).*

Leading luminaries and political masters are struggling to evolve a balancing act as a way forward: To continue with lockdown or go for graded unlocking to save economy. The balancing act is bound to be extremely delicate as second wave of infections could have disastrous consequences, as in case of Spanish flu in 1918. The Indian leadership has advocated self-reliance with focus on land, labor, liquidity and law in the overall ecosystem of Vasudaive Kutumbkam, the world is one family. However, in the context of higher education, we will have to stop making distinction between open learning, on-line education and ICT supported education, i. e. Open and Distance e learning (ODel) would not be an option.

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*General Article*

# Understanding the role of teachers at the advent of Digital Age

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**Abstract**

*The digital age appeals for a transformative change in the learning process. A constructive and thoughtful discourse is needed amongst the academia, researchers and teachers on how to harness the teacher's role to imbibe the core 'vision of teacher' as entailed from centuries commencing from ancient India to the contemporary times. The teacher now does not have to learn how to transmit content but, needs to enrich her skills with an understanding of how students learn, how skills are developed, how knowledge is represented through different media and then processed, and how they use other senses. It will involve impound efforts on the construction of knowledge as now in the digital the learner does not have one epitome source of knowledge (teacher) but, a set of multiple digital resources to learn from. This aspect has become more significant with the occurrence of COVID-19 pandemic.*

**Keywords:** Teacher education, digital age, Artificial Intelligence (AI), education technology and role of teachers.

## Introduction

The education system of India and the role of teachers have seen a multifold transition throughout the centuries. In every development, we have been contemplating the meaning of education. As we are advancing in the digital era, we need to set aback to search and answer questions about the purpose of teaching. Who is the best teacher, human or digital resource? Education and the evolutionary role of the teachers are involved in it. Even with succeeding centuries, we need to embellish answers to questions such as 'Is teacher just a transmitter of knowledge?', 'Does getting taught by a teacher makes one educated?', 'Will digital resources subjugate the role of teachers?', 'Are teachers prepared to enter the digital age?', etc. Multiple questions come to mind when we try to understand teachers' evolutionary role from the past to the present digital age.

## Vision and Role of Teachers

### Ancient and Medieval India

Since ancient times, India's education system has been regarded as the quintessence of learning, an epitome of source for the knowledge, traditions,

and practices that guided and encouraged humanity. Education was imparted at several places, i.e., home, temples, pathshalas, tools, chatuspadis, and gurukuls. Rig Veda focused on the holistic development of learners and thus, the aim of education focused on the same. The teacher was regarded as the highest personification of knowledge and wisdom. The teacher emphasized and transferred values such as humility, truthfulness, discipline, self-reliance, and respect for all formations. The process of teaching and learning followed the tenets of Vedas and Upanishads, which engrossed on fulfilling duties towards self, family, and society; encompassing all aspects of life. (NCERT, Ancient Education System of India)

The teacher was expected to have the essential qualities viz. profundity of education, clairvoyant vision, and intellectual regeneration. (http://eacharya.inflibnet.ac.in/).

The teacher was regarded as equivalent to spiritual father as enunciated in various texts such as Smriti literature – Atharveda and Baudhayana Dharmasutra. It is the teacher's critical role to lead the learner from the darkness of ignorance to the light of knowledge. Even his archetype held a high place, who could be a better example than Ekalavya, who had implicit faith in his teacher Dronacharya. The continuous transmission of the Vedic knowledge store, which society regarded as priceless, was passed only through the teacher's instrumentality. (Altekar, 2009) The mystical systems of philosophy in Upanishads made the role of teacher more necessary for spiritual salvation.

However, the Medieval Period saw an influx of political instability, which adversely affected the existing educational system. Education was now being imparted in Madrasas and Makhtabs. The role of the teacher was the provision of religious education, along with the elimination of illiteracy. For instance, education was the attainment of the ideals and goals of life (NCERT, Basics in Education, 2014). The role of teacher synchronized with the aim of education, i.e., provision of religious education.

**Pre – Independence**

With the coming of the colonial age, the transaction of education evolved, with schools were being set up. The schools were organized by large groups of students who would meet regularly at an allotted place, schools in this case. The education was witnessed as the composition of the curriculum, which will be transacted by the teacher. This has been comprehended in several reports and commissions in the colonial age.

