



## Information and Communication Technology (ICT) enabled Higher Education: Current Trends and Challenges

**Dr. Pravin Bagde**, Department of Business Management, C.P. & Berar E.S. College, Nagpur, India. ORCID – 0000-0002-5737-2919, [pravin\\_bag@yahoo.com](mailto:pravin_bag@yahoo.com)

**Dr. Abhijit Bobde**, Assistant Professor, Indira School of Business Studies, Pune. ORCID - 0000-0001-7392-4755, [abhijit.bobde@indiraisbs.ac.in](mailto:abhijit.bobde@indiraisbs.ac.in)

**Dr. Laxmi P. Bagde**, G.H. Raisoni Institute of Management Research, Nagpur, India. ORCID – 0000-0002-9416-2232, [laxmi\\_pbagde@rediffmail.com](mailto:laxmi_pbagde@rediffmail.com)

---

**Abstract-** Across globe, Education has emerged as Sociological entity. Developing countries has realized that education is one of the necessity for achieving success in any field and serves as the foundation for further development. Higher Education is where the onus falls. All the professions like Engineering, Medical, Accountancy, Science, Space science and Research needs quality higher education in content and practical orientation. With the changing scenario when ICT has taken over almost every field, education sector can't stay aloof from the impact of ICT. Information and Communication technology (ICT) is day by day getting matured and technological changes are taking place day to day with newer technology replacing older technology. Education sector is also witnessing the advent of technological gadgets, various techniques which has changed the teaching pedagogy. A teacher in this era is supposed to work in this technology supported environment. He needs to brace up the challenges of teaching in the technological environment. This paper attempts to throw a light on use of ICT in education and coming trends in the education under purview of ICT.

**Key Words:** ICT, AI, Analytics, Higher Education, Quality, Learning, Teaching, pedagogical innovations, e-learning, Education Technology

### I. INTRODUCTION

Education is a continuous life time process and never ends. Humans keep learning from outer environment, changes in environment and almost any facet of life. Humans derive enormous benefits out of education. In developing country like India, Government strive hard to impart education to children by making various policies to benefit weaker section so that they should continue to get educated. The fact that key to success lies in education is thoroughly understood by humans. Formal teaching-learning process is the backbone of any country. Higher education is the building block which has a power to shape the future of any country. A developing country like India which is seen as a young country globally as majority of population is near 35 years of age striving hard to impart quality education to the youth. Developed countries facilitate the higher proportion of population enters into higher education. The results are seen through the development made by these countries, though other factors are also working.



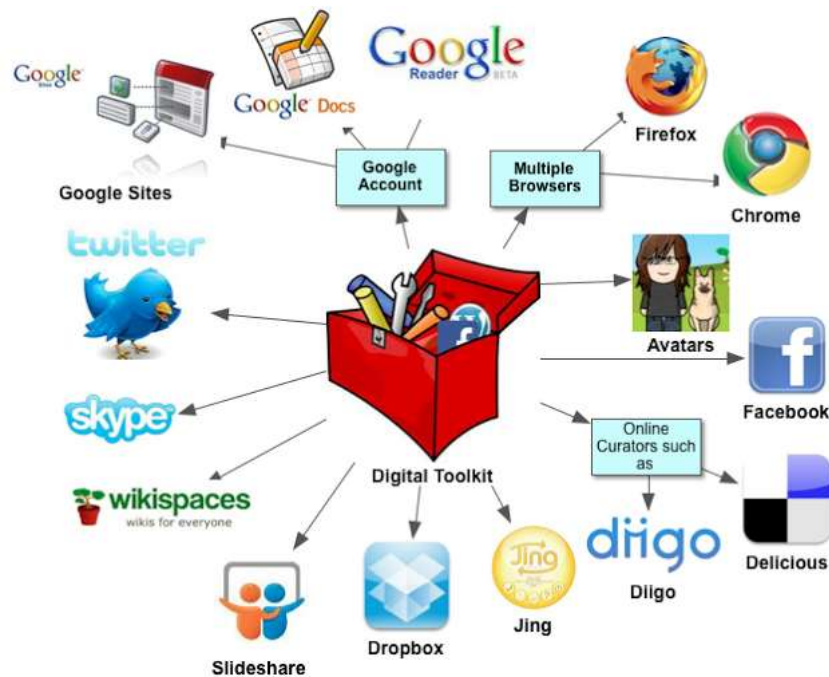
**Figure 1: Integrating ICT in Higher Education**

