What is ICTs and what types of ICTs are commonly used in education.

ICTs stand for information and communication technologies and are defined, for the purposes of this primer, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." [4] These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony.

In recent years there has been a groundswell of interest in how computers and the Internet can best be harnessed to improve the efficiency and effectiveness of education at all levels and in both formal and non-formal settings. But ICTs are more than just these technologies; older technologies such as the telephone, radio and television, although now given less attention, have a longer and richer history as instructional tools. For instance, radio and television have for over forty years been used for open and distance learning, although print remains the cheapest, most accessible and therefore most dominant delivery mechanism in both developed and developing countries. The use of computers and the Internet is still in its infancy in developing countries, if these are used at all, due to limited infrastructure and the attendant high costs of access.

Moreover, different technologies are typically used in combination rather than as the sole delivery mechanism. For instance, the Kothmale Community Radio Internet uses both radio broadcasts and computer and Internet technologies to facilitate the sharing of information and provide educational opportunities in a rural community in Sri Lanka.Similarly, the Indira Gandhi National Open University in India combines the use of print, recorded audio and video, broadcast radio and television, and audioconferencing technologies. [9

What is e-learning?

Although most commonly associated with higher education and corporate training, e-learning encompasses learning at all levels, both formal and non-formal, that uses an information network—the Internet, an intranet (LAN) or extranet (WAN)—whether wholly or in part, for course delivery, interaction, evaluation and/or facilitation. Others prefer the term online learning. Web-based learning is a subset of e-learning and refers to learning using an Internet mainly using a browser (such as Chrome or Firefox or Internet Explorer).

blended learning:-. This refers to learning models that combine traditional classroom practice with e-learning solutions. For example, students in a traditional class can be assigned both print-based and online materials, have online mentoring sessions with their teacher through chat, and are subscribed to a class email list. Or a Web-based training course can be enhanced by periodic face-to-face instruction."Blending" was prompted by the recognition that not all learning is best achieved in an electronically-mediated environment, particularly one that dispenses with a live instructor altogether. Instead, consideration must be given to the subject matter, the learning objectives and outcomes, the characteristics of the learners, and the learning context in order to arrive at the optimum mix of instructional and delivery methods.

What is open and distance learning

Open and distance learning is defined by the Commonwealth of Learning as "a way of providing learning opportunities that is characterized by the separation of teacher and learner in time or place, or both time and place; learning that is certified in some way by an institution or agency; the use of a variety of media, including print and electronic; two-way communications that allow learners and tutors to interact; the possibility of occasional face-to-face meetings; and a specialized division of labour in the production and delivery of courses."

What is meant by a learner-centered environment?

The National Research Council of the U.S. defines learner-centered environments as those that "pay careful attention to the knowledge, skills, attitudes, and beliefs that learners bring with them to the classroom." The impetus for learner-centredness derives from a theory of learning called constructivism, which views learning as a process in which individuals "construct" meaning based on prior knowledge and experience. Experience enables individuals to build mental models or schemas, which in turn provide meaning and organization to subsequent experience. Thus knowledge is not "out there", independent of the learner and which the learner passively receives; rather, knowledge is created through an active process in which the learner transforms information, constructs hypothesis, and makes decisions using his/her mental models. A form of constructivism called social constructivism also emphasizes the role of the teacher, parents, peers and other community members in helping learners to master concepts that they would not be able to understand on their own. For social constructivists, learning must be active, contextual and social. It is best done in a group setting with the teacher as facilitator or guide.

ICT for lifelong learning

Role of ICT in learning

We are living in a constantly evolving digital world. ICT has an impact on nearly every aspect of our lives - from working to socialising, learning to playing. The digital age has transformed the way young people communicate, network, seek help, access information and learn. We must recognise that young people are now an online population and access is through a variety of means such as computers, TV and mobile phones.

As technology becomes more and more embedded in our culture, we must provide our learners with relevant and contemporary experiences that allow them to successfully engage with technology and prepare them for life after school.

It is widely recognised that learners are motivated and purposefully engaged in the learning process when concepts and skills are underpinned with technology and sound pedagogy. Learning and Teaching Scotland aims to provide resources for practitioners, parents and pupils to engage with these technologies in order to inform and enhance the learning experience.

Impact of ICT on student achievement

1. **The positive impact of ICT use in education has not been proven** In general, and despite thousands of impact studies, the impact of ICT use on student achievement remains difficult to measure and open to much reasonable debate.
2. **Positive impact more likely when linked to pedagogy** It is believed that specific uses of ICT can have positive effects on student achievement when ICTs are used appropriately to complement a teacher's existing pedagogical philosophies.
3. **'Computer Aided Instruction' has been seen to slightly improve student performance on multiple choice, standardized testing in some areas**

Computer Aided (or Assisted) Instruction (CAI), which refers generally to student self-study or tutorials on PCs, has been shown to slightly improve student test scores on some reading and math skills, although whether such improvement correlates to real improvement in student learning is debatable.