In the Macaulay Minutes (1835); though no direct comment or suggestion is made on the role of the teacher while it is mentioned that for seeking the cooperation of the native public it is not necessary to make the learners learn Sanskrit and Arabic, the teacher should be captivated for influencing the learners. Seeing this phenomenon, Macaulay mentioned that the learners would prescribe the course to be taken by the teachers. This highlights the impact and the importance of the

teacher in colonial India, which Lord Macaulay evoked (Macaulay, 1835). Post which, the Wood's Dispatch emphasized the investment to be done on the formation of a teacher by developing teacher training institutions and revising teachers' pay scale. The Wood's Dispatch is regarded as the Magna Carta of the Indian Education system. It emphasized teacher's training for the transaction of the formal devised curriculum for the students (West, 1867). The Indian Education Commission (1884) highlighted on principles and practices of teachers. It honoured teacher's training as an essential component and that teaching and disciple exert a right influence on the manners, the conduct, and the character of children (Hunter, 1882).

In his book 'Towards New Education, Mahatma Gandhi' states the role of a teacher in a child's life, which was emphasized in the CABE Committee on the following of the same in the Wardha schools (Gandhi, 1953). As stated in the book, Mahatma Gandhi enunciates that the teacher has to be attentive to his pedagogy and whether the students are engaged in the learning process. The distance does not matter; the teacher needs to touch the mind and souls of the students. The same has been examined and reported in the Wardha Scheme of Basic Education, 1937, headed by Dr. Zakhir Hussain, recommended that the teachers be trained in the Wardha syllabus. It also emphasized the recruitment and remuneration of the teachers. (CABE, Report of the Wardha Education Committee of the Central Advisory Board of Education, 1940)

**Post-Independence**

The National Policy of Education 1968 embarks teachers as the critical agent of transformation. The personal qualities and character, educational qualifications, and professional competence that compose are all essential factors for being a good educator. Therefore, to boost these factors, adequate payments and other service conditions must be adequate and satisfactory.

Further, to have a sustainable and highly proficient system, teachers' academic freedom should be encouraged. The teachers should be encouraged to pursue and publish independent studies and research (MoE, 1968). The Chattopadhyaya Committee Report of the National Commission on Teachers (1983-85) 'The teacher and the society' states that the teacher's role has sadly been limited to the transaction of 3Rs. The quality of education has been suffering. The commission recommended that the teacher must associate with the tasks of nation-building. The teacher needs to upkeep the ethos and virtues and transcend the virtues, motivation, and ideals. It is equally important to involve teachers in using technology to meet the future needs, extensive use of education technology should be promoted with proper training of teachers. (NCTE, The Teacher and the Society, 1985)

The National Policy on Education 1986 and PoA 1992 state that traditionally teachers have been highly respected. The teacher is the prime instrument means for implementing educational programs. However, teachers' role

is not sufficed to the teaching and guidance of their pupils but essentially character development of the students. There should be adequate professional development of teachers for using digital resources (MHRD, National Education Policy, 1992) Adhering to the same idea, the National Curriculum Framework, 2005 expounds New Vision of Teacher Education; it states that with the changing times, the teacher education has to become more sensitive to the school system's emerging demands. Envisioning the vision, it discusses that the teacher should prepare for the dual role.

Firstly, the teacher should be an encouraging, supportive and humane facilitator who enables learners (students) to discover their talents. The teacher should help in realizing their physical and intellectual potentialities of the learners to the fullest. Further, develop character and desirable social and human values to function as responsible citizens.

Secondly, the teacher should be an active member of the group of persons who make conscious effort to contribute towards the renewal of school curriculum to maintain its relevance to the changing societal needs and personal needs of learners. This should be done while keeping in view the experience gained in the past; along with the concerns and imperatives that have emerged in the light of changing national development goals and educational priorities. It suggests fostering education technology as an efficient organization of the learning system to serve identified educational purposes. It is essential to revitalize the teachers' training and extensively imbibe ET in the teaching learning process through curriculum and teaching models (NCERT, National Curriculum Framework, 2005). Post NCF 2005, the NCFTE, 2009 emphasizes the human character of the teacher. The character of the teacher is impounded by the qualities of care and feeling of ravishment with the learner. The teachers should seek knowledge and own responsibility towards society and work to build a better world. The teacher should be sensitive to the needs and problems of the learners. This cannot be possible without the teacher's commitment to justice and zeal for social reconstruction. The process of teaching-learning is to be viewed as a search for meaning out of personal experiences and knowledge generation as a continuously evolving process of reflective learning.

Along with being a critical pedagogue, social values should be fostered in the teacher and the students. About technology, it recommends that the teacher education needs to familiarize and sensitize the teacher to distinguish three uses of ICT, i.e. useful, developmentally appropriate and the detrimental use of ICT. In a way, ICT can be imaginatively drawn upon for professional development and academic support of the pre-service and in-service teachers (NCTE, National Curriculum Framework for Teacher Education, 2009).

## Vision and role of teachers in the Digital Age

As implicit in the various policies, committees, and commissions, the

teachers have been regarded as transmitters of knowledge and values. There have been multi-fold changes in the educational institutes, from gurukuls to madrassas/maktabas to the present-day schools. It is the time when we discuss the vision and roles as recommended in the various policies and committees be embedded in the digital age of education.

The present-day school system represents the factory model of educational design where a large group of students, stratified by their age meet set up by the Britishers. This has now become a default design of education transactions. Though the system lasts long from the 19th century, the classroom has not been considered inflexible. For many years, teachers have been used as a wide variety of teaching approaches within this overall institutional framework in conjunction with the epistemological theories of knowledge (Bates, 2019). However, with the advent of digital education, especially during COVID-19 pandemic, the school setting has seen an advert change; with a significant alteration in the teachers' role.

The teacher now does not have just textbooks, pictorial charts, chalk and blackboard to teach but now have available magnificent learning resources on the digital mediums. The volume of 'content' is increasing and freely available over the internet – in all the e-learning platforms: e – Pathshala, DIKSHA, SWAYAM, SWAYAM PRABHA, NDL; to name a few. The learner now does not have one teacher but, has multiple teachers in digital resources to learn from. Thus, the teacher's teaching methods need to be wisely selected, that will help the students develop the skills and competencies required in the 21st century.

It is necessary to point out that the digital education transformation has happed by the leaps and bounds during the COVID-19. However, earlier it was impounded by schemes such as Operation Digital Board of the Ministry. The Ministry of Education had entrusted NCERT to collect information about various digital modes being used by students to receive online education. The Student's Learning Enhancement Guidelines reflects that the Indian Education system has enriched the use of multi-modal delivery of education during school closure. The maximum number of stakeholders has used mobile phones as a medium for teaching-learning during the COVID-19 period (NCERT, Student's Learning Enhancement Guidelines, 2020). Another report, ASER WAVE I points out that there has been a drastic increase in the proportion of students owning a smartphone from 36.5percent to 61.8percent in just two years, from 2018-20, WhatsApp has been by far the most common medium used for sharing learning materials and activities (ASER Centre, 2020). The NCERT study also reveals that about 60-70percent of the participants (students, teachers, parents and school principals from across KVS, NVS and CBSE) reflected that the teaching and learning during COVID-19 period were joyful and satisfactory. Students can learn through their schedule (approximately 46.8percent), they also noticed that the teachers had planned interesting

activities (about 46.4percent).

Thus, students have now started demanding high-flexibility learning that enables them to develop creative solutions that will allow them to live as free agents. The flexible learning demands need to be adhered with a more radical change in teaching supply – learning wherein the technology and traditional learning should come together (Sri, 2019). This can be made possible through self-paced learning of curriculum, lesson plans, that are most appropriate for a specific learner through AI techniques. AI-based digital platforms are empowered to provide optimized education in line with the student's needs. The platforms enable customized learning, testing, and feedback to all levels of students. Digital Education acts as a powerful tool to help students who cannot achieve his/her goal with today's education system (Shim, 2019). However, one must keep in mind that for enabling effective self-paced learning, the curriculum and syllabus available on the digital means needs to be mapped with the learning outcomes and students needs to be assessed accordingly.

Digital Education enables the teacher to change the postulate from knowledge as content to knowledge as a process. As opposed to the belief that the teacher knows everything as mentioned in the various policies and committees and that the learning can only take place in the teacher's presence. The process of education has been transformed. The teacher's role as the transmitter of knowledge is being subjugated in the digital age instead of the various centuries; in Vedic, medieval and modern history wherein the teacher was the sole epitome of knowledge. There is newness in the teaching-learning process. The abilities to add, subtract, divide, and multiply have become less valuable when so many devices (computers, phones, and watches) could do it for the learner. It has also become less critical for pupils and students to memorize dates, facts, and bookish references since the internet make this kind of knowledge available on a continuous and real-time basis. Experiential and experimental learning, creativity, combined with the ability to work in teams and problem solving, will become more central in education. The most fundamental change in education has not been about the 'how we learn or what we learn' but about the 'why we learn.' (Lanvin, 2019)

Earlier, it was the teacher's role to impinge on the morals, values, character building, and provide religious yet secular education. With digital Education and Artificial Intelligence (AI) coming in, as necessary it is to discuss the 'knowledge transmission' role of the digital platform, it is equally essential to discuss and understand the ethical implications AI can have in education. Rose Luckin shared her classroom observation experience in the United Kingdom, wherein a primary school teacher used AI software to help her class understand the different religions across the world. The AI had an interactive animated character on the screen, which asked questions about the children's beliefs and the festivals they took part in. The complexity of the answers that the on-screen character provides is categorically individualized

to each learner's comprehension level. This made it possible that the learner understood. However, to the amazement of the class, the answers for questions about Christianity that the on-screen character provides are always much simpler and positive than the answers for other faiths such as Islam or Judaism (Luckin, 2019). AI has the technical capability to deliver personalized education and training to every learner. Thus, it is imperative to devise strategies to process the content by a student (curriculum and of ethics and values).