Current scenario in higher education has changed with the advent of technology. ICT is day by day scaling new heights in every field. Each day is witnessing some technological innovation. This has now become a trend and population is witnessing this trend making its appearance in every aspect of life. Education sector is also witnessing this trend entering and making change in basic pedagogy. This is termed as pedagogical innovations. E-learning has changed the definition of modern day pedagogy. The MOOC (Massive Open Online Courses) is one such example of pedagogical innovation. MOOCs are designed in student centric way where knowledge is dissipated using ICT. The knowledge is dissipated through electronic gadgets like PC, Laptop, Mobile, aiding software and Internet. Internet is the backbone in such pedagogy. ISP's have gained a momentum in the field of education through this innovation. E-learning has facilitated teachers to put assignment on the various platforms like Google classroom and students getting them solved and again uploading to same platform with the use of internet. Online lectures are the need of hour and it has also been facilitated by various platforms like Google Meet, Microsoft Team, Zoom, Webex etc.

Advent of technology doesn't mean that the conventional pedagogy is abrogated. The basics of education lies in conventional pedagogy. The teaching-learning process is basically facilitated by conventional learning. The pedagogical innovation makes its entry in higher education in collaboration with conventional learning. In countries like India, the conventional pedagogy finds its place at the top since it forms the backbone of teaching-learning process. Major advantage of conventional pedagogy is active learning where there is a face to face meetings with the teacher and grasping is more facilitated. Learning is scheduled which benefits students in planned way. Attending classes on time makes students to become punctual. Again, not all specialisations can be taught online. Courses like nursing, agriculture, biology, music, or theater needs more of a practical approach which happens to be one of the major disadvantage of online learning. This paper is focused on measuring disadvantages of online learning but enumerating these can make readers understand the benefits of conventional learning.

One cannot refute the use of IT in learning. Educational technology (abbreviated as EduTech, or EdTech) is the combined use of computer hardware, software, and educational theory and practice to facilitate learning. There are various views available for educational technology. *James O. Finn and others (1960)*

refers the first concept (ET1) as application of physical sciences and engineering technology to provide mechanical instruments or “hardware” which can be used for instructional purposes.



**Figure 2: Technology enabling tools for ICT in Higher Education**

Skinner, Gagne and others refers second concept (ET2) of Educational Technology as application of scientific principles or ‘software approach’ to instruction. Yet another approach is given by Davis and Hartley (1972), describes (ET3) as incorporation of both ET 1 and ET 2 through the application of a ‘system approach’ to education and training.

A simple definition is given by Robert A. Cox as Educational technology is the application of scientific process to man’s learning conditions. As per the above definition, ET has contributed in creating different techniques for example Miniature showing technique, Interaction investigation, Audio Visual Aids and Programmed learning strategy. It depends on the utilization of the logical information. It is useful in showing the interaction level headed, simple, clear, intriguing and logical.

### Objectives of the study

Following are the objectives of the study.

1. To study and appreciate the changing scenario in the field of Higher Education and paradigm shift.
2. To study the inclusion of ICT in the field of Higher Education due to Paradigm shift.
3. To study the throw of ICT in Higher Education.
4. To study the Trends in of ICT in Higher Education.
5. To study the Challenges before ICT in the field of Higher Education.