4. **Need for clear goals**

   ICTs are seen to be less effective (or ineffective) when the goals for their use are not clear. While such a statement would appear to be self-evident, the specific goals for ICT use in education are, in practice, are often only very broadly or rather loosely defined.

5. **There is an important tension between traditional versus 'new' pedagogies and standardized testing**

   Traditional, transmission-type pedagogies are seen as more effective in preparation for standardized testing, which tends to measure the results of such teaching practices, than are more ‘constructivist’ pedagogical styles.

6. **Mismatch between methods used to measure effects and type of learning promoted**

   In many studies there may be a mismatch between the methods used to measure effects and the nature of the learning promoted by the specific uses of ICT. For example, some studies have looked only for improvements in traditional teaching and learning processes and knowledge mastery instead of looking for new processes and knowledge relatd to the use of ICTs. It may be that more useful analyses of the impact of ICT can only emerge when the methods used to measure achievement and outcomes are more closely related to the learning activities and processes promoted by the use of ICTs.

7. **ICTs are used differently in different school subjects**

   Uses of ICTs for simulations and modeling in science and math have been shown to be effective, as have word processing and communication software (e-mail) in the development of student language and communication skills.

8. **Access outside of school affects impact**

   The relationships between in-class student computer use, out of class student computer use and student achievement are unclear. However, students in OECD countries reporting the greatest amount of computer use outside school are seen in some studies to have lower than average achievement (the presumption is that high computer use outside of school is disproportionately devoted to computer gaming).

9. **Users believe that ICTs make a positive difference**

   In studies that rely largely on self-reporting, most users feel that using ICTs make them more effective learners.

Impact of ICT on student motivation

1. **ICTs motivate teachers and students**

   There appears to be general consensus that both teachers and students feel ICT use greatly contributes to student motivation for learning.

2. **Access outside of school affects user confidence**

   (Not surprisingly) Students who use a computer at home also use them in school more frequently and with more confidence than pupils who have no home access.

3. **Where to place computers has an impact**

   Placing computers in classrooms enables much greater use of ICTs for 'higher order' skills than placing computers in separate computer laboratories (indeed, fewer computers in classrooms may enable even more use than greater numbers of computers located in separate computer labs). Related to this is an **i**ncreasing attention given to the use of laptops by both teachers and students (and in some places, 'computers-on-wheels'), as well as, to a much lesser extent, to the use of personal digital assistants and other mobile devices.

4. **Models for successfully integrating ICT use in school and after school hours are still emerging**

   There are few successful models for the integration of student computer use at home or in other 'informal settings' outside of school facilities with use in school.

5. **The appropriate ages for introducing computers to students are hotly debated**

   On a general level, appropriate ages for student ICT use in general are unclear. However, it is clear that certain uses are more or less appropriate, given student ages and abilities. Emerging research cautions against widespread use at younger ages.

6. **ICTs can promote learner autonomy**

   Evidence exists that use of ICTs can increase learner autonomy for certain learners.

7. **Gender affects impact**

   Uses of ICTs in education in many cases to be affected by the gender of the learner.

8. **The 'pilot effect' can be an important driver for positive impact**

   Dedicated ICT-related interventions in education that introduce a new tool for teaching and learning may show improvements merely because the efforts surrounding such interventions lead teachers and students to do 'more' (potentially diverting energies and resources from other activities).

Ict for lifelong learning (promote lifelong learning by ict)

ICTs are a potentially powerful tool for extending educational opportunities, both formal and non-formal, to previously underserved constituencies—scattered and rural populations, groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as all others who for reasons of cost or because of time constraints are unable to enroll on campus.

- Anytime, anywhere. One defining feature of ICTs is their ability to transcend time and space. ICTs make possible asynchronous learning, or learning characterized by a time lag between the

delivery of instruction and its reception by learners. Online course materials, for example, may be accessed 24 hours a day, 7 days a week. ICT-based educational delivery (e.g., educational programming broadcast over radio or television) also dispenses with the need for all learners and the instructor to be in one physical location. Additionally, certain types of ICTs, such as teleconferencing technologies, enable instruction to be received simultaneously by multiple, geographically dispersed learners (i.e., synchronous learning).

- Access to remote learning resources. Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at anytime of the day and by an unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries, that have limited and outdated library resources. ICTs also facilitate access to resource persons— mentors, experts, researchers, professionals, business leaders, and peers—all over the world.

- Active learning. ICT-enhanced learning mobilizes tools for examination, calculation and analysis of information, thus providing a platform for student inquiry, analysis and construction of new information. Learners therefore learn as they do and, whenever appropriate, work on real-life problems in-depth, making learning less abstract and more relevant to the learner's life situation. In this way, and in contrast to memorization-based or rote learning, ICT-enhanced learning promotes increased learner engagement. ICT-enhanced learning is also "just-in-time" learning in which learners can choose what to learn when they need to learn it.

- Collaborative learning. ICT-supported learning encourages interaction and cooperation among students, teachers, and experts regardless of where they are. Apart from modeling real-world interactions, ICT-supported learning provides learners the opportunity to work with people from

different cultures, thereby helping to enhance learners' teaming and communicative skills as well as their global awareness. It models learning done throughout the learner's lifetime by expanding the learning space to include not just peers but also mentors and experts from different fields.

- Creative Learning. ICT-supported learning promotes the manipulation of existing information and the creation of real-world products rather than the regurgitation of received information.

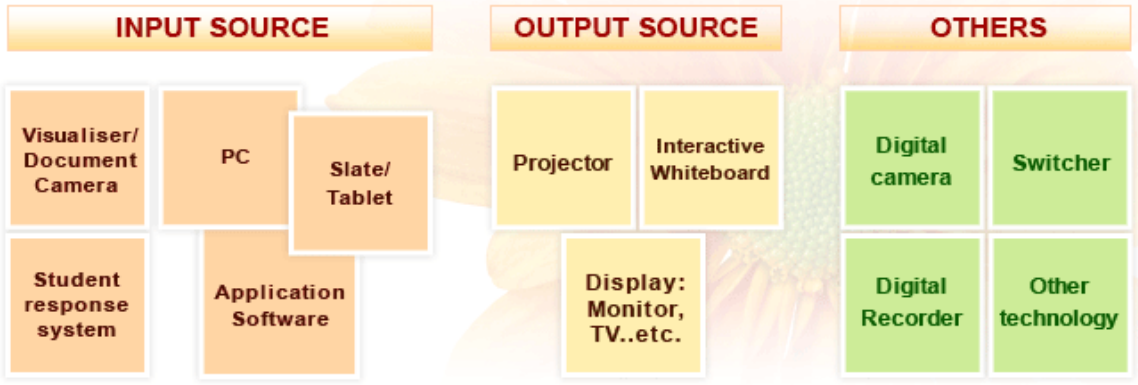
- Integrative learning. ICT-enhanced learning promotes a thematic, integrative approach to teaching and learning. This approach eliminates the artificial separation between the different disciplines and between theory and practice that characterizes the traditional classroom approach.

- Evaluative learning. ICT-enhanced learning is student-directed and diagnostic. Unlike static, text- or print-based educational technologies, ICT-enhanced learning recognizes that there are many different learning pathways and many different articulations of knowledge. ICTs allow learners to explore and discover rather than merely listen and remember.

ICT for Teacher Professional Development

"ICT" is the Information and Communication Technologies. "ICT in Education" means "Teaching and Learning with ICT"

Educational ICT tools can be divided into 3 categories: Input source, Output source and Others. As shown in the following figure:



Worldwide research has shown that ICT can lead to improved student learning and better teaching methods. A report made by the National Institute of Multimedia Education in Japan, proved that an increase in student exposure to educational ICT through curriculum integration has a significant and positive impact on student achievement, especially in terms of "**Knowledge ‧ Comprehension**" ‧ "**Practical skill**" and "**Presentation skill**" in subject areas such as mathematics, science, and social study.

Advantages of ICT tools for education

1‧ Through ICT, images can easily be used in teaching and improving the retentive memory of students.

2‧ Through ICT, teachers can easily explain complex instructions and ensure students' comprehension.

3‧ Through ICT, teachers are able to create interactive classes and make the lessons more enjoyable, which could improve student attendance and concentration.

ICT Professional Development:

There is a wide variety of professional development opportunities to assist teachers and school leaders to embrace the possibilities of ICT to enhance student learning,

- Increase efficiency of school operations and
- Advance life-long learning.

The mode may vary from:

- Participating in an online discussion list or web conference to undertaking an action research project.

Teachers' Professional Development Toolkit:

This toolkit contains a set of resources used to introduce Information and Communication Technology (ICT) into Teacher Education. The utility of these resources span from

- creating an ICT in Education strategy,
- collecting education data,
- considering approaches to advocacy,
- designing curriculum to materials development
- And provides a set of open materials that could be used for training new or in service teachers.

The tools contained here were developed through a partnership of UNESCO, the Commonwealth Secretariat, the Commonwealth of Learning (COL), Microsoft and the Ministries of Education of a number of countries in the Caribbean and Pacific committed to enhancing Teacher Education.

The approach suggested by these tools and supported by the accompanying justification contained here calls for an adoption, and where necessary the adaption, of Open Education Resources (OER) selected and aligned to the UNESCO ICT Competency Framework for Teachers (CFT). The UNESCO ICT CFT provides structure for a comprehensive ICT in Education programme or course.

THE UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS

	TECHNOLOGY LITERACY	KNOWLEDGE DEEPENING	KNOWLEDGE CREATION
UNDERSTANDING ICT IN EDUCATION	Policy awareness	Policy understanding	Policy innovation
CURRICULUM AND ASSESSMENT	Basic knowledge	Knowledge application	Knowledge society skills
PEDAGOGY	Integrate technology	Complex problem solving	Self management
ICT	Basic tools	Complex tools	Pervasive tools
ORGANIZATION AND ADMINISTRATION	Standard classroom	Collaborative groups	Learning organizations
TEACHER PROFESSIONAL LEARNING	Digital literacy	Manage and guide	Teacher as model learner

This table produced by COL introduces this critical element in the approach

Using Technology to Train Teachers

Following are the tools to improve and expand teacher professional development (TPD) activities;

- Teacher Incentives
- Supporting TPD in Schools
- Follow-up and Communications
- Mobile Phones as Support Tools
- Support from School Leadership
- Support from the Community
- Technical Support
- Collaborative Support
- Web Resources
- Internet Resources
- Training for using ICT

> *Without willing and knowledgeable teachers, students cannot benefit from the educational opportunities afforded by technology. Therefore it necessary to discusses training programmes for teachers - who are at the heart of education.*

Professional development components for technology programme:

In "Teacher Professional Development in the Use of Technology", **Sam Carlson and Cheick T Gadio** list the following as being fundamental components in any professional development for technology programme:

- Direct connection to student learning. The goal of teacher professional development is improved student achievement. The ICT that is used in the classroom should be relevant to student needs.
- Hands-on technology use. This requires development of core technology competencies and skills and actual application of skills in the classroom.
- Curriculum-specific applications. To the fullest extent possible, teachers need to see a direct link between technology and the curriculum for which they are responsible.
- New roles for teachers, as facilitators and guides, not simply as lecturers or instructors.
- Active participation of teachers and collegial learning.
- Professional development as an ongoing process.

A major factor that influences whether teacher training programme are successful or not is the attitudes of the teachers. Motivation and incentives are essential.

- One way to motivate teachers to take part in ICT-training programmes is to accredit the courses.
- Another motivating factor is linking teachers' training progress to their salary.
- Teachers can also become motivated by learning about how new technological skills allow them to break their professional isolation
- and share everything from lesson plans to the trials of the position with other teachers.
- Also, teachers can be motivated to learn about technologies if they understand how technology can boost their productivity and improve learning in their classrooms.

"UNESCO realises that any educational reform of a country means little without the support of those at the heart of education and so teachers are at the core of our programme."

UNESCO also says:

Professional development cannot be seen in isolation (Separation), but should be considered in the context of the broader educational reform, involving the development of supportive policy, infrastructure (Communication) and curriculum.

Approach to teacher development in ICT:

By incorporating certain essential principles, it reflects a holistic approach to teacher development in ICT.

- It acknowledges that ICT skills cannot be practised in isolation from their context.
- It also acknowledges that the development of ICT skills and knowledge for teachers should be an integral part of initial and continuing teacher development programmes,

As reflected in the National Policy Framework for Teacher Education and Development in South Africa.

The holistic approach to teacher development has the following three dimensions (adapted from the European Union's T3 Core Curriculum for Telematics in Teacher Training):

1. **A pedagogical dimension,** which implies an understanding and application of the opportunities of the use of ICT for teaching and learning in a local curriculum context.

2. **A technical dimension**, which implies

    • an ability to select, use and support a range of ICT resources as appropriate to enhance personal and professional effectiveness; and

    • the willingness to update skills and knowledge in the light of new developments.

3. **A collaboration and networking dimension**, which includes

    • a critical understanding of the added value of learning networks and collaboration within and between partners; and

    • the ability to create and participate in communities of practice.

These dimensions are embedded in the national and local infrastructure, culture and context**.**

Furthermore, when ICT is successfully integrated into teaching and learning, it can ensure a more meaningful interaction of learners with information. ICT can promote the development of advanced cognitive skills such as comprehension, reasoning, problem-solving and creative thinking, as well as the ability of learners **to:**

• identify and solve problems and make decisions using critical and creative thinking strategies;

• work effectively with others as members of a team, group, organisation and community;

• organise and manage themselves and their activities responsibly and effectively;

• collect, analyse, organise and critically evaluate information;

• communicate effectively using visual, symbolic and/or language skills in various modes;

• use science and technology effectively and critically, showing responsibility towards the environment and the health of others; and

• demonstrate an understanding of the world as a set of related systems by recognising that problems cannot be separated from their contexts.

Teacher ICT has knowledge, skills, values and attitudes