The teacher's role needs a transitional change from being an epitome of knowledge to an individual who can understand knowledge creation and devise strategies on how the learner will process that content. Above all, it means linking technology to the specific requirements of a particular knowledge domain or subject area. The learner and the teacher's symbiotic relationship needs to be harnessed with technology acting as a mediator. The changes are reflected in the curriculum – material for learning – the structure of the education facility and the enormous role and responsibility a teacher is perceived to carry out.

## Conclusion

Thoughtful discussions should take place amongst the academia on how to harness the teacher's role to imbed the 'vision of teacher' as laid down in various policies system in the digital era; especially with the advent of digital transformation teaching-learning process due to COVID-19.

Sadly, today, the average teacher's perception of his role and responsibility is far too limited and is concerned with his immediate tasks, namely the teaching of the 3 Rs., and later covering the subject matter prescribed for the examinations. The transitional classrooms and the teaching-learning process should focus on conceptual development, such as dialogue and discussion, and knowledge management, rather than information transmission, and experiential learning in real-world contexts. The content is mostly available on digital resources. A combination of conceptual, practical, personal, and social skills is the critical skill teachers need to possess in the 21st century.

Thus, aligned with a transition in teachers' role and responsibilities, policymakers need to ponder how to re-establish and simultaneously imbed the teacher in the digital age. This teacher can touch the student's hearts in this digital age. It is the teacher who can truly shape our children's future - and, therefore, the future of our nation.

Against this backdrop and keeping in view the vision of teachers, the following suggestions are made for keeping teachers' pace at pace with the digital age in accordance with the National Education Policy 2020.

- A coherent and viable curriculum approach should be developed, emphasizing teachers' role as a catalyst agent for upholding the ethos and virtues for developing humane learning.
- Teachers should be trained to transact specific skills linked to knowledge development and

dissemination to the learners while focusing on the processing of knowledge.

- Teachers should be adapted to more individualized learning and flexible transaction of the curriculum.
- At the advent of technology, the core philosophies and principles of teaching should not be forgotten, but a symbiotic relationship should be built among technology and philosophy of teaching.
- Academia, researchers and teachers should redevelop the learning goals and outcomes for the leaners in line with digital age requirements.

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# Innovative Practices
# Connecting Classrooms through Asynchronous and Asynchronous Technology

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**Abstract**

*The aim of this project was to integrate the technology in low-tech classrooms, particularly in rural government schools. Most of the teachers complain that students studying in rural India are not exposed to enough English so, this innovative practice helps to get connected with the native speakers using technology. During our project, we connected the classroom of the United States (US) with the classroom in India using a technology tool called Padlet. We made a plan of action for 7 weeks. We designed activities like, introducing each other on the online collaborative wall by posting three sentences, out of those three one is a lie. The students were asked to identify the lie and comment on it. This continued for two weeks. After two weeks they were asked to write a review on a film which they have seen recently and asked to read and comment on at least two or three students. This continued for about two more weeks. During the last two weeks, we worked on a Backpack project. Students were encouraged to read the reports or articles on backpacks and collect the information in their own country's context. After collecting information using the internet they prepared presentations and presented them to their class. Their presentations were recorded and shared with the US students. US students also filmed their presentations and shared with us. We came to the conclusion that the students are engaged meaningfully by integrating technology in the classroom. Students got an opportunity to interact with native speakers. This project also helped us to learn and understand US culture based on the reviews written by them. We also learned that students learn better when they are engaged in collaborative tasks with their peers. Technology played a vital role in our collaboration. Most of my students are not good at using technology but this project made them learn to browse the internet and started using Padlet effectively.*

**Keywords:** Connecting Classrooms, Padlet, Collaborating, Blended learning, Technology Integration

## Introduction

Technology has helped to connect the classrooms globally. Learning and sharing happens everywhere and classroom boundaries get widened. Technology helps us to prepare as global citizens. Our project focused on how technology can be integrated asynchronously using web.2.0 tools. We also concentrated on learning happens everywhere, not only in the closed classrooms. We have tried to break the

traditional way of teaching within the four walls of the classroom.

**About our project**

This project was taken with the initiation of Know my world. This is an NGO work for Global Education. This project was taken as part of a virtual exchange program. A virtual meeting was organized to connect with the US teachers for our planning and designing of the project. In the project, we connected our classroom with the classrooms of the United States using technology. During the project, we collaborated with the teacher in the US and prepared a timeline to work together for about 7 weeks and we used the online collaboration tool Padlet for our project. During our project, it was agreed to work on the main theme culture and digital exchange and the sub-themes like, compare and contrast and problem-solving techniques.

**Objectives of the Project**

- To understand the cultures of two countries.
- To make the students responsible citizens.
- Going out of classroom walls.
- Break the classroom walls using technology.
- Integrating technology in ESL teaching.
- Creating connections to understand the cultures.
- Incorporating 21st century skills like collaborating, Creating, Problem-solving into the ESL classroom using technology.
- Cross-Cultural exchange provides an opportunity to learn about other cultures and beliefs, cultivates empathy and understanding, and promotes tolerance and peace.
- To bring the world into the classroom.

**Collaborating teachers and their background**

P. Vinayadhar Raju is an English language teacher working in Telangana state government school. He has been teaching English since 2002. He works at ZPHS Jangapally in Karimnagar district. He is a continuous learner and tech-savvy, good at using technology but works at the low-tech environment. His students don't have an internet facility at home and school and no proper computer lab even at school so, he used his own laptop, tab and mobile phone for this project. The class strength was 60. Most of his students were from rural India. The medium of instruction in his school is English and Telugu. Class 9 students were chosen for this project who belong to 14 to 16 years age group.

Tanya Washington works at Honor Roll School, Texas in the United States of America. She involved her 6th grades in the project. Their school is well equipped with technology. Every student in the class is provided with a Chromebook. Her students are good at using technology and technological devices. Most of the students' mother tongue is English. One interesting thing is that there were students of Indian origin in her class. They participated very actively in our project and showed

a lot of enthusiasm. Their class strength was 50 and they were aged between 10 to 14 years.

**Subject: Culture and Digital Exchange**

**Planning meetings**

We planned our project by organizing synchronous meetings through online conference tools like zoom and Hangout. In our online meetings, we discussed our two-weeks plan of action at a time and prepared a timeline. We are from different time zones so we used whenisgood.net to plan our online meetings.

**Technology Used**

**Padlet:** It is an online asynchronous collaborative wall where, we can create our collaborative wall and share with anyone who we want to work with. We can also protect it with a password to maintain the privacy of our work. Padlet supports different ways to express our thoughts by posting text, audio and videos files, URLs, uploading files, embedded content and pictures. It also supports exporting our content to pdfs and excel sheets. Collaborative walls can be shared with friends and colleagues using the social media button.

**zoom:** zoom is an online conference tool to organize a synchronous meeting in real-time. This tool was used to plan our collaborative project. To work with zoom we need to install an app or access it from a computer. We need to create an online meeting by selecting a date and time and create an online meeting link. This link can be shared with our friends and colleagues to connect with them in real-time. Desktop screen can be shared during conference so this feature helped schedule our plan well.

**Hangout:** This is also an online conference tool like zoom. We can connect using a video call facility and even texting each other before calling.

**Mentoring:** This project is an initiation of Knowmyworld Global Education. Our project has been mentored by them by organizing online meetings frequently and setting deadlines to complete our tasks on time.

**Project Notes: General Overview**

Students will post introductions on padlet and respond to a student with similar interests. Students will continue to post and respond to that student for the duration of the exchange based on topics assigned around culture.

**Timeline**

| Dates | Week | Description | Notes |
|---|---|---|---|
| Oct. 22-26 | 1 | Introduction | Students will post a formal introduction with a picture of themselves. (no last names) and respond to a student with similar interests. |
| Oct. 29- Nov. 2 | 2 | Introduction | Students will post a formal introduction with a picture of themselves. (no last names) and respond to a student with similar interests. |

| | | | |
|---|---|---|---|
| Nov. 5- Nov. 9 | 3 | Movies (comparing and contrasting) | Vinay's students will pick an Indian movie and post a short summary of the story with an image of the movie. Tanya's students will reply with a movie in their culture that relates. |
| Nov. 12- Nov. 16 | 4 | Movies (comparing and contrasting) | Vinay's students will pick an Indian movie and post a short summary of the story with an image of the movie. Tanya's students will reply with a movie in their culture that relates. |
| Nov. 26- Nov. 30 | 5 | Problem-solving BackPack Issue Identifying and analyzing a problem | Students will research" backpack" issues and prepare a report for presentation.<br>Reading material:<br>Articles on the weight of backpacks.<br>1. https://www.thebetterindia.<br>2. http://indiaeducationdiary.in/ |
| Dec. 3- Dec. 7 | 6 | 1. Collecting data<br>2. Finding solutions<br><br>Preparation of reports to solve the problem of backpack. | Students will read and research the topic and prepare a presentation based on the following clues:<br>1. Problem<br>2. Statistics<br>3. Cause of a problem<br>4. Effects<br>5. Precautions<br>6. Role of parents/ teachers/ students<br>7. Possible solutions |
| Dec. 10-Dec. 14 | 7 | Closing by posting their videos | Students will present their reports and post their<br>videos online to receive comments and feedback. |

**Teacher reflections**

1st and 2nd week:

During the first two weeks of our project students introduced themselves by using the following clues:

They Wrote two truths and one lie about themselves and read the introductions posted by their friends and comment on it by finding which of them is a lie.

Students participated actively and engaged meaningfully. They uploaded their picture to get familiarized with each other. Most of them started questioning one another if they don't understand some words which are culture-dependent. By the end of the 2nd week they got familiar with their countries and cultures.

**Sample from their discussions:**

From US Students

"Hey

Hi, my name is Hanieh and I go to The

Honor Roll School at

Texas. If you don't know what I'm doing,

I'm telling you 2 truths and a lie

Here they are:

1) I love scrunchies

2) I only eat the frosting on cupcakes

3) I'm very athletic"

From My Students:

"Hi My name is Rahul .I am studying 9th

class in zphs jangapally in India

1. I read story books

2. I read horror story books

3. I am a kabaddi player"

3rd Week and 4th Week:

During these weeks the students started writing film summaries of their favorite movies. While writing their film summaries they included the following:

1. Preliminaries: They wrote preliminaries like hero, heroine, director, produces, choreographer, music director etc. They used the internet to collect information.
2. Summary: After watching the movie they had to write a summary of the film in English. The movies they saw were in their regional language for Indian students. They translated it into English. This activity provided an opportunity for the students to use the language in a real context.
3. Pictures: They are asked to collect the pictures of the film crew from newspapers to use them in their presentation. Some students even try to draw the characters in the film if don't get the pictures. Children love to do this activity of drawing and use of colors and enhanced their presentation skills and creativity.
4. Reflected on the following questions: The last part of their presentation included the answer to the following reflective questions.
    - Which part of the movie do you like most? Why?
    - Whose performance do you like most? Why?
    - Write some dialogues you like most?

Students participated actively and did their work well in advance particularly boys who never participate actively in classroom activities also did this activity with a lot of interest.

This task made the students to use the language in context. Most of them watched the movies regularly. The topic we chose was within their experiential orbit and provided an opportunity to read and use the language without much difficulty.

5th week and 6th week:

In the 5th week, students were encouraged to learn the skill of problem-solving. We took up the issue of school bags. Most of the students carry school bags having a lot of weight which result in health problems. The students were told to work in groups to learn collaboratively.

During the 5th week, they researched the topic by finding reports related to backpacks using the internet and collected different report and their findings. Using this information they worked in groups and brainstorm the topic and organized the information on different slides like our PowerPoint on papers. They added their own ideas to solve the problem, some of the best solutions they have given are dividing the textbooks into small books of two chapters each and bind them again and asking the teachers to plan their homework or assignment so that, every day they get only one homework. Some students even said they don't like the homework so they insisted to ban homework in schools. Few others suggested that every student should be given tabs that are preloaded with softcopies of their textbooks.

7th week:

During the 7th week, we filmed backpack project presentations and shared them with each other using Vimeo online video sharing tool. While doing this we struggled a lot because uploading lengthy videos in a low-tech environment is troublesome. So, we changed our plan and made portable documents of their presentation using the camscan application and shared them through the mail. At the end of our project, we invited guests to watch students' backpack presentations to provide feedback to them. They watched their presentations and gave constructive feedback by writing comments in their notebooks.

**Conclusion**

I conclude that the project has made a drastic change in my perception of language teaching. Initially I felt that writing spelling is more difficult for us because we are not native speakers but, now I have changed my opinion. My students got memorable lifelong experiences by interacting with students in the USA and I realized that even language is not a barrier when there is a need for communication. At the beginning of our project I thought that my students will not able to cope up with the US students but, they did well and worked hard.

Apart from language skills we also learnt so many life skills like collaboration, time management, planning, cultural etiquette and negotiation skills. We also started using new technologies like whenisgood and conference tools like zoom and hangout.

Finally, language learning is process-oriented, not product-oriented. Learning happens when students are engaged in real-life situations by creating an urge to do something. Collecting evidence of learning using technology is a key to become a successful teacher in the 21st century.

Technology has changed the role of teachers from teaching to mentoring, facilitating, collaborating, event organizer, content developer and e-moderator. This project is evidence of these changes. During our project we played the roles of a mentor and facilitator by supporting them and engaging them to become autonomous learners. We also became event organizers and content developers by creating our own

content and not depending on regular course books. By supporting online synchronously and asynchronously we become e-moderators and instructional designers as well.

"Technology won't replace teachers, but teachers who use technology will probably replace the teacher who don't"- Sheryl Nusbaum

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*Book review*

# Minds Online: Teaching effectively with technology

By: Michelle D. Miller, Cambridge, MA: Harvard University Press, 2016, 279 pages,
ISBN: 978-0674368-24-8.

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**Abstract**

*This article reviews the book titled, "Minds Online: teaching effectively with technology", by Michelle D. Miller. This review gives an introduction, summarizes the book's contents, analyses the book, and ends with conclusions. Through the nine chapters in this book, Miller explores the cognitive principles that enable better learning using technology. She invokes several cognitive psychological aspects, like attention, memory, thinking, and motivation, essential for learning that could be corroborated with technology. This book is recommended both for online and offline instructors at college as well as higher secondary level.*

**Keywords:** Online learning, technology, cognitive principles, college level

## Introduction

The use of technology for instructions at the college level, in the last few decades, have been through fully offline, fully online or blended mode using various modes of teaching such as PowerPoint presentations, live streaming of videos, animations etc. Teachers and instructors usually give higher merit to fully offline methods as compared to blended or fully online forms of instructions, because of the greater chances of face-to-face interactions and discussions in offline classes. It is important therefore, to understand the processes of cognition in learning by students, so that they can be applied for maximum learning through the online modes, in this era of COVID-19 pandemic. Although Michelle Miller (2014) wrote the book during non-COVID times, her book, "Minds online: teaching effectively with technology", is more relevant now because of the higher demands for the online modes of instructions at college and school levels. This book explores and expands on the use of technology to enhance the process of learning while understanding the role of cognitive psychology in the learning process. As the Co-Director of the First Year Learning Initiative and Professor of Psychology at Northern Arizona University, Miller elaborates upon the use of cognitive psychology and technology to enhance learning in online and blended classes through course design and strategies. She explores several opportunities for enhancement of course design through the use of technologies empowered by the knowledge of cognition in terms of attention, memory, thinking and

motivation, as the essential elements of learning.

Since it incorporates the concepts of cognitive psychology, viz., attention, thinking and motivation etc., in the process of learning by students, this book is useful for all teachers and instructors, whether they use online or offline modes of instructions. Certain parts of the book like, the need for detailed codified instructions to use technology in online mode might sound redundant to some of the seasoned professors, the book is essential for new teachers, especially the ones that teach first-year students. The author uses her experiences as a lecturer at different stages of her career to inform the discussions in this book. These experiences enrich the discourse on the use of technologies in the field of teaching.

Miller's use of cognitive principals in the learning process separates this book out of other books on online learning, that mostly focus on explaining the array of technologies and online tools are available to the instructors. Rather than directly jumping to what new technologies could be used to impart knowledge, she goes into understanding the process of learning to acknowledge how already existing technologies could be used to impart knowledge. In doing so, she talks about blending of both, the offline and online modes of instructions by using MOOCs as building blocks "to complement rather than replace traditional courses" (p. 6). Basics could be taught through MOOCs using standardized instructions, followed by discussions in physical classrooms. This blended mode of instructions using technology to complement the process of teaching is agreeable.

**Summary of the contents**

The book is divided into 9 chapters. The first three chapters traverse the importance and impact of technology in higher education while focusing on the common principles of good online and offline teaching, and the major concerns related to online teaching. Next three chapters focus on the cognitive principles of attention (chapter 4), memory (chapter 5) and thinking (chapter 6) that are most relevant to the process of learning and teaching. The last three chapters deal with the practical aspects of integrating these concepts in online education and teaching methods.

In the first chapter Miller deals with the need for technology in learning, such as economics, demand from students, need for measurable evidence of student success, availability of new technologies, curiosity and drive to innovate. She stresses the importance of developing proper course designs that incorporate various learning modes that "increase learning and success while simultaneously controlling or reducing costs" (p. 13). Therefore, teachers and instructors need to know to use it well. The second chapter compares the quality of learning in offline and online modes of instructions, and finds that there is not much difference in learning achieved by students in both these modes, as expressed by "good teaching is good teaching, regardless of technology" (p. 24). The points of differences between the offline and online modes lie in the timing and

synchronization of coursework, need to educate students about the use of technology, reliance on the text, social distance (lack of discussions) and other technical issues in online learning. She engages with cheating during online tests and agrees that there is no way to find whether it happens more in online or offline tests. She stresses on maximizing the quality of online teaching. Chapter three deals with how computing influences our minds. The author believes that the paranoia against the use of the internet for education is not real. She dispels several myths related to online education modes like, brain's rewiring due to the internet. "Technically speaking, computing experience does alter our brains at a neural level, but so does just about anything else that we remember" (p. 45). She agrees that online tools alter us. Still, when we use them mindfully, "we can remain in control of those changes, shaping them to benefit our students" (p. 63).

Chapter four investigates the concept of attention in the context of learning in class and then extrapolates it to online learning. Engagement is limited; therefore, the ideas of working memory, automaticity and voluntary control, are essential for learning in the classroom. She provides specific strategies to increase attention in online classes, such as asking students to respond, taking advantage of automaticity, assessing cognitive loads, discouraging distractions, and even walking in nature. She concludes that a suitable learning mechanism will work for all students, including those with certain limitations to learning like students with ADHD. Chapter five details the tool of memory, which is at the center of teaching and learning. Old and contemporary memory theories are elaborated to understand how short and long-term memories are created, retained and retrieved. Attention is significant for creating a memory. Therefore, for maximum learning the students should be as less distracted as possible in the class. Emotions also tend to heighten the process of retention of memory. They could be used carefully and prudently by experienced instructors to put their points across in a class. In online teaching, testing, spacing and interleaving are described as useful tools to enhance memory. Use of previous knowledge as a base for introducing newer concepts is seen as a good approach to enhance learning. Online tools work best when deployed "in sync with the operating principles of memory" (p. 116). Effective thinking strategies by differentiating between the novice and expert thinking are elaborated in chapter six. This chapter focuses on the structural components of problems and utilization of analogical reasoning, to stress that beginners could become experts through practice. It also addresses how online course activities can increase critical thinking among college students.

The use of sensory modes, multimedia theory, animations, and simulations, in online teaching could achieve educational mileage over offline teaching. Making education inclusive, to a greater extent, is discussed in chapter seven. The nuances of students' motivations are discussed in chapter eight. Motivation forms one of the

most important reasons behind the success of any learning process. This chapter elaborates in various ways that motivations could hinder learning and the ways to overcome those challenges. The theories of self-determination, intrinsic/extrinsic motivation and growth mindsets are explored along with self-efficacy, anxiety and procrastination to understand the challenge. The theories of gaming or gamification could also be used in devising course structure to motivate students. Finally, chapter nine culminates all the concepts from previous chapters and uses them to create specific course structures and instruction guides for teachers to get inspiration from.

**Analysis and remarks**

Using cognitive principles to explain the use of technology in teaching makes this book different from other books that focus mostly on the various kinds of technologies used to impart instructions in a classroom offline or online. This book concentrates on using the existing technologies to impart instructions to lead to maximum learning. The book is useful for instructors who are not aware of these cognitive principles or are new to teaching. It is also useful for people who are researching in the field of education. As we move down the chapters, it gives useful insights and justifications for the online modes of instructions and useful tips for seasoned instructors. She debunked several myths, such as online teaching is not up to the mark or cheating is more prevalent in online learning. She starts by pointing towards the issues of online teaching and then suggests several ways in which those issues could be dealt with. The book seems highly useful for a teacher and helps in learning several tips to use in online classes, as it ceaselessly alternated between theoretical and practical aspects of teaching.

The language used in the book is simple, and the technicalities are clearly explained, making it easier for a wider audience to benefit from the book. The practical and workable elaborations of the author's theories and experiences make it a valuable book for all teachers worldwide. The book rests a lot on cognitive psychology; still, people without any knowledge of psychology could easily read the book and benefit from it. Although the book centers around learning in college-level students, its more profound engagement with learning cognition make it indispensable for teaching at all stages. The replicable strategies, ideas and online tools enrich teachers and students' learning experience. Still, this book is not a 'problem fixing' kind of book for issues faced during online teaching. Instead, it is a book to understand the concepts relevant to learning and using them to learn in a better way. The author agrees that any new experience impacts the brain in the same way as technology does. Therefore, unlike what the author believes, excessive use of technology also can alter the human brain at the neurological level. "It's also unclear whether the changes in brain function associated with web browsing impact activities other than web browsing in any meaningful way" (p. 47).

The book lists online tools and websites on several occasions; however, it does not provide clear benefits or dis-benefits

of those tools over each other. The book's scope might not have permitted the author to elaborate on them; still, readers might feel the need to learn them then and there.

## Conclusions

The failure of technology, like the lack of electricity and proper equipment, could lead to the collapse of the online education system, as is the case in several parts of India. All the examples discussed were from the USA therefore, the need for such analytical work in the Indian context is essential.

The author agreed that the cognitive theories discussed in this book were mostly for people with "typical range of sensory functions" (p. 160). However, she pointed out that "many of the same best practices that benefit typically abled students such as sticking to germane graphics, providing clear organization and offering materials in multiple modalities also ease accessibility" (p. 164). Therefore, the book is useful for all kinds of instructors, offline, online, college level, school level and special educators.

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