### Scope of the Study

The study is Limited to inclusion of ICT into Higher Education. The throw of ICT in other sectors falls beyond the scope. The time frame for Developments on ICT in higher education and Challenges before ICT in Higher education is taken for 5 years only. As the speed of technology advancement is high some of the challenges may be resolved in the span of coming few years. Hence the methodology is taken as Grounded Theory Approach.

### Research Gap Analysis

With the advent of technology almost every field has witnessed entry of ICT. Newer technology is replacing older technology in very short span of time. Due to this, almost all the fields have witnessed a substantial paradigm shift. Education has also witnessed this paradigm shift. Older methods are becoming obsolete. Learners hold technological background and hence are more indulged in e-learning. Under this

situation, there is an enormous scope for the research in this area. Many parameters need to be studied in-depth as the newer approach is undergoing advancement rapidly and Education segment needs to be prepared for these changes.

## II. METHODOLOGY

Though the study seems to be exploratory, it is primarily based on grounded theory approach. Grounded theory offers educational researchers a method that supports varied forms of qualitative data collection and that will execute promptly the research work. Adopting grounded theory strategies enables educational researchers to delve the theoretical reach of their studies and to make implicit testaments and processes explicit. Researchers have not only re-envisioned grounded theory, but also revised it in ways that make the method more flexible and widely adoptable than its earlier versions. This paper focuses on challenges imposed on Educational Technology and e-learning in parlance to near future. These challenges may appear to be challenges now but with the passage of time may be resolved to make Eduetch wide spread. Grounded theory commonly uses the several data collection methods like interviewing participants with open-ended questions, Participant Observation (fieldwork) and/or focus groups and Study of Artifacts and Texts. The study of artifacts and Texts are widely used in this paper along with participant observation as the writers are instrumental in education sector. Results are drawn on the basis of material used for delving deep for knowledge sake.

## III. RESULT

Use of ICT in higher education has brought a revolution in education sector. It has redefined the knowledge transmission, skills and values imparted to students pursuing higher education. The students who are pursuing their higher education have access to millions or billions of knowledge modules. Some will be Web pages with simple text and graphics. Others are benefitted through use of multimedia simulations. In many segments, use of ICT in higher education has become the default way to conduct training or to provide education.

Although the use of technology does not ensure equity and accessibility in learning, it has the power to reduce barriers to both in ways which was thought to be impossible previously. Irrespective of their perceived abilities or geographic locations, all learners can access resources, experiences, planning tools, and information that can set them on a path to gain expertise which was thought to be unimaginable a generation back.

Tools and data systems can be integrated seamlessly to provide information for students. Learning dashboards and collaboration and communication tools can help connect teachers and student communities with affordable and instantaneous ease.

In order to carry out e-learning, Eduetch effectively the workforce i.e. the teachers must be equipped with knowledge of working in such environment. They need not be techno savvy but a working knowledge and operational ease must be present in the teachers. This is the need of the hour to impart necessary training to teachers to work on such platforms. This is not a herculean task but calls for a sanctioned budget and willingness to embrace pedagogical innovation on the part of organisation may be colleges, universities etc. Many teachers have mental blockade and trauma regarding online teaching. This needs to be addressed through proper counselling and imparting training to work on such platform. EduTech doesn't mean teachers have to become IT experts. But it's true that teachers can do these fascinating things only with technology, and that's why EduTech is needed to enhance quality of higher education.

It is a time of great possibility and progress for the use of technology to support imparting the quality in higher education. A word of caution follows that it is important to remember that technology is only a tool and everything depends on how it is being used. At times technology may turn into a bane instead of a boon if not used in a constructive manner.

## IV. DISCUSSION

As observed, there are four secrets of imparting quality in higher education through use of IT. The first secret is to teach most naturally what learners need to learn. The second secret is to delineate clearly the learning objectives. The third secret stands on the foundation of the first two. It is to focus on the right

objectives. The final secret is in the power of testing which entails about efficacy of this kind of pedagogical change.

Technology has made it possible for everyone to stay connected. Students and teachers connect, discuss, share their opinions, and act upon situations collaboratively. E-Learning is an educational tool that features collaboration by enabling students to share and discuss. Instead of being in a classroom and listening to teachers speak for 30 minutes, eLearning students can join an online group/platform and learn together by interacting with their peers. In this case, teachers are more accessible and act as mentors to help students develop themselves. This collaborative learning approach has bridged the gap between teachers and students and also helps students strengthen their interpersonal skills. This satisfies the first secret.

Once the learning objectives are set it becomes easier to draft the courses as per the need of students. This is applicable to all fields of higher education including Management, Engineering, Medical, Architecture, Psychology, Pharmacy and others. A student who wants to learn Business Analytics will get the appropriate course suiting his needs. This in turn, makes the database of courses rich. Tailor-made courses will also be possible through this defined objectives of learning. Universities have practice of drawing the course outline of various courses which comes new to learners. Here, if the exploratory study is made by the universities, the drafting of syllabi for courses will be easier depending upon the demands from industries thereby satisfying industry-academia interface. This happens to be the secret of success for technology enabled learning.

Rest of the two secrets are standing on the foundations of the first two secrets. Measuring the effectiveness of such pedagogy is done by the testing process.

### **Trends in ICT Enabled Higher Education**

The various trends in the technology enabled learning for imparting quality in higher education which are prevailing in the current scenarios are varied. The new developments in ICT brings new facets to e-learning each day. The innovative gadgets are thrown aback by new concepts. Some of them are discussed below.



**Figure 3: Trends in ICT Enabled Higher Education**

## **Distance learning using e-learning methodology**

Distance learning turned into the main 2020 instructive innovation pattern for the time being a result of the quick spread of COVID-19 and Lockdowns and closures. This prompted a rising interest for online learning medium. E-Learning is conveyed electronically. It tends to be slide-based online exercises, or it can likewise be an online course that helps a learners in essential abilities.

With eLearning, instructive content is conveyed to students through PCs, workstations, tablets, or cell phones. Saving time as well as opening numerous gateways for intelligent learning. As opposed to being in a passive way, students actively can pick what they need rapidly and effectively from any place they are. They additionally learn through associating with on-screen data through, for example, dragging content from one place to another. Additionally, the dynamic situations in eLearning urge students to settle on their own decisions on what they will realize straightaway.

In the process of eLearning, learners just infuse in knowledge through reading or viewing content. This changes the way education is delivered. Also, many eLearning courses include animation, podcasts, and videos that create a multimodal and practical learning experience.

## **Video-Aided Learning**

In contemporary period, video-aided learning has gained popularity as classroom displays. The concept of “video day” is no longer just a television on a trolley being taken into a class but with the internet and digital devices, every day can be a “video day.”

This trend is also prevailing in distance learning conditions, where students learn through terminals. Videos, especially animated videos, are extremely beneficial to enrich lessons and make content comprehensible. The graphical interface makes concepts clearer to students. It improves student’s outcomes and reduces teacher’s workload also.

## **Distributed Ledger Technology**

The Distributed Ledger Technology (DLT) is especially beneficial for data storage. Every time new data is added, it adds one “block” to the system, so the storage technically becomes limitless. This is also called as Block chain Technology. At the same time, the data will be encrypted and distributed across multiple terminals in the system. It ensures decentralization and bring transparency in transacting data.

The DLT is used in Massive Open Online Courses (MOOCs) and portfolios to verify skills and knowledge. The DLT systems will answer the problems of authentication, scale, and cost for eLearning agencies.

