

Effectiveness of ICT in Education Quality Assurance: A Theoretical Perspective

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Abstract: Education is an endeavor that is socially focused. Quality education is correlated with a high degree of personal interaction with learners through strong teachers. ICT has become an integral part of today's teaching and learning process, as the world rushes into digital media and information. Information and Communication Technologies are progressively becoming a crucial part of the education system. Education in Information and Communications Technology (ICT) is essentially the initiative of our society to impart useful knowledge and skills to its current and developing people about computing and communication devices, software that runs them, applications that run on them, and systems designed with them. This research paper aims to understand the significance of ICT in education to enhance the teaching and learning process. The use of ICT in education improves the classroom teaching-learning process, provides e-learning, and prepares the next generation for future lives and careers. Three fundamental aspects of education play a role in ICT: access, quality, and cost. It has advanced awareness through the growth and expansion of access to education, enhancing education quality, reducing prices, and extending education to remote areas through interactive, e-learning, online, and distance learning. The usage and implementation of ICTs in academics positively impact teaching, learning, and research. Students get motivation when learning actions are stimulating, reliable, engaging, and multi-disciplinary. This paper highlights the need, initiatives, and challenges of ICT in education, its limitations, and challenges to education systems.

KeyWords: Digital media, ICT, e-learning, education system, teaching, research.

1. INTRODUCTION

Education is an essential requirement for the welfare of individuals and society. Quality education assists in the country's empowerment. The use of technology is one of the effective and efficient ways to increase the learner's knowledge. ICT (Information Communication Technologies), including all technologies for manipulating and communicating information (Swati Desai, 2010). Information and Communication Technologies has developed as an integral part of one's life. From tourism to banking, all segments depend heavily on ICT for carrying out their activities and businesses. A study produced by the National Institute of

Multimedia Education in Japan showed that an increase in student exposure to ICT education through curriculum integration has a significant and positive impact on student performance, particularly in terms of comprehension, practical skill, presentation, and skill knowledge. The comprehensive description of ICT comprises mobile phones, television, the Internet, computers, radio, and satellite. ICT can be classified into two groups; *traditional ICT* (television, radio) and the *new ICTs* (Internet and telecommunications). *Learning through new ICTs is also known as e-learning*. Information and communication technology (ICT) is a crucial part of the modern world. It is an energy that has many aspects of the way we live and a means of capturing, processing, storing, and communicating electronically. According to UNESCO: ICT is a specialized, systematic, engineering discipline and management technique used in handling information in combination with social, economic, and cultural aspects. Proper use of ICT will alter and modify the entire teaching-learning process, leading to a paradigm shift in content and teaching methodology. The method of learning has evolved a lot over time in this age of technology and science. From notebooks to tablets, computers to laptops, blackboards to smart boards, technology and science are everywhere.



Fig. 1. Role of ICT in education

India has the third-largest education system globally, with more than 500 universities and about 30,000 schools, next to only the USA and China. To implement ICT-enabled education in such an extensive framework, for different courses, including its multilingual conversion, capacity building for teachers and students in ICT skills and state-of-the-art infrastructure, as well as networking and internet connectivity through a virtual private network (VPN) /

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broadband connectivity, high-quality multimedia enriched content in different disciplines must be available. ICT enables teaching, study, and learning processes to be transformed at all levels. It empowers teachers and students, rendering valuable contributions to the brotherhood of education.

In general terms, the role of the use of ICT in education can be categorized as:

1. **ICT as an object.** It relates to learning about ICT. According to the aim, purpose, and field of applicability, ICT has been organized into different courses. What is being taught often relies on the form of education and the level of the learners. Education trains students to use ICT in the fields of education, future work, and social life. Computer science, Information Technology, data communications, software engineering, information systems management, mobile computing, computer engineering, among many others, are some of the disciplines. In turn, this has led to ICT careers, both in the education sector and in the industry. In other fields of use, ICT as an entity is a crucial driver for the benefit of ICT.
2. **ICT in education as a tool.** ICT is used as a tool in most situations, such as when performing tasks, gathering data and documents, communicating, and conducting research. ICT is usually used separately from the subject matter. In modern higher learning institutions, the conventional form of paperwork is no longer performed with coursework, assignments, and other work. They are completed and submitted electronically.
3. **ICT as a teaching and learning tool.** The way that education is delivered has been transformed by ICT. It is the means by which teachers can teach, and learners can learn as a platform for teaching and educating themselves. Computer-assisted learning, internet learning, computer courses, online training, distance learning, eLearning, virtual learning, interactive training are several different styles in which ICT has been considered a medium for teaching and learning.
4. ICT is used as a record-keeping and management method, such as the planning and printing of examination papers, compilation of test results, schedule, course fees, and maintaining attendance records.

2. OBJECTIVES OF THE STUDY

To understand the conceptual framework of ICT education in India.

1. To study the need and the rationale of ICT in India.

2. To identify the significant ICT initiatives taken in education.
3. Identification of the problems faced by the implementation of education facilitated by
4. ICT in India.
5. To suggest and offer new options or paths forward.

3. LITERATURE REVIEW

Nidhi Phutela and Sunita Dwivedi (2019) reveal that the government takes many initiatives to develop and improve this platform. Students are also not wholly persuaded of the possible benefits of e-learning, despite the government's efforts. Besides, these platforms have misled students about the reason for which ICT should be selected. The authors have established managerial implications for educators, students, and educational institutions.

S. M. Tariq Zafar (2019) study concludes that the human search for information has significantly increased due to ICT. A tiny village with better living conditions has become the planet. Only by joint, cohesive, and multi-level efforts can teaching with educational ICT increase students' active learning. Rapid technological advances suggest that the future role of educational ICT will expand enormously in education.

Debarun Chakraborty, Soumya Kanti Dhara & Adrinil Santra (2018) summarizes in their study that ICT centers lead to a change of the educators' job during the time spent on advanced technology. Classroom instructions, different abilities, and knowledge of the instructors would lead them to use virtual aides to understand and utilize electronic media. It tends to infer that ICT instructing can support a few procedures identified with educating and learning through data transmission and information assistance. ICT makes the educating and learning process less demanding on the record of being broad and orderly. In this manner, fundamental abilities can be utilized to take additional profit of the same.

Singh (2017) expressed that globally, everyone acknowledged that instruction is the tremendous impetus behind any country's social and financial improvement. Its entrance and reasonableness for everyone have now been made possible by ICT. Yet, at the same time, a great deal needs to be done to accomplish the coveted level of IT selection in higher training. The utilization of ICT has upgraded independent learning. The teaching network will enter the most distant areas, and students can gain from any edge of the globe.

Gallego et al. (2014) report, which argues that a country needs to introduce ICT policies and regulations that must be

consistent and vigorous at all levels to enhance the standard of education effectively.

According to a study released by the Institute of Statistics of the United Nations Educational, Scientific and Cultural Organization (UNESCO) 2013, governments and university administrations worldwide have invested extensively in implementing information technology in their education systems. Overall, several attempts have been made, both theoretical and empirical, in an effort to determine the effect of ICT adoption on the education system.

Solar et al. (2013) have argued the implementation of ICT increases the quality of learning and improves the quality of education.

Learning of education can be classified into three types as a result of ICT:

1. E-Learning:

E-Learning or Electronic Learning, also known as online learning, is a universal term used to refer to computer-enhanced knowledge provided with the help of distance education. It overcomes timing, attendance, and travel difficulties. E-learning has the following advantages-

1. It helps to eradicate time and regional obstacles for both learners and teachers in education.
2. ICT leads to the enhancement of group collaboration.
3. Students and teachers can use new educational tools.
4. ICT helps in providing speedy dissemination of education to target disadvantaged groups.
5. It provides an amalgamation of education while juggling work and family life.
6. It strengthens the global dimension of educational services.

2. Blended Learning:

It refers to a situation where diverse delivery methods of education are united in delivering a particular course. It may include:

Face-to-face learning refers to learning in a typical classroom environment where a faculty member provides a community of learners with the guidance, which involves lectures, seminars, presentations, tutoring, meeting, and much more.

Self-paced learning provides the opportunity to learn according to the availability of the own time and space of learners; it takes place in several ways, such as: reading individual chapters from the textbook, reviewing course material delivered by a web-based or CD-based course, attending pre-recorded classes or sessions, reading articles submitted by the faculty member, working on assignments and projects, and searching and browsing the Internet.

Online Collaborative learning involves interaction between learners and faculty members through the web; this interaction may take place in one of the following modes:

- a. **Synchronous interaction:** Synchronous means 'simultaneously'; it includes communicating in real-time through the web with a faculty member and other learners using technology such as virtual classrooms and chat rooms.
- b. **Asynchronous interaction:** Asynchronous means 'not at the same time'; it allows learners to communicate, such as sharing via e-mail, with their peers and faculty members at their convenience.

3. Distance Learning

The presence of open and distance learning facilities is on the rise to expand access to higher education and boost its reach to the most remote parts of the world. Distance Learning refers to the education system in which students function independently at home or in the office and communicate through e-mail, electronic forums, video conferencing, chat rooms, instant messaging, and other types of computer-based communication with faculty and other students. A computer-based training (CBT) framework and communications tools to build a critical classroom are included in many distance learning programs.

Educational ICT tools can be divided into three categories: Input source, Output source, and Others, as shown in figure 2.

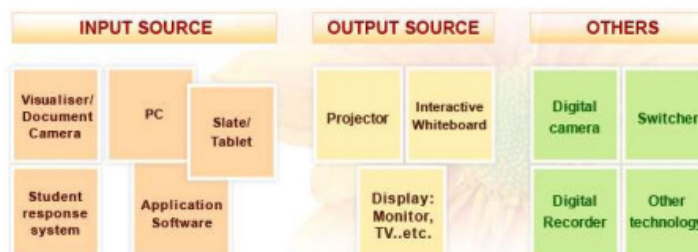


Fig. 2. ICT Educational tools

4. NEED AND RATIONALE OF ICT IN EDUCATION

ICT is student-driven and subsequently achieves the dynamic inclusion of understudies in the learning cycle. ICT is a

combination of correspondence, PC, and substance advance. It has pulled in the scholarly world, business, government, and networks to utilize creative, productive recommendations. To compete in a globally competitive environment, a highly skilled and talented workforce with the ability and skillsets in applying ICT is unavoidable for every country's are capable of innovating, accelerating, enriching and deepening skills, inspiring and educating students, helping to connect school experience to job practices, creating economic viability for staff tomorrow, and enhancing school teaching and support. In diverse socio-economic and cultural contexts, a significant number of students can use ICT, including those to whom

education was previously not easily accessible, promote learning, and expose students to the technical skills required for many occupations. By being part of a professional workforce and promoting social mobility, policymakers agree that ICT in education can help students succeed in the global economy. Personalized learning has been made accessible to larger audiences by the advent of educational technology and interactive content creation tools. To equip students with the necessary ICT skills, ICT modules are created, allowing students to use the knowledge and skills to build and improve the creative projects based on the 6-E ICT framework, as shown in Figure 3.

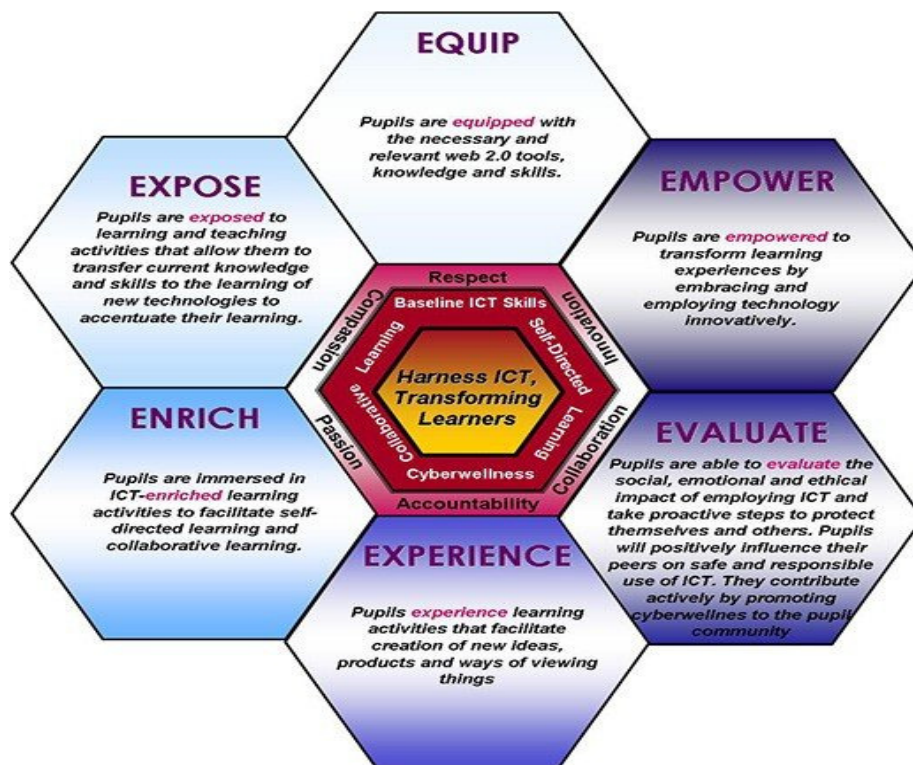


Fig. 3: 6-E Approach framework of ICT

There are a few points of interest in ICTs in education due to exploration and observational evidence:

- In an engaging and attractive form, ICTs should present material.
- ICTs support teachers in documenting and constantly tracking each student's progress.
- ICTs encourage each learner to deliver personalized educational materials.
- It may create virtual social networks between various educational institutions, student teams, or teachers.
- ICTs help learning-to-learn abilities and skills.

- To reach numerous students with MOOCs (Massive Open Online Courses)
- Helps to reduce expenditures and save time associated with information distribution and repetitive tasks automation.
- ICT strengthens organizations' administration to increase the consistency and reliability of service delivery.

The latest developments in ICTs (mobile tools, cloud solutions, etc.) allow continuous learning processes to be applied in various learning contexts and provide students with on-demand support.

ICT Ranking Of India

Cell phones are playing a significant role in the world in enhancing ICT connectivity. In terms of numbers, India's attempts to capitalize on the revolution in information and communication technology are based on the latest country rankings and related data published by the International Telecommunication Union. An ICT Development Index is the basis for the ranking (IDI). In terms of development in information and communication technology (ICT), India was ranked 121st out of 157 countries in a newly released study by the International Telecommunication Union (ITU), which makes an annual evaluation based on a broad range of criteria and results. In the wake of the Broadband Commission for Digital Growth, India is ranked 145th out of almost 200 countries in terms of the percentage of people using the Internet in a recent survey and 106th in the case of mobile broadband penetration.

5. MAJOR ICT INITIATIVES, POLICIES, AND PLANS IN EDUCATION

The activity of ICT Policy in instruction is driven by the exceptional capability of ICT for upgrading and improving the education quality. This approach gives rules to help the States advance ICT in education training inside a public arrangement

structure. The Government of India has reported 2010-2020 as the time of development with a specific spotlight on ICT empowered educating and getting ICT abilities for students. Several initiatives in the recent past portrayed the significant role ICT plays in higher education development. India has taken important initiatives in delivering content and the promotion of education through information and communication technologies.

Following the UGC country-wise classroom initiative, education programs on *GyanDarshan* launched in 2002 and on *Doordarshan* national channel for school kids, university students, and adults are broadcasted every day. *GyanVani* was another critical step with broadcast programs contributed by an institution such as IGNOU and IITs. *E-Gyankosh*, which aims at preserving digital learning resources, is an awareness scheme initiated by IGNOU in 2005, and almost 95% of IGNOU's material has been digitalized. The national program for technology-enhanced Learning (*NPTEL*), launched in 2001, is another joint initiative of IITs and IISC, which educate through technology. *Sristi*, the Sustainable Technologies, and Organizations Research and Initiatives Society promotes the use of ICT to improve grassroots inventors, innovators, and entrepreneurs interested in protecting biodiversity and creating eco-friendly solutions to local problems.

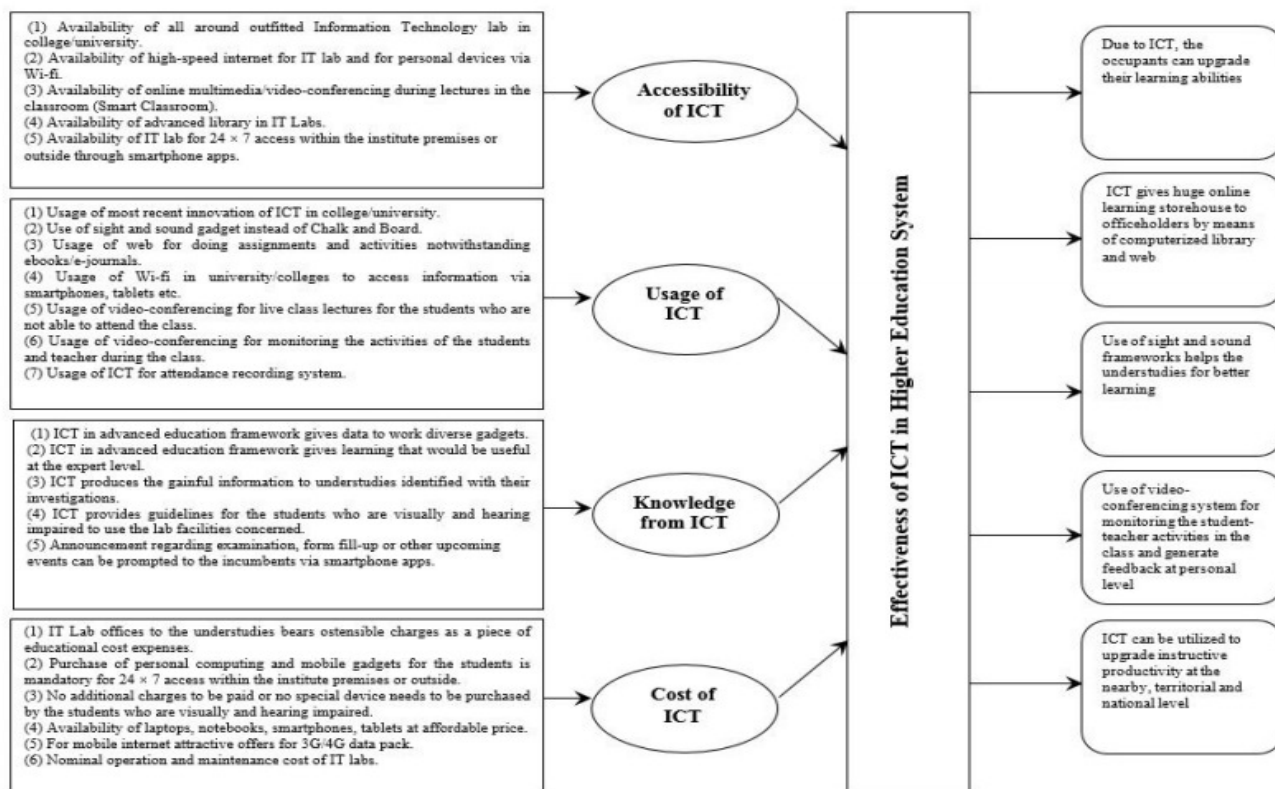


Fig. 4. ICT Effectiveness in Higher Education System

Important initiatives taken in the range of provisional instruction includes:

1. Schemes for computer education for educators and students Via IT buses, mobile classrooms
2. E-Learning centers and kiosks for developing social and financial online education modification of rural society.
3. Group Tele-focuses on ICT learning problems beyond a proper school environment to resolve.
4. Global honor in the educational learning measure for teachers using ICT in schools
5. Creation of an Education Strategy for IT
6. Infosys' groundbreaking Rural Reach Program for the provision of direct ICT knowledge to children in villages in grades 5-10
7. ICT events for higher study, such as E-Gyankosh, GyanDarshan, GyanVani, and other distance education services.

GOVT'S POLICIES & PLANS: INDIA'S PROMOTION OF ICT IN EDUCATION

1. **SWAYAM PROJECT:** The Union Cabinet, chaired by Prime Minister Shri NarendraModi, today approved the signing of a Joint Declaration of Intent between the Department of Human Resources Development (MHRD) and the United States of America. Department of State for Higher Education Cooperation for the Study of Webs of Active-earning for Young Aspiring Minds (SWAYAM), an online education program. The new Indo-US Online Education Partnership (IUPOE) program includes a framework that enables the top US universities (top 100 in the global ranking) to build and share online postgraduate courses (and related assets) on the SWAYAM Indian platform. The SWAYAM platform server located in India as part of the cooperation, and US universities will offer SWAYAM platform-certified postgraduate academic programs. The cooperation program will be integrated to strengthen the National Mission on Education through ICT (NMEICT) in India.
2. **AAKASH PROJECT:** In India, the government has begun distributing TAB and LAPTOPS to students to facilitate ICT education. The Aakash project in India, before Turkey and Thailand, excited the imagination of many proponents of placing vast numbers of tablet computers in the hands of students in a developing world. In the "Made in India" initiative, the aspiration to build a

prototype "Simputer" machine was first reflected. Aakash, a.k.a. Ubislate, promoted by the Government of India as part of an initiative to connect 25,000 colleges and 400 universities in an e-learning program, is an Android-based tablet computer. The tablet runs on Android 2.2 (Froyo) and comes with an 800x480 resolution, 7-inch resistive touch screen, and 350 grams. The tablet has 256 MB of RAM, a 32 GB memory slot that can be extended, and two USB ports.

6. CHALLENGES AND OBSTACLES IN IMPLEMENTATION OF ICT ENABLED EDUCATION

While ICT can significantly improve the country's education system, it is not the case in developing countries. Prerequisite for the provision of ICT-based education in rural areas unique to their skills set-up and for the implementation of policies to facilitate broad access to learning and ICT-based skills provision of broad-based ICT-based formal education. The introduction of ICT education in schools and educational institutions is facing several problems and challenges. ICT-related issues and concerns are intensified in schools located in remote villages and rural areas. In rural schools, the implementation of ICT faces challenges in the form of barriers. Internal obstacles, as shown in figure 1 related to ICT adoption in rural areas include:

1. The shortage of qualified teachers with a lack of experience and skills is a significant obstacle to the use of ICT in rural education. Furthermore, there is hardly any quality training offered regularly to teachers engaged in ICT education.
2. There are several barriers/obstacles that teachers experience in the use of ICT in their classrooms. These include technical problems, lack of trust amongst teachers, inadequate organizational support, the scarcity of time, lack of resource access, poor fit with the curriculum, scarce training opportunities, and insufficient information about incorporating ICT in lessons.
3. The most significant obstacles were the lack of computers, the lack of classroom time for students to use computers, and the lack of free time for learning. Other considerations include insufficient preparation and lack of professional development services for technology adoption.
4. The lack of technical skills, scarcity of software, inadequate funds, and time shortage were also significant barriers to technology use.
5. Unfavorable organizational culture, poor attitudes and beliefs, educational organizations, and school governance fail to recognize the importance and seriousness of ICT

in improving education. Teachers' views and perspectives are also orthodox. They are unaware, rigid, and not able to adjust to the transition.

6. Owing to lack of time, teachers are overburdened with more tasks than teaching. They will need to teach various subjects/courses along with the use of technology. They do not have the time to plan, build, and implement technology into teaching and learning. Teachers need time to interact with other teachers to learn how to use hardware and software while keeping themselves up to date with the new technologies.

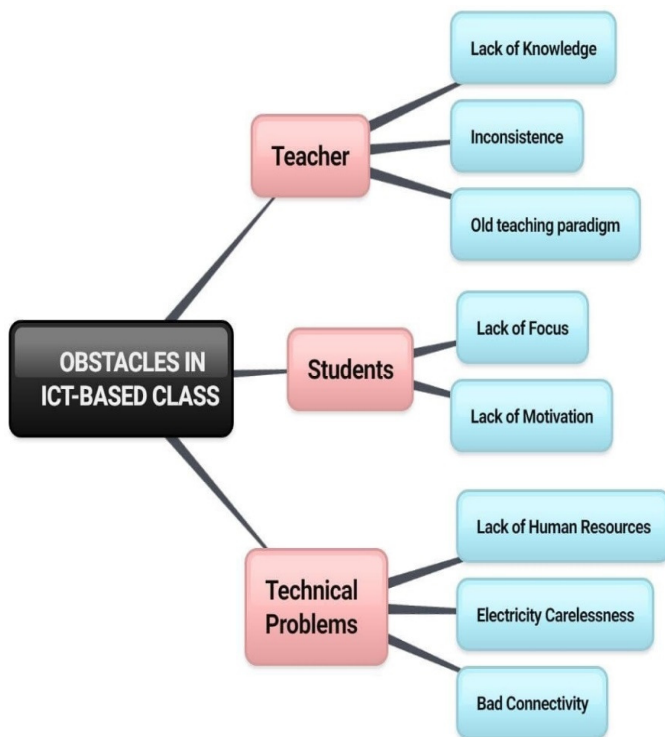


Fig. 5. Obstacles in Implementation of ICT Enabled Education

7. Maintenance and modifications of ICT facilities are subject to minimal financial resources in rural schools. Financial restrictions often limit government initiatives. ICT programs in rural schools are not viable. As government or private sector phase-out programs are implemented, students are provided with equipment maintenance. Students with low economic backgrounds are often unable to finance repairs and computer equipment costs.
8. A large percentage of educational software developed on the world market is available in English. The majority of the content available online is in English. In most developing countries, English language proficiency is not

high, particularly in rural areas, which is becoming a severe barrier to maximizing ICT's educational benefits.

9. Deficiencies include the lack of computers and computer-related tools, such as projectors, scanners, printers, etc., in rural government schools. The proportion of computers per pupil is inadequate, and there are also fewer private schools in these regions. The improper combination of ICT services has resulted in decreased technology diffusion and insufficient comprehension of ICT in educational institutions.
10. Even the critical ICT equipment and computers owned by rural schools are untrustworthy and unpredictable. Schools do not have new hardware and software available. Old and outdated equipment is a significant barrier to the implementation and application of ICT.
11. Lack of technological assistance for rural schools faces specialized expertise, lack of ICT service centers, and the absence of trained technical employees. For the continued sustainability of ICT use in a given school, technical support specialists are indispensable. Without on-site technical support, effort, resources, and time may be lost due to technical breakdowns. The lack of timely technical support has been a significant obstacle to optimizing computer use in schools.
12. Resource-related problems and rural schools generally face difficulties, accessing ICT-related resources such as uninterrupted electricity, infrastructure support additional resources such as scanners, projectors, multimedia, smart boards, etc. The Internet is required in the majority of rural schools as it is an integral component of ICT. Many schools cannot pay the high fees charged by internet providers, and even where the Internet exists, slow or inconsistent connectivity destroys the very essence and effect of ICT.
13. Cultural and social factors inherent in these areas, lack of action by community leaders, corruption, and burglary are other external factors that hinder ICT use in rural schools.
14. Educators, nearly older teachers relative to younger ones, are hesitant to apply ICT in their subject matter. Teachers must also update their knowledge and skills as a result of curriculum and technology changes.
15. Lack of motivation, lack of trust, lack of resources, lack of qualified human resources, weak ICT infrastructure, low accessibility, lack of knowledge, insufficient maintenance of hardware and software power

interruptions are other difficulties related to using ICT in education.

Because of these limitations, teachers are inadequately challenged and encouraged to build powerful learning environments and personally direct students in their learning processes.

7. RECOMMENDATIONS AND RESOLUTIONS OF APPLYING ICT FOR LEARNING

The lack of criteria for assessing education quality is one of the significant problems facing quality management in education. To determine the quality of education, all accreditation bodies such as the NBA, NAAC AICTE, CBSE, and other authorities must sit together and circulate a standard set of criteria. The creation of ICT has altered the epicenter of knowledge, and students are thus more educated than the teacher in certain instances. To a great extent, ICT allowed distance education can resolve this question. The absence of qualified teachers to enable proficient use of ICT is one of the critical barriers. Many educators are not able to first incorporate emerging technology to themselves and then to their students.

Teachers often need to upgrade their abilities and skills according to curriculum and technological changes; otherwise, it's just a computer lab apart from the conventional educational process. The implementation of modern technology in the teaching-learning phase has been limited and inconsistent, although computers came to Indian classrooms in 1984-85. It might not be feasible for the rural community to pay a hefty sum to use such ICT tools for education. Initial thought based on technology is one of the critical challenges in implementing ICT in education.

Also, ICT hardware and software are not intended for educational purposes but for general purposes. Only a specific subject such as IT or ICT is available, as per the latest practice. There is a need to have basic knowledge of computers and IT to use different ICT resources for teaching and learning. Computer teachers alone will not be able to accomplish this vital role of becoming agents of change. The screen can be split in half vertically to address the infrastructure issues for providing ICT education in schools. Two sets of applications can be viewed and used simultaneously by two users (students). Designing learning materials for delivery on accessible ICT instruments, including mobile devices, is a significant challenge faced by educators and trainers.

The tools for learning should be in manageable chunks, and multimedia should be included. The use of learning objects in mobile distribution has many benefits, including being reused and modified without impacting other learning items. Learners can store the information at any time for remote access in an electronic archive. Barriers include expensive support

infrastructure, costly and time-consuming production of online material, consistency, the validity of online material, lack of flexibility in the study material already prepared.

A lot of knowledge available online can dissuade learning from students. In the absence of classroom learning, students may feel alienated. Through using computer applications for the development of teaching and learning curricula, study and extension, governance and leadership, infrastructure services, and the use of the expert system to recommend intelligent decisions for top management, universities and schools may use computer programs at different levels of quality criteria to monitor, manage and impose strict discipline on campuses.

8. CONCLUSION

Information and Communication Technology is a policy of growth for both developed and developing nations. Through access to people and awareness building, ICT brings incredible social improvements and provides vulnerable people with adequate opportunities by giving them access to markets, health, and education. ICT is not only related to computers, the Internet, or telecommunications, but it is a combination of various electronic tools that facilitate the processing and communication of information, including transmission and display functions. Information and communication technology is regarded as an efficient method for the advancement of education. Among many academic practices, ICT plays a vital role as a powerful agent for change, i.e., conducting an online exam, paying online fees, accessing online books and journals. Thus, ICT improves the teaching-learning process in higher education, providing online learning facilities for thousands of learners who cannot benefit from higher education due to several controls, such as cost, time and geographical location, etc. Enabling ICT in education and the use of technology in education provides a learning atmosphere that is easy to navigate, where knowledge transmission is simpler and faster. For institutions, particularly in countries like ours, ICT is the direction to take, as our growth is directly linked to technology, and education is no exception. Ensuring the standard of education of its students will decide if the institution can step forward or perish.

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