

EFFECTIVENESS OF ICT TECHNOLOGY TOWARDS LEARNING AND TEACHING PROCEDURE METHODS FOR COMPUTER SCIENCE SUBJECTS

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ABSTRACT

Information and Communication Technology (ICT) has penetrated to all walks of life and education sector is no exception. Many studies have shown that ICT is a powerful technology that has the potential to revolutionised education. In today's global marketplace, innovation is a need. ICT plays a significant role in accomplishing a variety of objectives. Information and communication technology (ICT) is envisioned as a tool to address numerous educational obstacles because of its ability to transcend time and distance. ICT newfangled models for computer science and cloud integration are widely implemented in the education sector after an assessment of literature. Cloud computing systems, on the other hand, do not sufficiently handle a number of critical aspects that could improve performance. Infrastructural elements based on ICT in the Cloud have been delineated. We conducted an extensive evaluation of the highlighted qualities based on their usefulness to students, teachers, and technical specialists. According to the findings of this study, present ICT education systems barely solve 25% of interoperability difficulties, followed by 21% of accessibility and 19% of adaptability. Reusability was shown to account for 11% of the equation, whereas affordability was only responsible for 8%. Thus, it is clear that the current ICT-based education system for higher education in computer science topics does not adequately handle the fundamental characteristics. Studying current ICT-based systems, a comparison of many parameters was conducted. Various ICT difficulties like interoperability, accessibility, durability, flexibility, and affordability were addressed by developing a technical hybrid cloud framework based on ICT at the macro-level. As a result, the system can be improved. The study's end result was an ICT-based technological framework with cloud integration and a hybrid ICT framework. Higher education in computer science, whether at public or private institutions, would benefit from this framework's enhanced overall performance and comprehensive ICT-based solutions.

KEYWORDS: ICT integration; Teaching and learning; Technology effectiveness; Education.

INTRODUCTION

In this 21st century, the term “technology” is an important issue in many fields including education. This is due to the fact that technology is now the primary means of transferring knowledge throughout the world. Our civilizations have seen a radical shift in thinking, working, and living due to the advances and transformations brought about by technology integration. ICT integration should be a part of the curriculum in schools and other educational

institutions that are meant to prepare students for a "knowledge society." Classroom instruction can be enhanced by the use of computer-based communication and technology, which is known as ICT integration in education. Teacher use of ICT in the classroom is viewed as a critical component of preparing pupils for today's digital world. This can be attributed to the potential of ICT to provide a dynamic and proactive learning environment. Aside from increasing student access, quality, and affordability of teaching, ICT integration aims to connect learning communities so that they can better meet the challenges of globalisation. A single step in the use of ICT is not enough to support teaching and learning and information resources; rather, it is a series of continuing and continual steps. Technology integration in education often refers to a technology-based teaching and learning process that is directly linked to the use of learning tools in the classrooms. The topic of ICT integration in schools, particularly in the classroom, is critical because pupils are already comfortable with technology and will learn more effectively in a technology-based setting. Technology in education adds greatly to pedagogical aspects, in which the application of ICT elements and components will lead to successful learning with the aid and support of ICT elements and components. A wide range of academic disciplines, including mathematics, physics, languages, arts and humanities, and more, can be taught more successfully using technology-based tools. Teachers and students both benefit from ICT's assistance and supplementary resources when using computers as learning aids to facilitate effective learning. Technology and computers aren't viewed as a replacement for skilled teachers, but rather as a necessary adjunct to help students learn better. The importance of ICT integration in education cannot be overstated because, with the aid of technology, teaching and learning can take place even when teachers and students are physically separated. ICT integration is not a one-time event, but an ongoing process that fosters an environment conducive to both teaching and learning. There are numerous ways in which information and communications technology (ICT) may benefit both teachers and students in their pursuit of knowledge. There are a variety of ways to incorporate technology into the teaching and learning process, including the use of educational videos, the storing of data, the use of databases, mind-mapping and guided exploration and brainstorming, music, and the World Wide Web (www). As a result of incorporating ICT into the curriculum, students will benefit from hands-on activities in a technology-based course that are meant to increase their comprehension of the subject matter. It also aids teachers in developing lesson plans that are efficient, innovative, and engaging in order to encourage pupils to participate actively in their education. Students' active learning abilities have been shown to be enhanced by the use of ICT in the classroom, according to previous studies.

