Quadrant-I(e-Text)

Details of Module and its structure

Module Detail	
Subject Name	**Education**
Course Name	ICT in Education
Course Code	EDU504
Module Name/Title	*Behaviorism, cognitivism, constructivism, connectionism learning theories and its implications for ICT integration in education*
Module Code	IIE002
Pre-requisites	An understanding of meaning and importance of learning, education and ICT
Learning Outcomes	**After going through this lesson, the learners will be able to:** 1. Explain meaning of ICT and its purpose in education 2. Analyze the theories of learning, viz. behaviorism, cognitivism, constructivism and connectionism and infer meaningfully from these theories of learning 3. Apply these theories of learning in meaningful ICT integration in education
Keywords	ICT integration; learning theories; behaviorism; cognitivism; constructivism; connectionism

4. Development Team

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1. INTRODUCTION

Today, the presence of technology has saturated our lives, more so by the information and communication services and devices. The information and communication technologies (ICTs) have penetrated every nook and corner of our planet and nothing seems inaccessible, so to say. The advent of information and communication technology has transformed our lives in big ways – so much so that the effects cannot be comprehensibly perceived, captured, analysed and evaluated. Nonetheless, we must make an attempt to understand how ICT has influenced some of the major aspects of our lives, most importantly the field of education.

In past, with the start of mass-level formal education, a lot of emphasis was on 'literacy' or 'literacy skills' and it continues to be so more or less. The attribute of literacy is generally recognised as one of the key educational objectives of compulsory schooling. It refers to the ability to read and write to an appropriate level of fluency (Research Report Commissioned by Cambridge Assessment, 2013). However, over time this meaning has undergone a 360-degree change and now embraces the more comprehensive set of skills which range from the abilities of reading/writing to all the abilities that are needed to cope with everyday life – be it social interaction, effective use of gadgets, staying update with information, knowledge, skills etc. (Lemke, 2005; Lonsdale and McCurry, 2004). The uses of literacy for the exchange of knowledge are also constantly evolving. From the Internet to text messaging, the ever-wider availability of communication makes for greater social and political participation (UNESCO, 2013).

This paradigm shifts in the meaning of literacy and its uses can be attributed to the developments in the field of ICTs. The ability to use ICT has become quintessential for learning and working in the present-day society. This ability is claimed to be one of the most essential skills in the knowledge society. Thus, it has immense implication for the way people perceive, consume, create, and interact with information in everyday life (Mioduser, Nachmias & Forkosh-Baruch, 2008).

The technological revolution – wherever it has successfully built inroads – has transformed the learning environments across the globe, so much so that the learning has moved beyond the traditional learning environment contained in 'four walls' to the learning in cyberspace. This environmental change has caused educators to look more closely at the ways students' best experience learning in the 21st century (Weegar & Pacis, 2012).

This module will explore the meaning of ICT and purpose of ICT integration in education. Also, an effort has been made herein to analyse the relation between theories of learning and integration of ICT in education and more specifically in the teaching-learning process.

2. INFORMATION AND COMMUNICATION TECHNOLOGY

The humanity is currently at its most accelerated phase of evolution and this impetus has been provided by the scientific innovations.

As the efforts intensify to universalize the education (through Universalization of Elementary Education, Sarv Shiksha Abhiyan, Right to Education Act, Rashtriya Madhyamik Shiksha Abhiyan, and more recently the Samagra Shiksha Abhiyan etc.), the objective is larger than to merely build a 'literate nation'– it is to build a nation or a community that can create knowledge and innovate. ICTs have also changed the meaning of literacy (as discussed earlier). As per UNESCO (2013), a literate community is a dynamic community, one that exchanges ideas and engages in debate. Illiteracy, however, is an obstacle to a better quality of life, and can even breed exclusion and violence. According to Mioduser, Nachmias and Forkosh-Baruch (2008), literacy relates to the ability to know when and why there is a need for information; how and where to find it in, and retrieve it from the vast infospace; and how to decode, evaluate, use, and communicate it in both an efficient and ethical manner.

The Information and Communication Technologies (ICTs) have changed not only how we learn, but have also affected what we learn, when and where we learn and why we learn. The nations are aspiring to be the best 'knowledge societies' in the world. A key theme in the evolving identity of the knowledge

society is the obvious but essential fact that technologies, specifically information and communication technologies, are at the core of the transformations taking place (Mioduser, Nachmias & Forkosh-Baruch, 2008).

2.1 MEANING OF ICT

Information and Communication Technologies are a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information (Vallikkad, 2009). These may also be defined as all devices, tools, content, resources, forums, and services, digital and those that can be converted into or delivered through digital forms, which can be deployed for realising the goals of teaching learning, enhancing access to and reach of resources, building of capacities, as well as management of the educational system (Department of School Education and Literacy Ministry of Human Resource Development, Government of India, 2012).

On the whole, ICTs constitute an assembly of facilities used for the treatment, modification and exchange of information. Their application and areas of implantation are diverse and present in almost all spheres of human activity. Among the different technologies for information and communication, the computer and the internet represent privileged means of learning and teaching as they permit wide and rapid exposure to the world as well as enhanced pedagogical practices. These technologies are believed to contribute to the amelioration of the quality of education because they are not only used as tools for the facilitation of cognitive development of learners but also as a means for exposure by their users (Toure, Tchombe & Karsenti, 2008).

2.2 PURPOSE OF ICT IN EDUCATION

In the 1980s the computer was perceived as a revolutionary force that would have a direct impact on student learning and skills acquisition (www.tcd.ie, 2006). Over the past decades, the Information and Communication Technologies (ICTs) have shaped our lives beyond our imagination. There are scores of research studies that report the positive effects. Also, there's no

dearth of research studies that report negative effects. Yet, we see that the governments, organizations and educational institutes are recommending, and using more of ICTs mainly because it is the big reality of our times. If planned and used well, ICTs can facilitate the achievement of many educational objectives. ICTs can facilitate universal access to education, bridge learning divides, support the development of teachers, enhance the quality and relevance of learning, strengthen inclusion, and improve education administration and governance (UNESCO, 2019). The internet-driven curriculum is seen as a place for students to create meaningful knowledge on their own, using an environment full of experts waiting to be interviewed and vast amounts of information ready to be mined (Hollenbeck, 1998).

ICTs have an immense potential to impact education – of children, of teachers, of teacher educators and others, and provide newer and more effective ways of mitigating some of the challenges being faced by the educational system of our country (Central Institute of Educational Technology – NCERT, 2013). The Department of School Education and Literacy (under Ministry of Human Resource Development, Government of India, 2012) lists the potential of ICT to respond to the various challenges the Indian education system faces:

1. ICT can be beneficially leveraged to disseminate information about and catalyze adaptation, adoption, translation and distribution of sparse educational resources distributed across various media and forms. This will help promote its widespread availability and extensive use.
2. There is an urgent need to digitize and make available educational audio and video resources, which exist in different languages, media standards and formats.
3. Given the scarcity of print resources as well as web content in Indian languages, ICT can be very gainfully employed for digitizing and disseminating existing print resources like books, documents,

handouts, charts and posters, which have been used extensively in the school system, in order to enhance its reach and use.

4. ICT can address teacher capacity building, ongoing teacher support and strengthen the school system's ability to manage and improve efficiencies, which have been difficult to address so far due to the size of the school system and the limited reach of conventional methods of training and support.

5. Using computers and the Internet as mere information delivery devices grossly underutilizes its power and capabilities. There is an urgent need to develop and deploy a large variety of applications, software tools, media and interactive devices in order to promote creative, aesthetic, analytical and problem solving abilities and sensitivities in students and teachers.

The above discussion highlights that the use of ICTs in Education has great potential, albeit we know how to use is for the right purpose/s.

2.3 ICT INTEGRATION IN EDUCATION

The site for "school" learning has expanded beyond the school itself with the integration of internet, bringing aspects of a larger world into the school for discussion and taking classroom discussions beyond the walls of the classroom (Toure, Diarra, Karsenti & Tchaméni-Ngamo, 2008). This integration has led to a wide-spread, hot debate over its value and effect. Though there are mixed reactions and the empirical evidences also don't give any conclusive direction, yet educational policy specialists and administrators have made a concerted effort to increase the presence of technology in the classrooms (Kay, 2006).

"Successful integration of ICT into teaching and learning requires rethinking the role of teachers in planning and applying ICT to enhance and transform learning. Education systems need to regularly update and reform teacher preparation and professional development accordingly, ensuring that all teachers can harness technology for education (UNESCO, 2019). The integration of ICT within the curriculum should be directed towards enhancing teaching and learning i.e. not something to use just for the sake

of it (www.tcd.ie, 2006). We need to teach, not just "tech". We need imagination, not just information (Toure, 2008). The role of the teacher in planning, designing and supporting students learning with ICT is key if it is to be a success (www.tcd.ie, 2006).

At any given instant of time, one encounters schools at different levels of preparedness for ICT infusion, teachers with varying levels of awareness of and ability to use ICT in education and students with varied levels of exposure (Central Institute of Educational Technology – NCERT, 2013). It has been noted that the new technologies are often introduced and sometimes even parachuted into schools in ways that do not enhance teaching and learning, that promote automated thinking instead of critical thinking, that encourage dependency rather than autonomy and interdependence, and that reinforce existing patterns of exclusion. Too often the emphasis is on equipment, on making profits from schools, or on promises of modernity than on opportunities for teachers to learn and experiment effective uses of technologies to enhance teaching and learning processes (Toure, 2008).

In an extensive meta-analytical study carried out by Software Information Industry Association (SIIA) in 2000, a number of positive effects of technology on student achievement were identified. In its final report, some of the conclusions regarding the effectiveness of technology in education are listed as follows:

- The specific student population, the software design, the educator's role, how the students are grouped, the preparedness of the educator and the level of student access to the technology influence the level of effectiveness of educational technology.
- Educators are an essential element in the effectiveness of technology.
- Software is effective because it allows individual learner traits and multiple pathways to learning (e.g., text, graphics, speech) to be taken into consideration when software is being designed and used.
- Effectiveness of educational technology depends on a match between

the goals of instruction, characteristics of the learners, the design of the software and technology implementation decisions made by educators.

The UNESCO ICT Competency Framework for Teachers (ICT-CFT), 2019 provides a comprehensive national teacher ICT competency policies and standards and integrate these in overarching ICT in education plans. It highlights the role that technology can play in supporting six major education focus areas across three phases of knowledge acquisition, as illustrated in the table below:

Table 1: UNESCO ICT Competency Framework for Teachers, 2019

	TECHNOLOGY LITERACY	KNOWLEDGE DEEPENING	KNOWLEDGE CREATION
UNDERSTANDING 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

Source: https://en.unesco.org/themes/ict-education/competency-framework-teachers

The above discussion highlights not only the importance of ICT in our day-to-day life, but more importantly it points to the new frontiers that it offers in the teaching-learning process.

3. LEARNING THEORIES AND THEIR IMPLICATIONS FOR ICT INTEGRATION IN EDUCATION

The various learning theories provide us with an insight into how learning takes place. These theories explain the principles that underlie the learning process. We can draw from these theories and plan the teaching-learning content as well as the suitable pedagogy to deliver that content. An understanding of these theories, therefore, will surely help in understanding and executing the integration of ICT in Education. In this section, we'll study about behaviourism, cognitivism, constructivism and connectionism.

3.1 BEHAVIOURISM

From the word go, behaviourism – as a school of studying and explaining learning – has invested in the overt response of the organism, i.e., behaviour. 'Behaviour' means the action or the manner of conduct. In other words, it implies response of an organism to a particular stimulus, and this stimulus can be a word, any sound, image, idea, smell, or any situation. The rationale behind studying behaviour is that it is directly observable.

Ivan Petrovich Pavlov (1849 – 1936); John Broadhus Watson (1878 – 1958); and Burrhus Frederic Skinner (1904 – 1990) are considered to be the main exponents of the behaviouristic approach to learning and are often credited for our initial understanding of how learning takes place. They studied how learning is affected by changes in the environment and sought to prove that behaviour could be predicted and controlled (Weegar & Pacis, 2012).

Ivan P Pavlov (a Russian physiologist) was studying the functioning of digestive system of the dog and accidently observed what later took shape of a theory of learning – famously known as 'Classical Conditioning'. Pavlov observed that initially the dog was salivating when the food was presented but later the dog started salivating even before the food was presented. Pavlov was amazed at this response of dog, so he set out on finding the

explanation. Pavlov observed that dog had formed association between the sound of footsteps (of the person bringing food) and the presentation of food. As a result, the salivation was activated. He termed this phenomenon as 'psychic reflexes'. Classical conditioning is a reflexive or automatic type of learning in which a stimulus acquires the capacity to evoke a response that was originally evoked by another stimulus (David, 2014). Such learning is very deep and lasting.

Table 2: The three stages of conditioning in Pavlov's experiment

Stage – I: Before Conditioning	
Food (UCS)	Salivation (UCR)
Buzzer (NS)	Orientation
Stage – II: During Conditioning	
Food (UCS) + Buzzer (NS)	Salivation (UCR)
Stage – III: After Conditioning	
Buzzer (CS)	Salivation (CR)

Note: UCS – Unconditioned stimulus; UCR – Unconditioned Response; NS - Neutral Stimulus; CS – Conditioned Stimulus; CR – Conditioned Response

John B. Watson (an American psychologist), in contrast to Pavlov, studied humans and also experimented on them. Watson carried forward the work of Pavlov and worked on the same lines. In one of his experiment conducted on an infant, Watson presented an unpleasant stimulus (loud sound) while presenting a toy to the child. The loud sound would disturb the child. As the association between the loud sound and the presentation of toy strengthened (i.e., when conditioning was complete), the little child would fear any such toy or anything resembling that toy – in other words, the child had learnt to fear.

Burrhus Frederic Skinner (an American psychologist) was immensely influenced by the works of his predecessors, mainly Pavlov and Watson. He worked on similar lines; however, his contributions were not only new but also provided an entirely new dimension to the understanding of behaviour and how behaviours are learnt. His theory is popularly known as 'Operant Conditioning'. His radical stance was, in contrast to what Pavlov and Watson proposed, that it is not that only environmental stimuli evoke response but the organisms can also act/operate on the environment. He explained that an organism is not always at the receiving end of environmental stimulus; rather an organism can choose and act on the environmental stimulus. The major concepts he brought in the understanding of learning include reinforcement, reinforcement schedules, shaping, extinction, etc.

On the whole, the behaviouristic theories of learning propose that all behaviours are learnt. It studies behaviour in relation to the environment of the organism. According to the behaviourists, all learning occurs through the process called 'conditioning'. Conditioning results through (repeated) interaction with the environment. Our responses to environmental stimuli shape our actions. Behaviour is determined by environmental conditions because according to the behaviourists the human being is passive and it suffices to manipulate environmental conditions to obtain required behaviour (Toure, Tchombe & Karsenti, 2008).

Implications of Behaviourism for ICT integration in Education

The concepts and principles of behaviouristic theory can be effectively used for ICT integration. The initial efforts of teachers and students to incorporate ICT in teaching-learning should be recognised, reinforced and shaped in desired manner. General rules of ICT usage can be drawn consensually and the learners should be rewarded accordingly. The token economy or incentives for any ICT based assignment can further boost the morale and encourage further use of ICTs in for the learning tasks.

It is often reported that teachers do not possess necessary skills to use ICTs in classroom. But this is only partially true. The teachers do not adhere to innovation except when they see the benefit for their pupils and themselves.

The use of innovation will progress if teachers receive the necessary information and assistance that they consider useful and important. The behaviourist theory considers learning as change of behaviour and learning takes place when an individual produces a desirable/expected response to a given stimulus (IsaBelle, 2002).

Also, many students and teachers report their fear/apprehension/aversion/phobia of using technology. This fear is often unreasonable, mainly stemming from the lack of opportunities to learn, experiment and explore the use of technology for academic purposes. Also, the initial failures tend to condition the individual to believe that they can't use technology successfully. This conditioning needs to be broken and using the principles of behaviouristic approach to learning, the students and teachers must be exposed to situations where they experience success in the use and integration of technology effectively and efficiently. So the fear/aversion of technology can be transformed into a positive inclination towards meaningful use of ICT for academic purposes.

Behaviourist approach can help in overcoming phobia/aversion and can encourage repeated use of ICT, however it is mainly restricted to the promotion of attitudes, automatic/involuntary response and performance of tasks, i.e., making PPT, using email, searching internet for assignment completion. It may not necessarily encourage the user to integrate ICT for problem solving or creative thinking.

3.2 COGNITIVISM

Dissatisfaction with behaviorism's strict focus on observable behavior led educational psychologists to demand an approach to learning theory that paid more attention to what went on "inside the learner's head" (GSI Teaching & Resource Center, 2019). The cognitivists explain learning through the treatment of information. Cognition can be considered as internal activities and processes inherent to the acquisition of knowledge, information, memory, thinking, creativity, perception as well as understanding and problem solving (IsaBelle, 2002).

The cognitivists observed that the behavior is only an external manifestation of what goes inside the body, more specifically the brain. They are concerned with the internal processes involved in learning. The basic premise on which the cognitivist works is that the organism (human or animal) processes the information received via senses and does not merely work on reflex-model. In other words, the cognitivists place the learner in the 'active' role.

Jean Piaget (1896 – 1980) was a child psychologist based in Switzerland. His theory of cognitive development is hugely popular, but of course, not without its due share of criticism. In his theory, Piaget proposed four stages of cognitive development, viz. sensorimotor stage (birth to 2 years); preoperational stage (2 to 7 years of age); Concrete operational stage (7 to 11 years of age); and formal operational stage (12 years of age and above).

He believed that learning is a complex, dynamic process. It involves continuous adaptation and successive assimilation of information. Piaget proposed the principle of equilibration. He explained that an infant is born with schema or sets of schema that facilitate the infant's adaptation to the new world. As the infant grows, using these inherent schemas, s/he makes sense of the world and assimilates new information. But when the individual finds new knowledge contrary to the already acquired knowledge it causes disequilibrium. Individual thus, makes use of accommodation so as to regain the state of equilibrium. This process goes on and on.

Implications of Cognitivism for ICT integration in Education
The principles of cognitivist approach to learning better equip us for ICT integration in the desired way as compared to the behavioristic approach.
It guides us that new knowledge and skills can be built upon the already learnt skills/knowledge. So, if users know the basics of ICT, they can successfully acquire new, higher knowledge/skill if they are provided opportunities for the same, albeit without much fear of failure. The user will assimilate and/or accommodate new schemas into their existing ones.

The ICT integration can be effectively achieved through relatable, real-life examples. The success stories of ICT integration can encourage others. Let

teachers and learners discuss, debate, brainstorm on the ways the ICT should be incorporated in their classrooms/institutes. Allowing the users to reason and make informed choices would ensure the success of ICT integration.

3.3 CONSTRUCTIVISM

Constructivism is an extension of cognitivism. The constructivists view learning as a search for meaning and describe elements that help predict what students understand at different stages of development (Weegar & Pacis, 2012). The constructivist approach to learning can be classified as Cognitive constructivism (Jean Piaget) and Social Constructivism (Lev Vygotsky). Since Piaget's views on learning have been discussed in the previous section (Cognitivism), we'll take up the Social Constructivism in this section.

Lev Vygotsky (1896 – 1934) was a Russian psychologist. His major area of work was developmental psychology and he strongly believed that the best way to understand the (human) mind is by way of studying its genesis. He argued that the human mind is a product of the culture and the language of the society. He emphasized that the social environment plays a vital role in development of cognition of an individual, thus providing a socio-cultural approach to the cognitive development. Unlike Piaget, he doesn't prescribe any universal stages of cognitive development.

Vygotsky states that cognitive development stems from social interactions and the internalization of language. The guided learning takes place within the zone of proximal development as young learners and their partners co-construct knowledge. For Vygotsky, the environment in which children grow up influences how they think and what they think about (McLeod, 2018). In this learning, the 'knowledgeable other' has a vital role. Vygotsky also highlighted the significance of 'elementary mental functions' in the learning process, viz., attention, sensation, perception and memory. The individual not only acquires information, but also manipulates it, monitor it and strategize about its usage.

Table 3: A comparative view of two flavours of constructivism

	Cognitive Constructivism	Social Constructivism
View of knowledge	Knowledge systems of cognitive structures are actively constructed by learners based on pre-existing cognitive structures.	Knowledge is constructed within social contexts through interactions with a knowledge community.
View of learning	Active assimilation and accommodation of new information to existing cognitive structures. Discovery by learners is emphasized.	Integration of students into a knowledge community. Collaborative assimilation and accommodation of new information.
View of motivation	Intrinsic; learners set their own goals and motivate themselves to learn.	Intrinsic and extrinsic. Learning goals and motives are determined both by learners and extrinsic rewards provided by the knowledge community.
Implications for Teaching	The teacher facilitates learning by providing an environment that promotes discovery and assimilation/accommodation.	Collaborative learning is facilitated and guided by the teacher. Group work is encouraged.

Source: https://gsi.berkeley.edu/gsi-guide-contents/learning-theory-research/learning-overview/

Implications of Constructivism for ICT integration in Education

At the core of constructivism is the freedom and flexibility in the teaching-learning process. The learners are facilitated by the teacher to construct knowledge. Because knowledge is actively constructed, learning is presented as a process of active discovery. Teachers must thus take into account the knowledge that the learner currently possesses when deciding how to

construct the curriculum and how to present, sequence, and structure new material (GSI Teaching & Resource Center, 2019).

Further, the social constructivism lays great emphasis on the role of society. It can be a source of motivation. The aims of society should reflect clearly and meaningfully. What society values, it finds a place in the curriculum. The technology integration model adopted by society can be a role model for the educational institutes.

Teachers and students should see curriculum extending into the social life and vice-versa. The opportunities for the collaborative work with institutes and community, wherein ICT is used, should therefore be encouraged. Within institutes, ICT based projects, assignments and case studies be done. Encourage learners to adapt, modify, improvise, and innovate the devices/techniques by making use of ICTs. The emphasis should be on the social contributions for the overall process of holistic development.

3.4 CONNECTIONISM

Connectionist approach postulates that learning is a process of forming connections between action (response), outcome (consequence) and the affect (feelings of pleasure or pain). The S-R connections are the hallmark of connectionist approach to understand learning. The paradigm for S-R theory was trial and error learning in which certain responses come to dominate others due to rewards (Culatta, 2019). Generally speaking, connectionism falls under the broad category of behaviouristic theories of learning because herein also the focus is on the observable behaviour. Edward Lee Thorndike is the proponent of connectionism. The work done by him influenced countless psychologists over long period of time, and even still today (McLeod, 2018).

Edward Lee Thorndike (1874 – 1949) was an American psychologist. His theory of learning represents the original S-R framework of behavioral psychology, i.e., learning is the result of associations forming between stimuli and responses (Culatta, 2019). Based on the series of experiments

conducted on animals over the decades, he postulated the laws of connectionism or the three laws of learning, viz.,

- Law of readiness (mostly intuitive, it refers to the motivation to get into action)
- Law of exercise – it is further split into two:
    - Law of use (connections strengthen with repetition)
    - Law of disuse (connections fade away when not used)
- Law of effect

The secondary laws further supplement the aforementioned laws:

- Law of multiple response or varied action
- Law of set (attitude)
- Law of partial activity (prepotency of elements)
- Law of assimilation
- Law of associative shifting

Later he amended the law of exercise and explained that mere repetition is not effective, it should be guided by feedback for the desirable results. He also clarified that reward and punishment are not equal in their power to strengthen or weaken a connection.

Implications of Connectivism for ICT integration in Education

The responses that produce a satisfying effect in a particular situation become more likely to occur again in that situation, and responses that produce a discomforting effect become less likely to occur again in that situation (Gray, 2011)

He emphasized motivation through rewards, rather than using punishments, as an efficient means of obtaining desirable results. However, punishment may have an indirect positive influence by redirecting the attention of students from their existing ineffective stimulus-response bonds to more suitable ones, and this is where the teacher can assist by providing appropriate alternative stimulus-response route (www.tcd.ie, 2006).

Thus, applying the principles/laws of Connectivism, the ICT integration in Education can be made more efficient and effective. For example, the law of readiness emphasizes the importance of providing pre-requisite knowledge and skills related to ICT and its usage. Further, the law of exercise points that repeated use/practice can empower the teacher as well as the learners to make optimal use of ICTs in the teaching-learning process. Similarly, more implications can be inferred from theory of connectivism for the integration of ICT in education.

4. SUMMARY

We may conclude that no one learning theory can provide an entire basis for all educational uses of ICTs; some theories and theorists provide a rationale for the use of ICTs in certain contexts or situations, but no one theory can account satisfactorily for all educational uses of ICTs (www.tcd.ie, 2006).

It has been experienced that the authorities import the idea of integrating ICTs into schools without putting in place a policy environment and curriculum that supports the integration of technology into teaching and in ways that ensure equitable access. The focus seems to be on technology rather than on learning objectives and contexts. In using ICT in education, as long as the focus is technology we will fail. Without any systemic plan for incorporating technology into schools, efforts fail (Toure, 2008).

Also, ICTs are among the most expensive of investments, causing much confusion regarding practices that have the best returns on investments (Central Institute of Educational Technology, 2013).

Information and communication technologies (ICT) on their own will not bring about improvements in educational quality, but when we change our mindsets to use them reflectively and strategically, teaching and learning processes can be deepened. The introduction of ICT in schools necessitates a profound reflection on the part of teachers and decision makers in terms of the pedagogical conditions to be put in place and their implication on the quality of education (Tchombe, 2008) