



## Education Tech EDCI 321

Education Arts (Chuka University)



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## **Education Technology II**

### **Introduction**

The unit seeks to further focus the preservice teachers' attention on the role and use of resources in classroom instruction. Specifically, it seeks to highlight the significance of existing and emerging technology in teaching and learning.

Unit chapters include:

- Foundations of educational technology.
- Concepts of Visual Literacy.
- Media and Distant Education.
- Pedagogical integration of ICT.
- Education Resource Centre
- Future Trends in Education Technology
- Learning Resource Project

## **1. Philosophical and Psychological foundations of educational technology**

There are many issues surrounding the use of technology in learning including but not limited to the volatile nature of most technologies, dealing with evergreen students who are technologically savvy, the growing complexity of technological concepts which can make learning difficult, the lack of effective communication and collaborative behaviour among technologists (Weert & Tatnall, 2005).

### **Philosophical Foundation of Educational Technology**

This deals with the “why” of education technology in learning. While the purpose of technology education is often encapsulated as "learning by doing," the relative importance of knowledge and activity is a subject of debate. Specifically, most technology teacher educators and theoreticians regard the primary purpose of technology education either as **content, method, or process**.

The **content philosophy** views technology education as an academic discipline with a well-defined taxonomy of knowledge related to industries and technologies such as manufacturing, construction, communication, and transportation. That technology is an important subject of study for children at all grade levels is the essential precept of "Standards for Technology Education: Content for the Study of Technology" (2000), a multimillion dollar ITEA project funded by the National Science Foundation and NASA.

Proponents of the **method philosophy** see technology education primarily as a means of teaching the subjects of the curriculum. In this view, technology education takes the form of constructional activities in which children manipulate tools and materials to create products and, in so doing, learn about social studies, science, and other subjects. Advocates of the **method philosophy** put secondary focus on technological content, emphasizing that any content may be taught via technology education. This conception is most common in the elementary grades.

In the **process philosophy**, teaching technology education is tantamount to fostering competence in problem solving and solution design. The content of technology education in the **process view** is any and all knowledge needed to design solutions to problems, and technology activities constitute a context for the entire K—12 curriculum. This philosophy has re-emerged in U.S. technology education literature and teacher education due to its popularity abroad, especially in Anglophone Europe and Australia.

Because it is espoused by the major U.S. technology teachers' organizations and enjoys the financial support of well-known U.S. government agencies, the view of technology education as a content area dominates teacher education, textbooks, curriculum, funded projects, and doctoral research. Scholarly discourse also favors this view, but to a smaller extent. *The Standards for Technology Education* represents an attempt by the field to position itself as an academic subject by emulating the efforts of educators in the mathematics, science, language arts, social studies, and fine arts fields in the standards movement of the 1980s and 1990s. It is also the most comprehensive effort in the field's history to arrive at consensus as to the nature of American technology education.

### **Approaches to Curriculum**

It is clear that in classroom practice, the most common approaches to technology education do not correspond neatly to these three philosophies. Surveys revealing that high school technology course offerings closely resemble those from the early twentieth century have been a source of consternation to leaders in the field since the 1960s, yet schools and teachers have been very slow to shift curricula from traditional industrial courses, such as woodworking and drafting, to technological studies like manufacturing or communications. The most prominent leaders in the field have advocated this change in focus since the late 1940s. Their primary success has been in the nearly nationwide name change from *industrial arts* to *technology education*, accomplished in the 1980s and 1990s.

A 1999 survey found that the four most frequently taught middle and high school technology courses had not changed since 1963: general technology education, drafting, woodworking, and metalworking. Other popular courses include automotives, architectural drafting, communications, electricity/electronics, and manufacturing.

### **Psychological Foundation of Education Technology**

Relates to theories of learning and their Application to media for learning. According to psychologist:

- No two children are alike, and the way every person learns will vary. Our brains are all unique, and our experiences all contribute to the different ways we learn. Psychologists have spent countless hours performing tests to better understand how children learn.

- Current and aspiring teachers need to have education to be prepared for teaching students every day. And an important part of teacher education understands different ways of learning. There are many solidified learning theories that teachers can learn from as they prepare to help students in the classroom. Teachers who **understand learning theories can use different techniques in their classroom to cater to different kinds of learning. This can help all kinds of students find success in learning.**
- There are five educational learning theories that educators can utilize to help them enhance their classroom and make it a better learning environment for all students.

### **Cognitive learning theory**

- The cognitive learning theory looks at the way people think. Mental processes are an important part in understanding how we learn. The cognitive theory understands that learners can be influenced by both internal and external elements.
- Plato and Descartes are two of the first philosophers that focused on cognition and how we as human beings think.
- Jean Piaget is a highly important figure in the field of cognitive psychology, and his work focuses on environments and internal structures and how they impact learning.
- The cognitive theory has developed over time, breaking off into sub-theories that focus on unique elements of learning and understanding.
- At the most basic level, the cognitive theory suggests that internal thoughts and external forces are both an important part of the cognitive process.
- And as children understand how their thinking impacts their learning and behaviour; they are able to have more control over it.
- The cognitive learning theory impacts children because their understanding of their thought process can help them learn.
- Teachers can give children opportunities to ask questions, to fail, and think out loud.
- These strategies can help children understand how their thought process works, and utilize this knowledge to construct better learning opportunities.

### **Behaviourism learning theory**

- Behaviourism learning theory is the idea that how a child behaves is based on their interaction with their environment.

- It suggests that behaviours are influenced and learned from external forces rather than internal forces.
- Psychologists have been working on the idea of behaviourism since the 19th century.
- Behavioural learning theory is the basis for psychology that can be observed and quantified.
- Positive reinforcement is a popular element of behaviourism—classical conditioning observed in Pavlov's dog experiments suggests that behaviours are directly motivated by the reward that can be obtained.
- Teachers in a classroom can utilize positive reinforcement to help children better learn a concept.
- Children who receive positive reinforcement are more likely to retain information moving forward, a direct result of the behaviourism theory.

### **Constructivism learning theory**

- Constructivism learning theory is based on the idea that children actually create their own learning based on their previous experience.
- Children take what they are being taught and add it to their previous knowledge and experiences, creating a unique reality that is just for them.
- This learning theory focuses on learning as an active process, personal and unique for each child.
- Teachers can utilize constructivism to help understand that each child will bring their own past to the classroom every day.
- Teachers in constructivist classrooms act as more of a guide to helping children create their own learning and understanding. They help them create their own process and reality based on their own past.
- This is crucial to helping many kinds of children take their own experiences and include them in their learning.

### **Humanism learning theory**

- Humanism is very closely related to constructivism.
- Humanism directly focuses on the idea of self-actualization.
- **Everyone functions under a hierarchy of needs.**

- Self-actualization is at the top of the hierarchy of needs—it is the brief moments where you feel all of your needs are met and that you're the best possible version of yourself.
- Everyone is striving for this, and your learning environment can either move toward meeting your needs or away from meeting your needs.
- Teachers can create classroom environments that help children get closer to their self-actualization.
- Educators can help fulfil children's emotional and physical needs, giving them a safe and comfortable place to learn, plenty of food, and the support they need to succeed.
- This kind of environment is the most conducive to helping children learn.

### **Connectivism learning theory**

- Connectivism is one of the newest educational learning theories.
- It focuses on the idea that people learn and grow when they form connections.
- This can be connections with each other, or connections with their roles and obligations in their life.
- Hobbies, goals, and people can all be connections that influence learning.
- Teachers can utilize connectivism in their classroom to help children make connections to things that excite them, helping them learn.
- Teachers can use digital media to make good, positive connections to learning.
- They can help create connections and relationships with their students and with their peer groups to help students feel motivated about learning.

## **2. The Concept of Visual Literacy**

- Being literate in the 21st century entails more complex criteria than in prior generations. More diverse expectations are being placed on students'

cognitive capabilities considering the current bombardment of non-linear demands of the technological age. As students move away from strict print reading and journey into a world of literacy that is predominantly visual, sensory and technologically loaded in other ways, visual literacy instruction is becoming paramount.

- In today's world, we use more visuals than ever before. Research suggests that the balance between words and images has shifted considerably calling for new forms of literacy (Brumberger, 2011). Visual literacy goes above and beyond the traditional concepts of reading and writing, expanding literacy to include visuals.
- To have a discussion about visual literacy, we should review what the traditional definition of literacy is. In traditional literacy, we use standard language to deliver meaning through metaphors and figurative expression. In print books, images are an adjunct to reinforce the meaning of language. What then is Visual Literacy?
- Visual literacy involves skills that we use when interacting with multi-media, and is defined by two prongs. The first prong is the ability to extract or "read" (decode) linguistic meaningful information from an image. The second prong involves the ability of the individual to produce visual representations using art elements (line, shape, color, proportion, etc.) to communicate (encode) clear messages and symbols (Piro, 2002).
- Visual literacy is therefore the "ability to understand, interpret and evaluate visual messages" (Bristor & Drake, 1994). According to Wikipedia (2011), "Visual literacy is based on the idea that pictures can be 'read' and that meaning can be communicated through a process of reading." It can also be defined as having the ability to understand and produce visual messages.
- This means a fully literate modern person is an individual who communicates successfully as both writer and designer, as well as accurately interprets and evaluates the pooled text and images in both traditional and Internet hypermedia.

### **Skills Involved in Visual Literacy**

While reading, writing and speaking will always be the mainstay of literacy; many high order critical thinking skills overlap in visual literacy. They include:



- Being able to manipulate, navigate and produce visual information to communicate a clear message.
- Having the interpretive skills to understand the complexity of imagery and its interplay with text.
- Being able to evaluate multi-media's purpose and message, emotional effect on society, authenticity and relevance.
- Having visual observational skills
- Having visual analytical skills
- Understanding symbols and symbol-making
- Making inner mental images concrete

### **Rationale for Visual Literacy in School Instruction**

Being able to use visual symbols successfully and relevantly to express an idea can clarify language confusion- both for the meaning of words in isolation (vocabulary instruction) and words in context. Integrating the words and the visual reinforce the dual process of encoding and decoding, skills essential to interpreting literacy in any form of representation

Understanding text cognitively involves multiple sensory processes, and interpreting visual imagery does too. Words or music can definitely change the connotation of an image.

It is the interdependence between reading text, sensory input and perceiving images that is the rationale for utilizing visual literacy techniques in the classroom (Duncum, 2004).

Visual literacy skills are advantageous to children's comprehension and cognitive abilities.

Integrating visual literacy strategies with traditional reading can support, scaffold, and serve as a diagnostic instrument for reading comprehension assessment and instruction.

### **Benefits of Visual Literacy Skills**

- The concept of linking technology to the learning process is based on the constructivist learning philosophy that evolved during the 1970s. The philosophy presupposes that rather than only receiving information from an

external source, children construct, compose and interact with material drawn from many stratum. In other words, learning is best achieved when participants in the process are involved in authentic tasks.

- Using media in the classroom to communicate ideas has many benefits. For students, the challenge of creating hypermedia texts, an aspect of visual literacy sometimes makes the task very motivating.
- In classroom research done by Garthwait (2001), students using a basic hypermedia program found integrating sound and color into their text exciting, and helped them to organize their information more successfully.
- Students were inspired by the freedom of innovation, enabling them to independently experiment and maneuver language and graphics seamlessly tying together words with images.
- The role of producing these projects helped students to learn visual literacy skills along the way.
- The arts and imagery can be the “great equalizers” since children of many different backgrounds, abilities and attitudes can participate in a learning activity embedded with multiple forms of communication.
- Many times, Learning Disabled and At Risk students have significant breakdowns in areas of metacognition and strategic processing; causing a lack of awareness or misunderstandings that can snowball and escalate confusion about a story (Gersten, Fuchs, Williams & Bates, 2001). Imagery can make language come to life like a movie or document story actions and happenings more clearly.
- Even the use of colour can influence or evoke emotional response to a story and imply calmness or excitement.
- Images are powerful means for achieving individual and collective consciousness. Visual literacy involves problem solving and critical thinking and these can be applied to all areas learning.
- Visual education provides the foundation for understanding and evaluating aesthetic intention and artistic skills. It also enables students to be more resistant to manipulation by visual means.

### **Teaching implication**

- Enables the development of critical thinking skills in relation to visual images.

- Enhances verbal and written literacy skills and vocabulary to be able to talk and write about images.
- Introduce image production, manipulative techniques and software to preservice and in-service teachers.
- Integrate visual literacy across all curriculum areas
- Ensure a balance of visual and textual literacy in the classroom
- Be aware of visual literacy principles in the design of teaching and learning resources.

### **3. Education Resource Centre**

Educational resource centre refers to a self-contained environment designed to promote individual or small group learning around a specific task. It is an environment or a structure that is specifically designed to store, organize and allow for the use of instructional materials by any user for the purpose of bringing about learning. A learning resource centre is therefore a laboratory of an educational

technologist as well as the place where instructional materials are kept and maintained.

The main objectives of establishing a resource centre include:

- To pool, produce, organise, maintain, and provide services of the various types of material resources related to the teaching-learning process. The centre should be able to engage in activities focused on production of teaching/learning materials; acquire instructional materials from various sources; acquire the needed information, knowledge and skills from various sources.
- To conduct and help in the organisation of various types of activities related to knowledge and application of educational technology for the benefit of the students and the teachers.
- To conduct and help in the organisation of training to help teachers and students acquire knowledge, information and skills related to educational technology for improving the processes and product of education.
- To work as a centre for the dissemination of information and knowledge related to the development and application of educational technology.
- To work as a motivating and inspirational source for the development and application of educational technology.
- To work as a coordinating agency for the development and application of educational technology among the resource centres at the local, regional and national levels.
- To have provision of extension services to the community in extending application of educational technology aiming to spread the fruits of education among the masses.

### **Organization of the Resource Centre**

Since educational technology has a significant role to play in a school setting, the organisation of the Resource centre must occupy a prominent place in the planning and scheduling of the school management. For example:

- It should be centrally located to provide access to the classrooms and subject related instruction.

- It should have adequate space with essential furnishing and accommodation for the essential services to be carried out with ease.
- An adequate budget should be allocated for the purchase of resources and equipment.
- There is need to establish a management team to manage the centre in order to assist the centre achieve its mandate.

### **Basic Concept of a Resource Centres**

Resource Centres represent a starting point for all movements and activities towards the implementation of effective teaching and learning methods. Teaching and learning resource materials involve integration of equipment, materials, ideas, methods and the contribution of expertise, knowledge and training available. Resource centres have the following characteristics:

- (a) Physical facilities. Resource centres must have the best physical facilities to become the best resource centre. However, the determining factor is dependent on the financial and non-financial capabilities of the school.
- (b) Variety of information (printed and unprinted). Resource centres should have a complete collection of printed and unprinted information inclusive of facilities to surf the Internet to search for information. A complete collection helps to achieve the general objective of resource centres which is to provide the best facilities for the teaching and learning process as well as for recreation.
- (c) Efficient management. Resource Centres must be managed systematically in order to become the best place to find information. For example, books arranged in a resource centre usually follow the Dewey Decimal Classification to make searching easier. To ensure the management system runs efficiently, resource centres should have a central committee chaired by the headmaster or principal.
- (d) Trained media personnel. Media personnel working for a resource centres need to have undertaken one of the following courses to enable them competently provide required services within the centre:
  - i) Degree in Library Science or Information Analysis;
  - ii) Course on Library Science;
  - iii) Course on Resource Centre Management;

- iv) Basic Course on Resource Centre Management
  - v) Intermediate Course in Resource Centre Management.
- (e) Various types of services. A well-managed school resource centre will provide services to assist in the teaching and learning process. However, the type of services depends on its financial capability and physical as well as expert workforce. The four basic requirements needed for a school resource centre are:
- (i) Library services;
  - (ii) Internet surfing services;
  - (iii) Audio video services; and
  - (iv) Teaching aid services
- . Support services provided are:
- i) Recording services and studio;
  - ii) Photographic services; and
  - iii) Printing services.

### **Models/Forms of Resource Centres**

- Classroom learning resource centre.
- School learning resource centre.
- Community learning resource centre.

### **Materials at a Resource Centre**

Teaching resources can be categorised into two main components, namely, human resources and non-human resources. When the two are optimised, effective teaching is created. Non-human resources in education technology are:

- a. Printed matter such as books and magazines;
- b. Information from cyberspace such as from the Internet;
- c. Audio systems such as audio tapes and discs;
- d. Non-projectable images such as charts, photos, maps and three dimensional models;
- e. Projectable images such as transparencies, OHP and movies;
- f. Video systems such as television.
- g. Community resources

- Teaching materials have since increased in type and form (or media) that has become increasingly sophisticated. It follows that these resources would need a place that can manage their usage in the process of teaching and learning. This special place is called a resource centre.
- School resource centres need to emphasise on learning concepts and the search for knowledge from the simple to the complex. Intellectual appreciation found in resource centres need a combination of systems to run consistently and consciously during the teaching and learning process. School resource centres provide the best venue for stimulating opportunities for students to enhance effective learning. Resource centres train their users to evaluate and to think positively, imaginatively, efficiently and effectively while inculcating courage to face challenges towards producing knowledgeable and progressive human resources.
- School resource centres and the resources contained within them were created to fulfil the need and to maximise exposure to information and material to the user. In a world full of information, teachers are no longer the only source of knowledge in the teaching process. Resource-based teaching is now a concept that utilises all efforts by teachers to use the teaching resources to equip their approach and strategies towards encouraging students to learn. Resource materials can also be categorised into teaching or learning materials, printed or unprinted.
- Resource materials such as books, documents, newspapers, charts and models, photos, media, tables, maps, slides, films, video tapes, television, media multi-kits and other objects that can be found in our daily lives contain knowledge, captivate attention or encourage teachers to teach and students to learn.

### **Management of a Resource Centre**

Managing is a social process that can produce positive effects in building an organisation. A manager is responsible in leading an organisation towards relevant decision-making in order to create effective resources. Administrating and

managing is a process that integrates management factors of manager, materials, manpower and money.

### **Management Factors (4M)**

#### **(a) Manager**

Managing is the most important aspect in establishing an effective resource centre and achieving its objectives. A school resource centre manager does not only have to manage academic materials in the resource centre by collecting, storing and distributing printed and non-printed materials.

A resource centre coordinating teacher manages the resource centre. He also has to manage the infrastructure, services and manpower so that the centre runs smoothly on its intended course. Various patterns and ways of management can be practised by the manager according to current needs and demands.

#### **(b) Material**

A good resource centre must produce relevant, up-to-date teaching and learning materials. The centre's manager must have a working knowledge of materials and equipment needed in a resource centre. These materials must be well-kept to avoid damage. They must be arranged and stored in good condition.

Therefore, a well-managed and effective school resource centre not only has a collection of good and current materials, but also stores its collections and materials well and provides easy access to materials, collections and equipment for its users.

#### **(c) Manpower**

A resource centre with well-managed human resources could provide good service to its users. Thus, human resources are very important in resource centre management. A resource centre needs trained personnel. Although a resource centre might have enough manpower, lack of skill and unequal distribution of work not based on specialisation would cause human resources to be poorly managed.

A resource centre's workforce is divided into two categories: professional and support. The professional workforce consists of media experts. They are trained, knowledgeable and skilled in matters regarding media and education. They hold the



posts of specific room's coordinator like audio-visual coordinator, teaching aid coordinator, library coordinator and so on.

The support workforce comprises the junior general assistant, clerks and media assistants. They assist in tidying up the library, cataloguing resource materials, clerical work and so forth.

#### (d) Money

Money is an important factor in a successful organisation. Financial management encompasses the process of making and spending money. A good manager must think of ways to make and manage money. In managing a resource centre, a manager must know the financial source and allocation total provided for schools.

Besides the allocation, a good manager must also find other financial sources. However, a large amount of financial sources would still not be enough if there is no proper financial management. Instead, it will result in wastage. Therefore, a resource centre manager must think of appropriate ways to utilise the money. A school resource centre has to be managed well to make it a knowledge powerhouse. It collects, stores and disseminates information effectively. Among the requirements for a well-managed resource centre are as follows:

- a) The manager must prepare the centres authority file, filing system and desktop file;
- b) The centre must be systematically and effectively managed using the latest technology;
- c) The centre must be in a strategic location so that it is easily accessible to its users;
- d) The centre must have relevant, interesting and up-to-date collection of resources;
- e) The services employed by the centre must be used optimally;
- f) The centre must plan and carry out various activities to attract users; and
- g) The centre must be able to attract the cooperation of outside communities in terms of usage and contribution.

### **Steps in Managing a Resource Centre**

There are several necessities or steps that must be taken in managing an effective resource centre. They are:

a) Resource Centre Organisation In managing an effective resource centre, a manager has to construct and establish a Central Committee, Working Committee and Prefect Committee for the centre. The organisation in setting-up a resource centre Prefect Committee has to follow a hierarchy. The division of work in the organisation must be clear so as to avoid overlapping of job specification.

i) Resource committee

- It has three sub-committees; central committee, workforce committee and prefect or assisting committee; and
- All three work as a team to build the best school resource centre.

ii) Central committee

- This committee makes all the decisions and designs important policies in the management of the resource centre.
- The principal is the chairman, the Senior Assistant 1 is the vice-chairman and the school resource centre coordinator is the secretary.
- The committee members comprise of senior assistants, senior subject teachers and the PTA representative.
- In order to deal with the needs and weaknesses of the resource centre, the committee must carry out periodic meetings each month.
- In general, the responsibilities of the committee are as follows:
  - Plan and implement the resource centres objectives and policies and use them as guidelines in every action taken.
  - Prepare a sufficient yearly budget so that the centre could provide excellent service to the school community.
  - Distribute sufficient financial allocation to every division of the committee. Enough financial allocation would allow the division to operate optimally.
  - Accept, assess, study and approve programmes related to the school resource centre.

- Prepare and present the annual report to the administration stating the progress and weaknesses of the school resource centre.
- Efficiently manage the services of the school resource centre and strive to make it satisfying for its users in terms of quality and service.

### **Financial Management**

A good resource centre manager must be able to manage finance well and efficiently. The main thing regarding finance that needs to be known by a resource centre manager is its source. The financial source of a school resource centre includes grants from the government as well as donations from well-wishers.

The resource centre coordinator must be skilled in filling in and understanding information in the cash book. In this way, he would know the total earnings, balance and would be able to come up with the Resource Centre's annual estimated budget. A resource centre coordinator also has to prepare the budget estimate by the end of each year, for the following year. For valuation purposes, the estimated budget has to be checked after six months. It is also discussed in the resource centre's working committee meeting for better results. Things that must be discussed include:

- i) Current and future needs.
- ii) Type of material or equipment that has to be purchased.
- iii) Estimated cost of RCÊs projects and activities.
- iv) Estimated cost of equipment maintenance.
- v) Estimated cost of decoration, stationery and others.
- vi) Compare the current estimated budget with the year after's.

### **Asset Management**

Asset management means to manage stock and inventory, but for a resource centre, asset refers to the ways stock and inventory is managed in the resource centre. Asset management aims at improving the level of government property or asset. In managing asset, capital asset, inventory and office supplies are three things that can be updated. This asset involves four types of forms:

- i) Capital Asset Schedule
- ii) Inventory Schedule

- iii) Office Supplies Stock Schedule
- iv) Capital Asset and Inventory Movement Schedule

### **Managing Records, Charts and Schedules for the Resource Centre**

For the purpose of good management, the resource centre needs to store and update all material acquisition record, material borrowing record, material use record, related charts and schedules.

Types of record needed include:

- i) Book acquisition record.
- ii) Non-book material acquisition record.
- iii) Newspaper acquisition record.
- iv) Magazine acquisition record.

### **Managing Activities**

Management duties of a resource centre manage are:

- i) Managing meetings and briefings.
- ii) Managing courses or workshops.
- iii) Managing competitions.
- iv) Managing staff development programme.
- v) Managing RC orientation programme.
- vi) Managing academic visits.

### **Managing a resource centre development plan**

In planning the development of RC, we need to prepare:

- i) Short-term strategic plan or blue print (1 year).
- ii) Long-term development plan (3 to 5 years).

Things that must be included in planning are:

- i) Physical planning.
- ii) Developing book and non-book collection.
- iii) Skills practice for students and teachers.
- iv) Types of services.
- v) Activities that need to be prepared.
- vi) Financial implication or estimated budget.
- vii) Re-evaluation.

Managing the physical facilities and decoration of the school resource centre

Managing physical facilities and decoration of RC like:

- i) Rearranging and renovating racks, furniture, as well as equipment according to the space needed.
- ii) Labelling and displaying guidelines.
- iii) Displaying regulation and guide for information search.
- iv) Placing posters, pictures and charts in suitable places.

Evaluation and action research:

- i) To study how much of the aims and objectives of RC were met.
- ii) To identify the source of weakness and strength of RC.
- iii) To obtain feedback and information that can assist in improving the RC organisation.
- iv) Use a checklist to identify what has not been acted upon.

#### **4. Media and Distance Education**

##### **Distance Education**

- Distance learning is a form of education in which there is physical separation of teacher and student.

- There is no physical contact between the two and the students are not required to be together at the same time.
- It is conducted without the students needing to attend class or college, so no physical presentation at a school. It is mostly carried out remotely by using electronic communication.
- It is less expensive compared to other modes of learning and is not constrained by geographical consideration.
- It can be described as a mode of education that is received at another geographical location.

### **Forms of Distance Education**

Worldwide there are many types of distance learning courses, which include;

- Synchronous
- Asynchronous
- Hybrid distance learning
- Computer based distance learning
- Fixed time online courses
- Open schedule online courses

#### Synchronous

This is learning by either chatting online, teleconferencing or sitting in a classroom when teaching and learning is taking place. This kind of distance learning offers less flexibility and affects the students life because they have to sit at a scheduled time and concentrate for a given period for teaching and learning to take place. In this form of distance education, learners take part in learning activities simultaneously with their instructors and fellow students. This leads to interaction between learners and other students and also between the students and the instructors in the process of teaching and learning. This kind of learning facilitates instant feedback from both instructors and learners and it also motivates Learners to ask question about any information that is not understood and also participate in discussions. It is usually suited for degree programs that require communication and demonstration such as nursing, counselling psychology and general education.

#### Asynchronously

This is type of distance learning in which learners access course materials flexibly on their own schedules, that is learning occurs at a significantly different time from when the real teaching and learning process was taking place. It allows access to learning materials at anytime, anyplace and at the convince of the students. Learners choose if and when to participate. This time flexibility gives the students the opportunity to think, research, reflect, formulate and back up their ideas and thoughts before giving feedback since immediate response is not necessary. Also global communication and participation is available at the time convenient to learners around the world especially where learners come from different countries.

#### Hybrid distance learning

This is a combination of synchronous and asynchronous learning in which learners are required to be available at fixed time in the internet chatroom or classroom but are allowed to complete assignments at their own pace and submit them online. This are courses in which some traditional face-to-face learning has been replaced by online activities. This web-based activities are introduced to complement face-to-face learning activities but not to replace it entirely. This form of learning takes advantage of the best features of both face-to-face and online learning so as to reinforce, complement and elaborate each other, instead of treating the online activities as add-on or duplicate of what is taught in the classroom. For example in cases where;

The instructor lectures and facilitates class discussion in the face-to-face classes, students complete online assignments based on these classroom activities, then these online assignments are posted to discussion forums foe online discussion.

An instructor places lectures online using voiceover PowerPoint or streaming media for students to review, then in class students use these online materials to engage in face-to-face small group activities and discussions.

Students prepare small group projects online, post them to discussion forums for debate and revision, then present them in the face-to-face class for final discussion and assessment.

#### Open schedule online courses

This is a type of distance learning which gives learners maximum freedom since they do not have any scheduled classes. It provides students with mailing lists, e-

mail, internet-based textbooks and bulletin boards to finish their assignments. The students are provided with a schedule in the beginning of the course but are allowed to work at their own speed as long as they stick to the schedule. These courses are aimed at unlimited participation and open access through the internet. In addition to traditional course materials such as filmed lectures and readings they provide interactive user forums to facilitate interactions among learners and instructors. Some of these online courses offer open access features such as open licensing of content to ensure maximum use of resources while others use closed licenses for their course material but maintain free access for their students.

**Correspondence Learning** - with correspondence learning, you receive your textbooks, study guides, assignments and other study materials via post. You work through these materials in your own time and at your own pace depending on the situation through which you wish to study your course. You may be able to ask a tutor or instructor for help via email, telephone, instant messaging or post.

**Computer based distance learning** - Here students are to meet at a specific computer lab or in a classroom at a designated time each week; Internet chat with teacher is the mode of learning.

### **Media and Distance Education**

Due to the aspect of physical separation between the teacher and students in distance learning, media plays a pivotal role in enabling education be accessible to learners. Since one doesn't have to go to class to learn, use of media in distance learning has made education personalized. Students learn better when education address their needs, and education has become more interactive since social media has taken its part in education especially distance education. Through some forms of media, document can be accessed online and education has become accessible in distance learning. Education is cheaper with distance learning because of technology. You can take classes online and find appropriate information in the internet. Distance in distance learning has been addressed and now distance is not a limiting factor to education at all. With technological advancements, access to distance learning has tremendously improved. Specific instances include:



(a) **Social Media:** After class ends most students prefer to stay connected and they have embraced Social media and use it to empower themselves to communicate and learn. Instructors can also be members of for example a WhatsApp group or Facebook group for the purposes of learning and passing instructions.

(b) **Online Polls;** this is another technology helping instructors to survey students' knowledge opinions that can in turn teaching strategies. Although students and instructors are not meeting face to face technology helps them to benefit from seeing opinion. This improves honesty and transparency that in turn provokes online discussions that are interactive.

(c) **Web conferencing;** technology has really revolutionized distance education in modern world, web conferencing for students collaboration is another technology that is being used more frequently in distance education. For example Google, hangouts are interesting because it is a free web conferencing where up to 10 students can interact at once while working simultaneously on a document. This can help working on projects on distance learning platform.

(d) **Teleconferencing:** is another example that is giving students flexible schedule as opposed to traditional modes of education.

The above examples describe the role of technology in distance learning. Technology has created paradigm shift in education since the walls and boundaries have been eliminated by technology. Now phone calls, social media and other modes of communication have been translated into learning tools hence making education easy, affordable, flexible and accessible no matter the distance.

**Creating a global platform:** no longer confined to a single platform, education aided by technology has crossed borders and continents. Several institutions are now offering online courses that can be accessed by students across the globe. Video conferences and applications like Skype have created a global platform of teachers and students who can share knowledge in an easy and convenient manner.

**Efficient assessment:** More and more institutions have now digitalized the assessment process. Students can now take online tests that allow them to immediately assess their knowledge base. They are very flexible and impartial. The students can take online tests based on his/her availability. This has especially helped students who pursue distance or correspondence courses.

**Improve student-teacher interaction:** Teachers are now using technological aids to keep in touch with their students. Teachers remain in constant touch with their students through email and services like drop box that allow you to upload and share content with a large number of people

**Addressing students diversity;** an assortment of various educational tools, a audio/visual stimulus and animations, e-learning modules appeal to students with different learning styles. Some students do not respond to classroom learning which has often been termed as “boring” and unimaginative. Such students are effectively lured into studying through digital aids which provide a perfect blend of fun and learning.

**Use of Multimedia;** Technology and media have positively impacted the field of education. Use of animation, videos, multimedia aids by making it more engaging, fun and entertaining.

**E-Books;** Online libraries and eBooks are now in vogue. We can take the goggle project as an example. Goggle has been working with publisher and libraries to create a unique online library that’s comprehensive and virtual. Features like goggle books provide snippets of a large of books, thus bringing together new books and publishers to the reader.

## **5. Pedagogical Integration of ICT**

The impact of technology in our lives, today, is unmeasurable. We use technology every day, in different ways. But what we are used to call modern technology, technically it is not as new as we think. For instance, if we have a great smartphone today we can figure out that it is just an advancement of an ordinary mobile phone that we had years ago. Or look at a train today – we used to use steam powered trains and now we have electronic trains – just to get faster to some place. The technology evolves, but it finds old ways and old technologies to evolve. We use technology every day, in order to fulfil specific tasks or specific interests. We have specific needs and we want to have faster technologies.

### **Definition of Terms**

- i. **Technology:** The theory and practice of design, development, utilization, management and evaluation of processes and resources for learning.
- ii. **Technology Integration:** Use of any technology tool e.g. CD ROMs, Internet, e-learning etc. to assist classroom instruction (teaching and learning).
- iii. **Information Communication Technology (ICT):** refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums.

In the past few decades, information and communication technologies have provided society with a vast array of new communication capabilities. For example, people can communicate in real-time with others in different countries using technologies such as instant messaging, voice over IP (VoIP), and video-conferencing. Social networking websites like Facebook allow users from all over the world to remain in contact and communicate on a regular basis.

Modern information and communication technologies have created a "global village," in which people can communicate with others across the world as if they were living next door. For this reason, ICT is often studied in the context of how modern communication technologies affect society.

## **Benefits of Technology in the Classroom**

### **1. Helps Instructors Personalize Education Experience**

A PBS teacher survey found that teachers like and support technology in the classroom. Tools like websites, apps, learning games, e-books, and virtual tutoring help the student learn at their own pace. Digital materials can support classroom learning topics, and introduce different teaching methods for each student's unique learning needs.

### **2. Instant Access to Knowledge**

The Internet gives students instant access to answers beyond what's in their textbooks. In fact, today's kids are already familiar with "Googling-it" to find answers to questions. The gift of the internet to the classroom gives teachers the

chance to give their students a holistic view of any given subject while still giving students the guidance to find the right sources. In-classroom internet research gives teachers the opportunity to teach their students how to assess the quality of the information they find online while removing the one-sided restrictions of a textbook.

### **3. Student Preference**

A study by Educause found that students prefer to have technology integrated into their curriculum. Computers, tablets, smartphones, and the internet are the same tools that they use at home. Students are already comfortable using these tools to connect with other students, their instructors, and their institution. In fact, the Educause survey found that 54% of students would typically use at least two devices simultaneously for school work.

### **4. Student Workplace Readiness**

One of the greatest benefits for technology in the classroom is student workplace readiness. Mobility is currently the next great movement in the workplace, and students who use technology in the classroom today will be more adapted to using it in the future. The importance of technology in the classroom goes even beyond simple digital literacy: it promotes workplace soft skills like critical thinking, independent research, and cross-technology proficiency.

### **5. Supports Blended Learning**

The Educause survey found that 75% of students currently have experience with blended online/on premise learning. This offers several benefits, including a cost reduction for some schools. Blended learning programs often use e-textbooks to allow their students to have unlimited access to their learning material. Blended environments also support online submission of electronic documents, cutting school costs on paper and other materials. Cost-benefits aside, students say that they enjoy the benefits of blending both online and in-class learning styles.

### **6. Teacher Support**

A 2013 PBS LearningMedia study found that 74% of teachers agree that technology enables them to reinforce their lessons. Curriculums, learning trends, and student engagement can rise or fall on the basis of teacher support. Technology in the classroom would never flourish without the support of instructors, and an overwhelming percentage of teachers are eager to use even more technology in the classrooms. Huffington Post found that, “78 percent of Kindergarten through Middle

School teachers agrees that technology has had a positive impact on their classroom — and that's just the start."

### **7. Proven Student Engagement**

An article by the National Math and Science Initiative shows that blended learning styles keep students focused longer and makes them more excited to learn more, especially for STEM (Science, Technology, Engineering, and Math) subjects.

### **8. The Information Highway**

Any answer to any question can be found with a few clicks of the keys on the computer or smart phone. Powerful search engines allow an organized and simply way to find the answers that students may need for assignments or projects.

### **9. Broaden the Mind**

Before the internet, children knew what their family taught them. This caused their political and religious views to be the only ones that the children knew. Having access to the technology will expose them to things outside of their parents' interests and help them to form their own opinions.

### **10. Brings Some Fun into the Classroom**

Learning the same exact way from the same person every day can really get... boring. This boredom turns into a lack of motivation in the students. When they are able to integrate computer learning into their normal schedule, they become much more excited to learn.

## **Disadvantages of Technology In Education**

### **1. Access To Inappropriate Content**

The biggest concern when it comes to the use of technology in schools is how easy pornographic, violent, and other inappropriate materials can be accessed and viewed. This could cause big problems if the material is shared with other students while in the classroom.

### **2. A Disconnected Students**

This harmful effect of technology has already come to light in today's world. People are attached to their screens almost 24/7, which is causing an entirely new set of social issues to pop up. This translates into the school system in a bit of a different way, however. More and more students are experiencing social anxieties when it comes to face to face interactions, but are perfectly fine socializing online.

### **3. Cyberbullying Trap**

Giving students access to anonymous accounts and endless contact avenues can only lead to trouble. Cyber bullying has become a real and in our face problem among young people today. This harassment has no end, which includes the classroom. There is also no way to monitor or discipline students who are involved.

### **4. Inevitable Cheating**

While having an easy access to information may seem like a great thing, it can become a real problem in a test taking environment. Cell phones have made cheating easier than ever. You no longer have to figure out how to write all of the answers down, you can just look them up!

### **5. A Major Distraction**

Attentiveness drops drastically in the classroom when students have their cell phones or other technologies out. The focus shifts from their teacher and education, to whatever they are looking at, playing, or doing on their phones.

## **Types of Technology used in the Classroom**

**1. Use of computers in the classroom:** Computers have evolved and they have changed the way they look and the way they function. Now days we have both desktop computers and portable computers commonly known as notebooks or laptops. New technologies have also emerged and birthed some new computer related gadgets like the iPad or Galaxy tablet. These computers can be used by teachers to assign work to students and study groups in a classroom. Also teachers can use computers to illustrate visual related subjects which help students to learn easily. Modern computers come with installed applications which can help students study well. For example, students can use internet explorer to search the internet, they can use word processing application to write notes. Teachers can also help their students to learn complicated applications on these computers as a way of making it easier for students to learn and also make the teacher's job easier. Computer programs that can be readily used include:

#### **i. PowerPoint and Excel**

- **PowerPoint** is a technology tool that's exceptionally easy to use in the classroom. All kinds of research projects can be adapted to this application.

- If a teacher has experience, presentation skills also can be emphasized. Besides standard presentations, such as slide shows, projects may be presented in an interactive way, using a game show format, for example.
- A student I know created "Millionaire Muslim Style," using a popular game show format to present facts about the Muslim religion. It was fun and everyone learned the information."
- **Excel** is another easily adaptable application. Charts and graphs are a natural with Excel.
- This application can be used to tally results for any kind of question. Elementary students can enter results, create graphs, and compare and contrast their results.
- The natural graph structure of Excel can be used to create game boards or patterns.
- "Calendars or timelines also are easily created with Excel. The database capabilities of Excel allow easy sorting and classifying of information.
- Spreadsheets, such as those created in Excel, also can be used to chart different observations.

## ii. Word Processing

- Word processing is a standard application available in almost every school. A word processing program can be used for desktop publishing; to create newsletters and magazines, advertisements and flyers, even business cards.
- The drawing tools included in most word processing programs can be used to create pictures and logos, puzzles and more.
- Stories can be illustrated. Cookbooks can be created with imported graphics or custom illustrations.
- HTML conversion utilities can be used to create Web pages from word processing documents. At the same time Interactive documents can be made with the use of hyperlinks.
- Word processing features, such as tracking and commenting, facilitate collaborative projects.
- Tables are useful for collecting data and recording information. If a word processing program was the only application available, a teacher could have a technology-rich classroom with little effort.



**2. Creating class websites and blogs:** It is very easy to create a website or blog using WordPress or any other content management software. Teachers can create class blogs where they post assignments. If the school has no website server to host these class blogs, the teacher can use free website hosting services like wordpress.com or blogger.com. Via these platforms, the teacher will create a blog under a sub domain of that host. For example, **matchclass.wordpress.com**, so students will find all academic assignments via that blog. It is very easy to manage and post data to a blog, because they have simple HTML editors.

**3. Use of digital microphones in the classroom:** Big classrooms are characterized by endless noise, so teachers can resort to these wireless digital microphones. The microphone will transmit the voice to the loud speakers and every student will hear their teacher clearly. This helps the teacher not to strain their voice while trying to explain points to their students. These digital microphones are not too expensive so even a small income generating school can manage to buy a wireless microphone for every classroom. Also students can use the same microphone when asking questions to their teachers in class, or when they are explaining a subject to their fellow students during a classroom debate.

**4. Use of mobile devices:** Teachers and students can use smart-phones for academic purposes in the classroom. Mobile learning is becoming so popular. It is similar to e-learning or long distance education. Though it's based on mobile phones. M-Learning is convenient because it is accessible from anywhere. Mobile phones are very light yet they can also have the same application a simple PC can have, a student can access academic information like assignments via an educational mobile application (APP). Teachers can tell their students to use mobile apps like "[PIAZZA](#)" to access course materials and also to post questions about specific subjects, all this can be done in the classroom or outside the classroom.

**5. Use of smart interactive Whiteboards:** Modern smart white boards have a touch screen functionality, so the teacher can illustrate points using a pen or their finger. Using a projector, teachers can display visual images on these white boards which improve the learning process. Students will learn more easily with visual images. Also students can use a white board to draw, write or manipulate images. Smart whiteboards come in various sizes, the wide ones are better, because they can show a larger image and can also be used by two students at a time. Most of

them are electronically powered, so they can be switched on with a button, and they can also save teachers work for later use.

**6. Use of online media:** Teachers and students can both use online streaming Medias to learn in the classroom. With the aid of a projector, computer, internet and a white board, a teacher displays a real-time example using sites like **Youtube.com**. This website has videos which can be used for academic reference. “Let’s take a simple example on how a Geography class can use technology. Teachers can explain volcanic activities and its impacts on the environment using live stream YouTube videos about the subject. This type of illustration will attract the student’s attention and they will learn easily.”

**7. Use of online study tools :** Online study tools like “Dynamic Periodic Table” ([ptable.com](http://ptable.com)) which can be used by Chemistry students in keeping elements apart , “Foldit” ([fold.it](http://fold.it)) this tool can help biology students easily understand basics about proteins. “Mathway” ([Mathway.com](http://Mathway.com)) this helps math students solve math challenges, students can simply select a subject and hit solve, the equation will be solved by the tool. All these academic tools can improve the way students learn.

**8. Use of digital graphic materials such as calculators, camera:** These are available in most PCs or mobile phones or can be downloaded and used by the teacher and students

### Theories of Technology Integration

ICT integration is guided by three theories of technology namely; the instrumental theory, the substantive theory and the critical theory of technology. Basing on these three theories, a clear understanding of this study can be realized.

#### a. Instrumental theory of Technology

- The instrumental theory states that technologies are purely machines aiding man to accomplish tasks that would never be done or done little in their absence.
- This view according to Feenberg (2002) limits our thinking within the box to believe that technologies are only instruments such as computers, telephones, TVs, etc. and they must be commanded, directed and decided by their creator.

- Though such a view might have some truth in it there is still more to ask; For example, why is it that when computers fail to function or in case of internet disconnection 'the creator' has no choice except to bow and obey?
- Instrumental theory in this regard is based on the common sense idea that technologies are "tools" standing ready to serve the purposes of their users (p. 5).
- Therefore it is deemed "neutral," without evaluative content of its own.

**b. Substantive theory of technology**

- Substantive theory believes on the view that technology is not simply a means but has become an environment and a way of life.
- It argues that technology constitutes a new cultural system that restructures the entire social world as an object of control.
- Therefore this theory leads us to another level of understanding what technology has to offer in addition to the instrumental theory.

**c. Critical theory of technology**

- Critical theory advocates that technology must cross the enormous cultural barrier that separate the heritage of the radical intelligentsia from the contemporary world of technical expertise.
- It must explain how modern technology can be redesigned to adapt it to the needs of a freer society (Feenberg, 2002).
- Further, critical theory of technology is not a thing in the ordinary sense of the term, but an "ambivalent" process of development suspended between different possibilities. This "ambivalence" of technology is distinguished from neutrality by the role it attributes to social values in the design, and not merely the use of technical systems.
- On this view, Feenberg advocates that, "technology is not a destiny but a scene of struggle. It is a social battlefield, or perhaps a better metaphor would be a *parliament of things* on which civilization alternatives are debated and decided". (p. 11).

- In his discussion of how critical theory of technology is to be realized in a re-written "technical code," Feenberg highlights two additional features of his critical theory that are particularly helpful.
- The first is the need for the theory to inspire action that changes technology for the better, hence the need to rewrite the technical code, to make social objectives such as justice "engineering objectives".
- The second is the need to stop seeing technology as separate from people, to view the human subject, instead, "as bodily subject and member of the community in the life of the objects [technologies.]"
- These two tenets of the critical position are important distinguishing features of arguments in computers and social work, which take a substantive position and those that take a critical position.

### **ICT Integration in Secondary Education in Kenya**

ICT integration in secondary education in Kenyan schools appears to be a relatively new area of research though computers were introduced to Kenya in the 1970s and the Internet became available in 1993 (Wanjira, 2009). However, available empirical data suggests that computer use in this sub sector in the country dates back to April 1983 when one of the earliest computer deployment projects in the sub sector, the Computers in Education Project in Kenya (CEPAK) was launched in a secondary school in Nairobi with funding from the Aga Khan Foundation (Wambui & Barasa, 2007). According to these researchers, the program was subjected to both in-house and external evaluations in the succeeding two years, with the outcome culminating into an additional funding from Apple Inc., the International Development Research Centre (IDRC) and the Rockefeller Foundation. From their proceed, a three-year Phase II of the program was launched in mid-1986 incorporating additional five secondary schools (both private and public) distributed throughout the country. Each school received computers, computer software and teacher training and the innovative project studied and evaluated by an independent research team made up of three educational researchers (Makau, 1990). The evaluation found that most computer-assisted lessons were in Mathematics and the sciences and a majority of teachers tended to be passive during the computer-assisted lessons, thus leaving students to do whatever they chose.

The second major research project in ICT integration was undertaken in November 2002 using 69 secondary schools sampled from 46 districts of all provinces within the country (Keengwe & Onchwari, 2008). The findings showed that only 46.4% of the sampled schools had computers although there did appear to be a high level of awareness of the benefits of computers in schools, Internet and fax were rare, that E-mail was yet to be recognized as a tool for collaboration among teachers, that only one school had a website and only two reported having networked all their computers to the Internet. Specifically, the study asserted that access to the Internet was severely limited and when available, was only for administrative use

The New Partnership for Africa Development (NEPAD) e-school initiative launched in 2005 with the aim of integrating ICT in the delivery of education curriculum at secondary and primary school levels to improve access, quality and equity in education in Kenya is probably one of the models of cooperation between the government and the private sector players (MOE, 2006). In an attempt to create model centres of excellence in ICT education for other schools to copy, pilot schools were fitted with the necessary ICT infrastructure which included computers, e-materials, internet appliances and trained personnel (Eyoh, 2007). To gauge their success as centres of excellence, a number of researchers have carried out surveys on their contribution in enhancing ICT integration in teaching and learning. For instance Ayere, Odera and Agak (2010) in a comparative study of the application of e-learning in NEPAD and non-NEPAD schools in Kenya identified significant differences in levels of integration of ICT in curriculum subjects. However, Ogutu (2010) reported that though both students and teachers in these schools were found to have developed a positive attitude towards the use ICTs and related accessories in the teaching/learning process and that though the schools under study were already using educational management software for various processes carried out in the schools, there were challenges they still faced. Notable challenges according to the researcher, included lack of funding to support the purchase of the infrastructure to improve access to educational materials, lack of training for teachers to adopt ICT as a teaching tool and lack suitable e-content for various subjects.

### **Factors Affecting ICT Integration**

Various factors have been shown to have an effect on ICT integration into the classroom teaching and learning experience. This review considers effects of teachers' characteristics, effects of institutional characteristics, effects of technology and lastly organizational factors.

### **Teachers' Characteristics and ICT Integration**

A teacher's personal characteristics such as educational level, age, gender and teaching experience has been said to influence the adoption of a technology (Schiller, 2003). Studies concerning teachers' gender and ICT use have cited female teachers' low levels of computer use due to their limited technology access, skill, and interest (Volman and van Eck, 2001) though the situation was found to be different in mid-western US basic schools where Breisser (2006) found that females' self-perceptions about technology competence improved while males' self-perceptions about technological dominance remained unchanged in a lego-logo project.

Age of the teacher as a factor has also been shown to relate to computer use though Lawless and Pellegrino (2007) felt that there is no evidence to support this conclusion. However, Lau and Sim (2008), on their part in a study on the extent of ICT adoption among secondary school teachers in Malaysia revealed that older teachers frequently used computer technology in the classrooms more than the younger teachers which is supported by Russell, Bebell, O'Dwyer, and O'Connor, (2003) who found that new teachers who were highly skilled with technology more than older teachers did not incorporate ICT in their teaching with the reason being that either new teachers focus could be on how to use ICT instead of how to incorporate ICT in their teaching. Alternatively, they felt that new teachers could be experiencing some challenges in their first few years of teaching and therefore spend most of their time in familiarizing themselves with school's curriculum and classroom management at the expense of ICT integration.

In terms of teachers' educational background, Alazzam et al (2012) found that based on Pillai's Trace test there is no significant effect of teachers' educational background on their overall readiness to integrate ICT in teaching. Similarly, a study conducted by Teo (2008), showed that teachers' level of training had a significant

effect on their ICT skills and resulted in the effective use of ICT in classroom teaching. Other studies have also highlighted the role of teaching experience on ICT integration (Wong and Li, 2008; Giordano, 2007; Hernandez-Ramos, 2005). Gorder (2008) for instance is categorical that teacher experience is significantly correlated to the actual use of technology.

Most importantly, teacher's attitude has been shown to impact either positively or negatively on ICT integration. Research has shown that teachers' attitudes towards technology influence their acceptance of the usefulness of technology and its integration into teaching (Huang and Liaw, 2005). According to Russell and Bradley (1997), anxiety, lack of confidence, competence and fear often implies ICT takes a back seat to conventional learning mechanisms. It has also been alleged by some researchers that if teachers perceived technology programs as neither fulfilling their needs nor their students' needs, it is likely that they will not integrate the technology into their teaching and learning (Hew and Brush, 2007; Keengwe and Onchwari, 2008).

### **Institutional Factors and ICT Integration**

Institutional factors help to improve teachers' existing attributes. According to Vannatta and Fordham (2004), teacher's time committed to teaching and amount of technology training are reliable factors of technology use in classroom. They asserted that teacher trainers and administrators should not only provide extensive training on educational technology, but should also facilitate a contribution to teaching improvement. Norris, Sullivan, Poirot and Soloway (2003) also pointed out the importance of access to technology.

Likewise, researchers have proposed enhancement of professional development (Bauer and Kenton, 2005; Franklin, 2007), accessibility (Yildirim, 2007; Usluel, Askar and Bas, 2008), technical support (Jones, 2004; Becta, 2004) and leadership support (Yee, 2000; Lai and Pratt, 2004) for effective ICT integration. Therefore, an understanding of institutional characteristics that influence teachers' adoption and integration of ICT into teaching is relevant.

### **Technological Factors and ICT Integration**

Technology characteristics influence the diffusion processes of an innovation and are significant factors impacting on innovation adoption. Evidence suggests that innovation attributes such as relative advantage, compatibility, complexity, trialability and observability as perceived by individuals influence the rate of adoption (Rogers, 2003). Understanding educators' perceptions of innovation is key to successful adoption of technology in learning, which according to Watson (2006) is a particular kind of instructive innovation. Groff and Mouza (2008) assert that when teachers integrate ICT into teaching, they operate as innovators. A number of recent studies on effect of technology characteristics have been undertaken. They include studies on students' perceptions of educational technology in tertiary education (Parker, Bianchi and Cheach, 2008), perceptions of pre-service teachers, perceptions of asynchronous discussion boards (Ajayi, 2009), teachers' perceptions of learning technologies (Cope and Ward, 2002) and perceived attributes of the Internet to predict the adoption of the Internet as a learning tool (Martins, Steil and Todesco, 2004). These studies found observability and trialability as the two most significant elements.

Further, Jebelie and Reeve (2003) studied teacher adoption of web technology in a second-cycle school and reported that relative advantage, compatibility, visibility, ease of use, results demonstrability and trialability be taken into consideration by school principals wanting to maximize the ICT use in their schools. More recent study by Smarkola (2007), confirmed that perceived usefulness and perceived ease of use were predictors of user acceptance of computer technology. Also, Tella, Tella, Toyobo, Adika and Adeyinka (2007) investigated 700 Nigerian secondary school teachers' uses of ICTs and implications for further development of ICT use in schools. The findings showed that most teachers perceived ICT as very useful and as making teaching and learning easier. Askar, Usluel and Mumcu, (2006) examined the extent to which perceived innovation characteristics are associated with the probability of task related ICT use among secondary school teachers. A questionnaire completed by 416 secondary school teachers in Turkey to determine the task-related usage and the perceptions of the teachers in regard to ICT showed that complexity or ease of use was a common perceived innovation characteristic for teaching delivery, preparation and managerial tasks in schools. The study also revealed that observability is a perceived attribute in teaching delivery in some



specific tasks performed during the class period while relative advantage and compatibility are for teaching preparation tasks.

In a similar study, Usluel, Askar and Bas (2008) adopted structural equation modeling technique to analyze the effects of technology resources and computer attributes (i.e. relative advantage, compatibility, ease of use and observability) on innovative educational and administrative uses. The study involving 834 faculty members from 22 universities in Turkey reported that about 61% of variance of ICT use was explained by ICT resources and computer attributes. In addition, Yi et al. (2006) reported that relative advantage, complexity, observability, and image are the most significant factors in predicting student teachers' intentions to make use of technology.

According to Dillon and Morris (1996), "innovations that offer advantages, compatibility with existing practices and beliefs, low complexity, potential trialability and observability will have a more widespread and rapid rate of integration". Therefore, if teachers perceive that an innovation has an advantage over the existing technology, compatible with their social needs, ease to adopt, it can be trialed before use and finally the results can be seen, it is likely that teachers will adopt and integrate it quickly. In spite of the factors that encourage teachers' use of ICT in classrooms, several studies have conducted empirical research on factors (barriers) that discourage the use of ICT by teachers. Balanskat et al. (2007), categorized the factors that prevent teachers from ICT use into teacher level, school-level and system-level barriers. Teacher-level barriers include lack of teacher ICT skills; lack of teacher confidence; lack of pedagogical teacher training; lack of follow-up of new and lack of differentiated training programmes. The school-level barriers comprise absence of ICT infrastructure; old or poorly maintained hardware; lack of suitable educational software; limited access to ICT; limited project-related experience; lack of ICT mainstreaming into school's strategy and the system-level barriers include rigid structure of traditional education systems; traditional assessment; restrictive curricula and restricted organizational structure.

Yildirim (2007) conducted a survey on factors that discourage teachers' use of computer technology in classrooms. He reported that the major use of technology

by teachers was to prepare lesson notes and assessments instead of improving students' performances. The research also revealed that barriers to the use of technology include congested classes, insufficient training, inadequate technical and pedagogical support, rigid school syllabi, inadequate motivation, lack of strong leadership and inadequate cooperation among teachers. Slaouti and Barton (2007) also claimed that lack of access, time pressures, lack of mentors and opportunities for training have effect on teachers' use of ICT in teaching and learning. Similarly, Chigona and Chigona (2010) employed qualitative approach to collect and analyze empirical data on factors preventing teachers from using ICT in teaching in Khanya schools in South Africa. Fourteen educators were sampled from four high schools and interviewed. The study revealed that inadequate training, lack of access to computer laboratories, lack of technical support and inadequate technology resources were factors discouraging teachers from implementing ICT into their teaching.

Also Peralta and Costa (2007) collected and analyzed data on teachers' confidence and competence in the use of ICT in teaching. The quantitative and qualitative research randomly sampled 20 teachers from Greece, Italy, Spain, Portugal and the Netherlands. The findings revealed that lack of teachers' time to learn new skills, old ICT equipment, large classes, number of computers available for pupils' use, lack of technical and pedagogical support and lack of collaboration among teachers were constraints to teachers' confidence and competence in the use of ICT.

### **Challenges of ICT Integration**

The implementation of ICT in schools according to available empirical data faces several challenges. These include limited ICT facilities, costly Internet access, limited information sharing, limited skills for ICT integration according to Swarts and Wachira (2010), shortage of labour force due the failure of training institutions to produce ICT technicians and professionals needed for the labour market as per Mendes, Tuijnman and Young (2003) as reported in Mwalongo (2011). Other challenges include limited electricity supply, poor telephone connectivity and inadequate number of computers according to Hesselmark (2003). Hare (2007) considered lack of policy framework, inadequate infrastructure, high cost of bandwidth, and inadequate in-service training on ICT integration in education as

some of the factors inhibiting ICT integration. Mendes et al (2003) as reported in Mwangolo (2011) in a study of extent of use of ICT resources pointed out that there is less emphasis on ICT training in primary and secondary schools in Tanzania due to limited facilities while Adomi and Kpangban (2010) in a study on causes of the low rate of ICT adoption and application in Nigerian secondary schools found it to be attributable to several factors. These factors were found to include; limited/poor information infrastructure, lack of/ inadequate ICT facilities in schools, frequent electricity interruption, poor ICT policy/project implementation strategy, inadequate ICT manpower in the schools, high cost of ICT facilities and lack of/poor perception of ICTs among teachers and administrators. Thus, these challenges can be broadly classified as infrastructure-related, teacher-related, capacity-building related and technical-support related (Das, 2012). Other categories of challenges according to the researcher include language and content-related, sustainability related and equality-related.

## **6. Future Trends in Education Technology**

Technology has rapidly changed every facet of our society, including the education industry. Today students grow up with internet-connected devices at home and in the classroom, which changes the way they learn. Future education technology will transform learning by giving teachers and students a variety of new tools to work with.

Education technology (Ed Tech) includes many of the popular digital developments, such as the Internet of Things (IoT) and virtual reality (VR), but it has unique

applications exclusive to the task of teaching. The education sector thus presents a significant opportunity for tech entrepreneurs looking for a promising market.

Trends in Media and Technology:

- ✓ **Discipline convergence:** The disciplines of instructional design, educational media, and educational computing are merging into a single discipline that we call **educational technology**. The computer has not only demonstrated its capability to integrate other forms of media, but it has also proven itself to be the forerunner of the digital revolution. Due to the advances in computing, many digital devices have evolved.
- ✓ **Media convergence.** Where once media developed separately, each with its own technological basis, today all the media are converging on the computer. Driving these changes and media convergence is the computer's ability to reduce all conventional information forms into a common form (*digital form*). The digital form will allow the combination of text, numbers, sound, motion images, simulations, integrated learning systems and job aids.
- ✓ **The growth of the Internet.** Another area of change in media and technology is linked to telecommunication revolution. Telecommunication tools permit the computer to communicate with other computers to share information. Today, we live in an era of global computer interconnectivity that brings a whole world of information to the personal computer user through computer networking and telecommunication. By accessing the Internet, one can instantly locate up-to-date information, communicate with others and explore the far corners of cyberspace (Newby et al.; 2006:58) . This has created what is referred to as '**information superhighway**'. Information superhighways will deliver vast amounts of information to individuals at school, work and home.
- ✓ **Increasing computer power with decreasing size and cost.** Continuing developments in computing are affecting more than just media. For example, storage capacities are increasing, and wireless technologies are making it possible for people to use computers and the Internet without being connected to a wired connection. This has implications on affordability and access to

connectivity. More people can afford to use the computer but this has had negative effect. For example, security threats and misuse of the technology particularly when handled by groups and individuals with sinister motives and for clandestine activities.

- ✓ **Decentralizing Instruction:** A major change in trend is expected in the nature of instruction itself. For example, distance delivery and alternative delivery modes will redefine instruction. Classrooms will need to change to accommodate virtual communities of learners located anywhere in the world. Virtual learning communities and environments may take students anywhere they wish to learn and at any time they wish to learn.
- ✓ **The changing role of the teacher:** Teachers might find themselves in new and more challenging roles. Rather than directing instruction in a single classroom setting, they will facilitate learning by creating optimal instructional experiences and assisting students through them. Teachers will no longer operate from isolated classrooms but will become part of a collegial network focused on high quality educational practices. Technology will play a large role in instigating the changes both in our society in general and education in particular.
- ✓ **Greater access to STEM materials.** As technology has become increasingly central to all aspects of modern life, schools have put more focus on science, technology, engineering, and math (STEM) subjects. To take advantage of this shift, companies can develop engaging curriculum for robotics, coding, and programming.
- ✓ **Increasing need to enhance privacy for students.** Cyber-security and digital privacy rank among the top concerns of all consumers, including consumers of education. As a result, there is a large market for improving the efficacy of existing products and creating new ones that will help manage student data and protect the privacy of these young individuals.
- ✓ **“Flipped learning”** A new approach to education is called “flipped learning,” and as the name suggests, it involves turning traditional teaching methods upside down. In a “flipped” classroom, students take advantage of new technologies to absorb content at home through videos and other digital

content and then complete their “homework” at school in small groups under the teacher’s supervision.

- ✓ **Virtual education.** Closely related to the concept of flipped learning is the idea of remote, or “virtual,” education, which takes place outside of a physical school building. With this method, students complete courses at home using online content, including videos of instructors in front of an actual class. Another benefit of virtual education is that teachers can utilize video conferencing and social media technologies, as well as a variety of subject-matter experts to convey information and check for understanding.
- ✓ **Digital and media literacy courses.** As students spend more and more time online, there is a growing need for a curriculum that teaches digital literacy — systems to help students harness the technological tools at their disposal. This includes developing guidelines for how to interact with others (for more than social and entertainment purposes) and how to process information they encounter online.
- ✓ **New utility for wearable technology.** Wearable technology can help keep kids safe. Not only can these devices track the locations of students at school, but they can also monitor the whereabouts of campus visitors. These items can even facilitate paperless transactions in the cafeteria, thus reducing waste, and quite possibly, bullying and theft.
- ✓ **Game-based curricula.** Schools are more frequently adopting game-based curricula as a means for creatively engaging students in their lessons. Many learners appreciate the challenge-reward concept of video games, and these digital platforms can incorporate a wealth of problem-solving and social skills.
- ✓ **Improved parent-teacher connections.** As schools continue to incorporate Ed Tech into the classroom, communication between teachers and parents will flourish. Teachers will take advantage of programs that track assignments and report student progress to all involved parties. Therefore, businesses will do well to supply new and better communication channels.
- ✓ **Better open resources for educators.** A vast array of educational resources exists for teachers looking to incorporate digital content into their lessons. However, many of these are of low quality. Tech developers, therefore, can profit from developing intelligent, polished, and well-researched digital materials.

- ✓ **AI and VR.** Artificial intelligence (AI) has gained a lot of traction in the market recently. Tech companies can use this technology to provide educational facilities with virtual mentors and teaching assistants, as well as improved automated grading systems. Virtual and augmented reality (VR/AR) is a popular gaming technology that teachers can use to enhance student learning. At some schools, students are already taking “virtual” field trips with a VR headset. Estimates project instructional AI and VR expanding into a multibillion-dollar industry in the near future.
- ✓ **Paperless textbooks.** School today must decide whether to procure print textbooks or tablets for every student are more expensive. Over time, the latter usually proves a better financial investment because schools can easily upload new and better classroom materials to the same devices, but they must spend thousands to replace outdated traditional textbooks.
- ✓ **Big data analysis.** Just as big data helps businesses obtain a better grasp of their consumer base, it can help teachers learn more about their students. Technology-assisted learning can yield valuable information about how children learn and in which specific areas they are struggling. For example, a student might fully understand the material but get confused by the format of a test.
- ✓ **Social media.** Educators have recently embraced the utility of social media for organizing group projects. Moreover, online conversations and homework-related hash tags can help students build their own peer community. It can also encourage new ways of learning.

## 7. Learning Resource Project