## **Big Data**

Big data is a term that describes the voluminous data encompassing both both structured and unstructured data. Data inundates a business on a day-to-day basis. But it’s not the amount of data that’s important. It’s what organizations do with the data that matters. Big data can be analyzed for insights that lead to better decisions and strategic business moves. Typically Big Data runs on a principles of 3V’s i.e. Volume, Velocity and Variety. Volume as name suggests the volume is corpus of data, velocity suggests the speed with which the data is gathered and variety entails about formats of data structured and unstructured.

Learner’s needs are satisfied by personalizing the learning experience. With online learning booming the volume of data has increased exponentially. The organisers of the e-learning sessions have the relevant information about learner’s experiences which is helpful in designing a course in a customized and suitable format. Some information analysed for is the course’s topic, learner enrollment, learner performance (time per course, completion, test result), and learner feedback (rating, survey).

## **Learning Analytics**

The current landscape of learning analytics has dramatically expanded, especially for higher education. Learning analytics allows educators to measure and report student learning just by the web. From that, it’s possible for them to better understand and optimize learning.

When teachers assess students’ learning processes, they can improve the knowledge and skill acquisition of their students accordingly. For instance, teachers are able to see what type of information (text, images, infographics, or videos) that students enjoy most and use it more in their following lessons. Also, teachers are able to notice what piece of knowledge wasn’t effectively delivered and enrich it next time. Moreover, learning analytics helps educators identify blocks of students who may have academic or

behavioral challenges. Using this information, teachers could develop a way to help students reach their full potential.

### **Immersive Learning using VR and AR**

The learning experience has experienced an incredible change since Virtual Reality (VR) and Augmented Reality (AR) has made its entry into education. The rise in demand for experiential learning has driven forward the urge of learning with VR and AR.

Interactive Learning is increased much more than traditional methods. While VR provides a constructed reality, AR gives an enhanced view of a real image. Thus, they help explain complex concepts that plain images or even a lab's hands-on experiments couldn't show students. For example, VR is pretty helpful when you are attending a medical training course. In detail, VR creates a chance for students to experience real-world surgeries in a low-risk environment.

### **STEM/STEAM Based Programs**

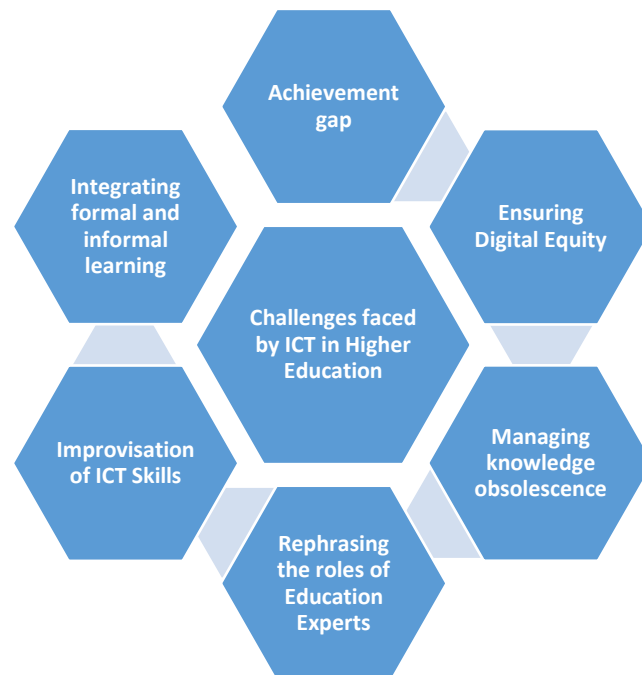
STEM/STEAM based programs address for coupling various subjects into one aura. Rather than teaching Science, Technology, Engineering and Mathematics as separate and discrete subjects, STEM integrates them into "interdependent" learning units based on real-world applications. STEAM is an educational approach to learning that uses Science, Technology, Engineering, the Arts and Mathematics as access points for guiding student inquiry, dialogue, and critical thinking.

STEM/STEAM-based programmes take an integrated approach to learning and teaching, which requires an intentional connection between curriculum learning objectives, standards, assessments, and lesson design/implementation.

STEM/STEAM learning applies meaningful maths, science, and technology content to solve real-world problems through hands-on learning activities and creative design.

### **Challenges faced by ICT in Higher Education**

The purpose of this section is to present common challenges faced by educators when attempting to integrate technology. The journey to impart quality to higher education using ICT is not plain and simple. It has several challenges and problems. These challenges may hold back the achievement of target. The success lies in the fact that these challenges must be addressed and resolved effectively so as to achieve the target. Some of the challenges are enlisted below.



**Figure 4: Challenges faced by ICT in Higher Education**

### **Improvisation of ICT Skills**

Key among all challenges is the lack of adequate, ongoing skills needed to work in IT Enabled Environment for teachers who are required to integrate new technologies into their classrooms yet who are unprepared or unable to understand new technologies.

Teachers often lack ICT skills when asked to incorporate them in regular teaching, teachers are left without the tools (and often skills) to effectively integrate the new capabilities into their teaching methods. The results are that the new investments are underutilized, not used at all, or used in a way that mimics an old process rather than innovating new processes that may be more engaging for students.

### **Apprehension for Change**

Apprehension to change comes in many forms, but one of the key resistance challenges identified is "comfort with the status quo." Resistance to technology is the outcome of this apprehension to change. According to the researchers, teachers and school leaders often see technological experimentation as outside the scope of their job descriptions. Hence are not ready mentally and psychologically to adopt it.

### **Integrating formal and informal learning**

ICT in Education has given impetus to self-learning also. Self-learning is self-directed and curiosity based learning. This comes under the ambit of Informal Learning. Experts believe that blending formal and informal methods of learning can create an environment that fosters experimentation, curiosity, and creativity.

The fundamental target is to inculcate the pursuit of lifelong learning in all students and Teachers. Institutions have already started to exercise flexible programmes that provide credit for prior learning and competencies gained through employment or through extracurricular experiences.

Scarcity of suitable methodology of documenting and assessing skills gained outside of the classroom and adapting pricing structures and financial aid models to fit new degree options are impeding progress.

Higher education institutions are uniquely placed to connect more students to informal opportunities. This fact is proved by Humboldt State University Library, which promotes research on the effects of mindfulness, attention and contemplation through its Library Brain Booth, a drop-in space with hands-on tools and activities.

### **Achievement gap**

The achievement gap reveals a discrimination in the enrolment and performance between student groups, coming from diverse socioeconomic status, race, ethnicity, or gender. While advancement in technology has created cosier atmosphere for students from these groups to facilitate with learning resources, still, significant issues of access and equity prevail.

The one-size-fits-all approach of traditional higher education paradigms, coupled with burdensome tuition costs, is in sheer disparity with continuously increasing diverse global student population. To address this issue, more flexible academic plans are needed. The challenge faced by higher education is to address learner's needs, blend post-graduate programmes with meaningful learning outcomes and the acquisition of essential skills supported by personalised learning strategies and data-driven student support systems that foster goal achievement and gainful employment."

### **Ensuring Digital Equity**

Digital equity advocates equal access to technology. This social justice issue is rampant, which not only impacts developed as well as developing countries equally, but is also a major concern for higher education.

Technology plays an important role in ensuring the availability of higher education for underprivileged student section, while ensuring accessibility of web materials for disabled students. The use of open educational resources provides cost savings to students.

Higher education has target of fostering the technology-enhanced education to meet the needs of underprivileged students. Numerous universities are spotted which are exercising digital equity. One such university is the University of Oxford is branching into free online courses through the edX platform founded by Harvard University and the Massachusetts Institute of Technology. In India, Government of India's Swayam in collaboration with NPTEL is an initiative to foster this concept. It was found in a



research that adding activities which promote social belonging and self-confidence to massive open online courses (Moocs) can improve learner perseverance and achievement for participants from developing countries.

### **Managing knowledge obsolescence**

Keeping updated and staying organized is a complex issue for academics in the era where educational needs, software and devices are marching ahead with a stupendous rate.

Technological advancement can virtually improve the quality of learning and ease of operations at universities. But with the advent of new technologies, they are replaced colossally by newer versions which makes it difficult to keep up with stream.

Universities and Academic Institutions must tighten their grip to cope up with the longevity of technologies and devise back-up plans before making large investments. There is burdensome but shall ensure that any tools selected are complementary to strengthen learning outcomes in ways that are measurable.

There must be procedures for technology and pedagogy discovery so that educators can process information in an efficient and insightful manner. The emphasis on research over teaching for promotion and tenure consideration has put progress in peril while designing and developing high-quality learning material. Faculty are often required to balance the two and pursue their own professional development often despite having insufficient resources.

### **Rephrasing the roles of Education Experts**

The role of Teachers is shifting considerably. They are progressively expected to make use of a variety of technology-based tools and engage in online discussions and collaborative methodology. In addition, they are also expected to leverage active learning methodologies like project and problem-based learning. Under technology enabled education, learning paradigm is shifting towards more under the control of the students and teachers are now acting as guides and facilitators.

Competency based education has added up to this issue as it orients the academic experience towards students needs. Many academic entities have started to ponder over the main responsibilities of their teachers under the circumstances created by shifting paradigm. Government intervention shall serve to help education experts to keep pace with these advanced learners especially in the context of being ready to take up the challenge.

Education institutes are striving hard to help their teachers to transform their teaching practices by use of technology. The University of Maryland University College is embarking on a three-year initiative to shift its pedagogies from those based on memorising knowledge to experiential learning and competency – radically changing the teaching culture.

#### REFERENCES

1. Francisco M, Higher Education Facilities: Issues and Trends, University of Arizona, United States
2. Balasubramanian S., Konana P., India as a Knowledge Economy: Aspirations versus Reality
3. Ministry of Education Science and Technology, Government of Malawi, Towards Quality Education: Implementing the National Education Sector Plan 2009 – 2013.
4. Asian Development Bank, July 2010, Education Sector Risk Assessment.
5. Ting Seng Eng, The impact of ICT on learning: A review of research, International Education Journal, 2005, 6(5), 635-650. ISSN 1443-1475
6. Ghavifekr,S.& Rosdy,W.A.W.(2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. International Journal of Research in Education and Science (IJRES), 1(2),175-191<https://potomac.edu/top-advantages-of-traditional-education/>
7. Anamika Pandey1\*, Arun Kumar Pandey - ICT in Teaching And Learning: An Indian Scene , Journal of Critical Reviews, SSN-2394-5125 Vol 7, Issue 9, 2020

8. Syed Noor-Ul-Amin- An effective use of ICT for education and learning by drawing on worldwide knowledge, research and experience: ICT as a change agent for education (A Literature review), Scholarly Journal of Education Vol. 2(4), pp. 38-45, April 2013
9. Namita Saxena-The Role and Impact of ICT in improving the quality of Education: An Overview, International Journal of Engineering Sciences & Research Technology, March, 2017
10. <https://drarockiasamy.wordpress.com/unit-i-concept-of-educational-technology/>
11. <https://www.sciencedirect.com/topics/neuroscience/grounded-theory>
12. <https://onlinelibrary.wiley.com/doi/10.1002/9781118256039.ch11>
13. <https://tech.ed.gov/netp/>
14. <https://elearningindustry.com/top-educational-technology-trends-2020-2021>
15. [https://www.sas.com/en\\_in/insights/big-data/what-is-big-data.html](https://www.sas.com/en_in/insights/big-data/what-is-big-data.html)
16. <https://thejournal.com/articles/2013/06/04/6-technology-challenges-facing-education.aspx>
17. <https://www.timeshighereducation.com/features/six-significant-challenges-technology-higher-education-2017>