INFORMATION AND COMMUNICATION TECHNOLOGY IN EDUCATION

There has been a dramatic shift in the global economy due to globalisation and technological advancements. Educational institutions will have to reevaluate their mission and goals in light of the new global economy. Increasing access to information means that schools can no longer rely on a fixed amount of time to pass on knowledge. It is imperative that they adapt to the ever-expanding knowledge as well as have the technology to deal with it.

Characteristics of ICT in Education

The term "information and communication technology" (ICT) refers to any hardware or software used in the processing of educational data. In today's world, ICT primarily consists of computer technology, which includes hardware such as personal computers, Internet infrastructure, and software such as CD ROMs containing various programme packages, e-learning methodologies, and other tools. Data gathering, storage, modification, management, transmission, or reception are all aspects of ICT in education that focus on instructional purposes. Information regarding students' records, their admissions, and updates on their auricular and co-curricular activities, for instance. Using ICT in education refers to any technology that facilitates the exchange of information or communication throughout the teaching and learning process. Teleconferences, powerpoint presentations, and CD-ROMs are all examples of Communication Technology, a subset of Information and Communications Technology (ICT). Technology in education includes any educational technology used during the course of teaching or learning. It includes hardware, software, and systems approaches. Libraries, administration, and software for managing the complete teaching-learning process are only a few examples of the wide range of educational software packages available. The use of ICT in education serves as a tool for the human resources participating in the educational process in order to improve educational quality. The use of computer technology in conjunction with the science of online and offline learning is ICT in education.

APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN EDUCATION

There are several applications for information and communications technology (ICT) in everyday life. Students, the future citizens, can no longer afford to avoid using the computer because of its growing relevance. At every level of education and in both official and non-formal contexts, the use of ICT has become essential. Even at the elementary school level, students must receive computer training. To be a successful citizen of the future, one must have a deep understanding of and a good attitude toward this technology.

It can be used for the following purposes.

- To broadcast material, online facility or CD -ROM can be used as sources of information in different subjects.
- To facilitate communication for pupils with special needs;
- To use electronic toys to develop spatial awareness and psycho motor control;
- To use the online resource like, email, Chat, discussion forum to support collaborative writing and sharing of information.
- To facilitate video-conferencing or other form of Tele conferencing to involve wide range of students from distant Geographic areas.
- For blended learning by combining conventional classroom learning with E-learning systems

- To process administrative and assessment data.
- To exchange and share ideas -among teachers for the professional growth.
- To carry out internet-based research to enhance, educational process

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN TEACHING AND LEARNING PROCESS

ICT has made life easier in recent years, making it more convenient. Education (distant learning via electronic networks; open learning through student-controlled learning pathways; the process of changing teaching and learning styles by using a narrow range of Information Technology-based), facilities; industries; businesses; societies; and people's lives have all seen a tremendous increase in the use of ICT. Currently, educational institutions around the world are incorporating ICT into the teaching and learning process in order to provide students with the knowledge and skills they need to handle the challenges of the educational environment. Only by using ICT in education can one teach pupils how to participate in the growth process during this era of fast change. Technology has transformed the way people work today (Watson, 2001) and is now affecting educational systems (Watson, 2001). Children may not be ready for the future of information and communications technology if they are taught skills and technologies from yesterday. ICT should be recognised over the world because of this. In 2002, former UN Secretary General Kofi Annan said that information and communication technology (ICT) must unlock educational institutions' doors in order to achieve Universal Primary Education by 2005, indicating the growing need for and important place that ICT may receive in education.

CHANGES IN TEACHING AND LEARNING ENVIRONMENT

It is possible to create a more participatory and engaging learning environment for both teachers and students by shifting the emphasis from teaching to learning. Teachers and students alike will find themselves in a new role in this new environment. Teachers' responsibilities will shift from knowledge transmitter to knowledge facilitator, navigator, and co-learner. Teachers' new responsibility necessitates a new style of thinking and grasping the new vision of learning. In the future, students will assume greater responsibility for their own education as they search out, acquire and synthesise information, and then share their findings with others. ICT is a powerful instrument to assist the move from teacher-centered to learner-centered paradigm and the new roles of teacher, learner, curriculum, and new media.

Components of ICT for Teaching and Learning

a) Video conferencing: It is a two way communication system. It is also called teleconferencing, it's the use of television video and sound technology (webcam) between people in different locations. It can be used to give and receive lectures irrespective of the location of teachers or learners.

b) World Wide Web: The World Wide Web, known as www, w3 or simply the web, is one of the several internet resources developed to help, publish, organize and provide access to information on the Internet. The web was first developed by Tim Berners Lee I 1989 while working at CERN,

c) Web 2.0: The term was coined by Tim O' Reilly at the O' Reilly Media. Web2.0 describes World Wide Web sites that use technology beyond the static pages of earlier web sites. Although web2.0 suggest new version of www, it does not refer to update to any technical specification, but rather to cumulative changes in the way web pages are designed and used. It allows users to interact, collaborate and chat with each other both synchronously and asynchronously. Social Media, Blogs, Wikis, Video sharing are all based on Web2.0 Technology. With web2.0 tools, users can communicate around the world at a nominal cost. It allows population to correspond and spread ideas with each other rather than receiving the information from a single source.

d) Blog and Wikis: Blogs and wikis are fundamentally web2.0 and their global proliferations have enormous implication for libraries and also in teaching and learning process. Blogs may indeed be a greater milestone in the history of publishing than web pages. They enable the rapid production and consumption of web based publications. Blogs contains posts some time similar to journal entries, from a person or a group. The post are dated and listed in reverse chronological order. People can comment on posts as well as provide links to related sites, photos and blogs. Wiki is an online collaborative writing tool. According to (Richardson, 2006) a wiki is a collaborative web space where anyone can add content and anyone can edit content. That has already been published Wikis are designed to help groups collaborate, share and build online content and are especially useful for learners who are separated by time and place.

e) Social Media: Social media are perhaps the most promising and embracing technology. They enable messaging, blogging streaming media and tagging .Some most commonly used social media are MySpace. Facebook, Delicious, Frappr and Flickr networks that have enjoyed massive popularity in web 2.0. It is based on web2.0 technology. MySpace and Face book enable users to communicate with each other, Del.icio.us enables users to share web resources and Flickr enables the sharing of pictures. Frappr is a bit of a blended network, using maps, chat rooms and pictures to connect individual.

TEACHERS' BELIEF ON TECHNOLOGY-BASED TEACHING AND LEARNING

As learning technology advanced in the late twentieth century, the education system underwent a dramatic shift. Technology's ability to deliver a proactive, easy-to-access and complete teaching and learning environment is to blame. In today's world, the Ministry of Education provides a wide range of resources and training to help teachers and students use cutting-edge technology in the classroom. In order to strengthen the education system, a large amount of money has been allocated for the purchase of teaching aids. Despite their best efforts, teachers in many nations still fail to make full use of the technology available to them. The use of ICT in the teaching and learning process has been proved to boost student achievement in many previous studies. Teachers' willingness to use

technology in the classroom has been studied by a slew of experts. It demonstrates that instructors' assumption that they are the ones who implement change in their teaching and learning process was the biggest barrier to implementation. A strong link has been found between instructors' faith in technology and their actual usage of it, according to prior studies. For teachers, the use of ICT in pedagogy is becoming increasingly crucial, as it has the potential to boost student performance while also enhancing their creativity and critical thinking abilities. Teachers' effectiveness in urban schools, on the other hand, varies with the number of years of experience and age of the teachers. Teacher efficacy is diminishing with age and experience, but the belief in teacher efficacy is dependent on school administration in some way. When we talk about school administration, we're talking about the ways in which students and faculty can connect with one another and with the tools available to them in the classroom. Schools that allow instructors and administrators to cooperate and communicate with each other, as well as facilitate the utilisation of instructional resources, would be ideal. According to the findings of this study, teachers' perceptions of their own efficacy are influenced by school leadership and culture. It's simpler to integrate ICT in the classroom if the school has a culture of change and instructors are constantly sent for training to keep their skills up-to-date.

TEACHING COMPUTER SCIENCE IN TWENTY FIRST CENTURY

In today's world, technology is always evolving, and this has an impact on a wide range of fields, including education. Because educational institutions are pushing students to utilise computers and the internet to get information, the current generation is encouraged to do so in a variety of contexts. As a result, an adoption strategy that is adaptable and can be scaled up or down depending on the technology's readiness for change should be developed. When it comes to learning technology and operating applications, digital literacy has traditionally been the most important factor. However, the youth/students of today are more concerned with how to use technology and what are the basic needs that are required to learn technologies, which will help them better understand their customers' needs and become creative agents in this digital age. A large number of volunteers from non-profit organisations and corporations are returning to universities in many developed countries to examine the curricula in order to integrate computational thinking into the student's mentality in order to facilitate the student's learning of new technologies in developing the code and serve as a change agent for informal computer science education.. This ability will serve as a stimulant for students' cognitive development and broaden their technological interest, both of which are essential for landing a good job and advancing their careers, both of which have a direct bearing on the country's economic progress. This discussion should be incorporated into a larger framework of ICT use in education. New computerised advancements can be used in a wide range of ways in schools, including enhancing or altering teaching and learning methods, and enhancing or altering the use of general applications and instructive programming and the Internet in a cross-area way in all educational programmes. It's possible that the significance and final motives for various ICT uses vary by country, district and university, but one thing is certain: every dynamic educator in the twenty-first century is being driven to change their teaching methods and use ICTs in some way. Even though no one knows what the final outcome of this enormously significant development will be or what

it will mean, agreement is inevitable. Not only is computer science promotion not influenced by replacing it, but it's a much more complete technique of adapting training to current innovation situations. To put it another way, if this new information isn't taken into account as one of the essential competencies that all students should acquire during their educational experience, this adjustment will be lacking. MS Office, some instructional software, and how to utilise the internet are some of the in-built applications that students may learn without putting in additional effort, but they don't have comprehensive competency that is appropriate for today's world. Students will study computer science as part of their graduation requirements, where they will learn the basics of programming, retrieving and arranging processed data, and storing data in databases. However, this is not the level of computer literacy required for the job at hand. Currently, computer science needs to be studied in a methodical manner that is framed by a reliable authority. As a result, students will have a starting point from which to work their way through the subject and gain a thorough understanding of its breadth and distinctive characteristics. As a result, computer science courses are in high demand at universities, and the next step is to figure out how to combine them, teach them to students, and why they are so important in the current educational system. Using computers and software and hardware design, students in the academic computer science subject learn what they can do and how they can go about doing it. Using algorithms, PCs can get, communicate, structure, process, and convey information while also doing computations. Every one of these tasks is at the core of the PC programmes we use on a daily basis. Databases, system design and architecture, human-computer cooperation and interaction, system software, programming language, and computer security are all part of computer science. Experts from universities' Computer Science departments will be established to plan, design, and maintain our IT frameworks. These experts research human concerns and forms, organise and display the measurements that can be tended to by computers, and outline and implement equipment and programming frameworks that shape IT solutions.

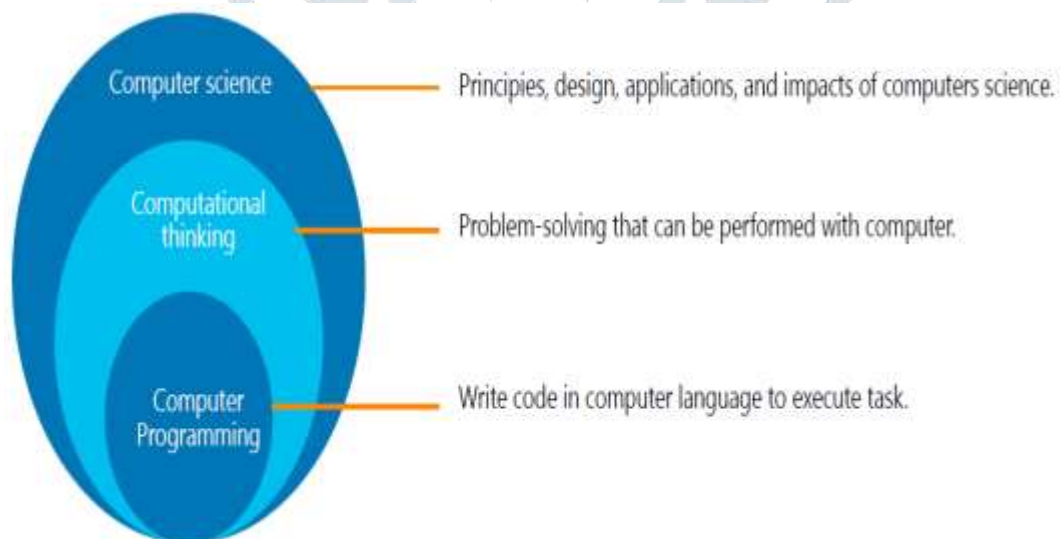


Figure 1 Student Fundamental to the World of Digitization

When it comes to creating software that makes life easier while also allowing a company to thrive in the global market, significant changes have occurred in recent years in the computer industry. Individuals can now conduct

banking tasks from the comfort of their own homes, including bill payment and transportation service requests, all while utilising their mobile phones. All of these will necessitate a computational approach that allows the individual to frame the problem and design a solution with computer assistance. Computer solutions have their advantages and disadvantages, and students can use their own methods to tackle the problem. The use of software engineering methods and tools in conjunction with computational thinking would allow young people to better conceptualise, examine, and respond to complex challenges. Reflection, conjecture, and illustrating and breaking down concerns into sub-issues are just few examples of computational reasoning. Also, deconstructing procedures and information, making virtual advanced or real-world curiosities, and so on are all examples of computational reasoning. It might be useful in a coding or programming context since it refers to the process of putting together a collection of instructions to carry out a preset task. It is, however, vital to use conceptual computing in the solution to the problem in order to expand the content beyond code. Algorithm design and computer-readable code are among the tasks involved.

An introduction to digital technology and a set of creative tools for students are provided via three modules depicted in this graphic. Traditional teaching of computer science involves problem-based learning, which is the most prevalent way for learning the science. Students will put what they've learned in the classroom into practise in everyday life. Preferably, these issues will have a real-world impact on how computers handle information.

TECHNOLOGICAL TEACHING TO STUDENTS IN 21ST CENTURY

To adequately connect with and educate adult students, educational structures must be equipped with an essential ICT property and educational module essential be intended to advance a cooperative student-focused condition to which students will react and match. Technology (ICT) coordinated into classrooms; teachers should have proficient improvement and confirmation of registering aptitudes. Understudies should likewise be shown ICT aptitudes significant to their entrance into the workforce. Need for curriculum revision: now a day's teenagers are very much interested in playing games includes solo, groups or networked and some surveys showed 8 out of 10 will play networked and online games. So, keeping this in mind academic researchers should design the curriculum should include the gaming theme which will help the facilitator will involve the students in learning better. This will help in analytical thinking, team activity, involvement and improve the problem-solving skills that facilitator needed presently this is also called as Gamification. This will help to develop below attributes in students

Goal defining: Computer games give players a reasonable clarification of the coveted result of the diversion and meaning of play manual guide. For instance, a computer game goal might be, "princess spare." Meaning of play may incorporate, "Go through universes. Finish courageous assignments." In learning room, instructors must define clear guidelines, practical, feasible desires for progress. Entire class students will not accomplish an objective similarly or at a similar speed, however, everyone student must be given chance for similar passing criteria. For lucidity, give rubrics to solve taking different cases and analyzing capabilities on how student will solve without any dependency.

Cultivate Patience: Computer games give players a reasonable clarification of the coveted result of diversion and meaning of game on how to understand and play a game. For instance, a computer game goal might be, "Spare the kingdom." Its meaning of game may incorporate, "Go through universes. Finish courageous assignments." In classroom, instructors must provide clear, practical, feasible desires to progress. Not all students will accomplish an objective similarly or at a similar speed, however, each student will be given similar standards and measures for passing. For lucidity, give color matching cube, various rules and cases, considering how singular students show interest in learning.

ADVANTAGES OF THE USE OF ICT IN EDUCATION

ICT encompasses all those gadgets that deal with the processing of information for better and effective communication. In education, communication process takes place between teachers, students, management and administrative personnel which requires plenty of data to be stored for retrieval as and when required, to be disseminated or transmitted in the desired format. The hardware and software like OHP, Television, Radio, Computers and related software are used in the educational process. However ICT today is mostly focused on the use of Computer technology for processing the data. In this context, advantages of ICT in education can be listed down as follows:

- Quick access to information: Information can be accessed in seconds by connecting to the internet and surfing through Web pages.
- Easy availability of updated data: Sitting at home or at any comfortable place the desired information can be accessed easily. This helps the students to learn the updated content. Teachers too can keep themselves abreast of the latest teaching learning strategies and related technologies.
- Connecting Geographically dispersed regions: With the advancement of ICT, education does not remain restricted within four walls of the educational institutions. Students from different parts of the world can learn together by using online, offline resources. This would result in the enriching learning experience. Such collaborative learning can result in developing.
- Divergent thinking ability in students,
- Global perspectives
- Respect for varied nature of human life and acculturation.
- Facilitation of learning

ICT has contributed in shifting the focus on learning than teaching. ICT helps students to explore knowledge to learn the content through self -study. Teacher can help the students by ensuring right direction towards effective

learning. Situational learning, Programmed learning, many Online learning courses are some of the example of self-learning strategies that are being utilized with the help of ICT.

- **Catering to the Individual differences:** ICT can contribute in catering to individual needs of the students as per their capabilities and interest. Crowded class rooms have always been a challenge for the teacher to consider the needs of every student in the class.

- **Wider range of communication media:** With the advent of ICT, different means of communication are being introduced in the teaching learning process. Offline learning, on line learning, blended learning is some of the resources that can be used in educational institutions. Collaborative learning, individualized learning strategies can enhance the quality of group as well as individual learning. This can ensure the applicability of knowledge.

CONCLUSION

The integration of ICT into the very idea of teaching and learning has placed pedagogy over technology. We weren't just interested in learning how to use technology, but also how to make it better for students and teachers alike. To increase learning, excite and engage students, promote cooperation, foster inquiry and exploration and establish a new learner-centered learning culture, ICT infusion in the classroom is a significant focus. Computer science was the most popular stream among those who participated in this study, with 95.4 percent of respondents coming from universities and institutions located in the suburban area. This survey also includes facilitators and subject experts who showed full interest and returned with a 100% number, out of which 98 percent of facilitators and 97.5 percent of subject experts recommended pushing toward the need for a new model to teach computer science subjects to students in a practical and real-time manner. For this reason, "Hybrid Cloud enabled ICT model" has been developed, which focuses on student learning through real-time practical experience and the application of computer science subjects to a higher extent, as demonstrated in this discussion above. Before putting together the above model, a significant amount of work was done to collect elements that would make it possible for kids to learn computer science in an engaging way. Students had no actual experience with these principles before now because they were taught them only theoretically and by memorization. A fundamental revision of computer science education is required, and this research shows that the existing paradigm and incorporation of cloud services are the best ways to do this. This study shows that integrating the cloud with the suggested model has a beneficial impact, boosts practical knowledge, piques student interest, and so on. As a result, we can conclude that this research will have a beneficial impact on students, facilitators, and cloud services, which ensures that all activities are clearly visible. All software will be protected from unauthorised access and misuse in this way.

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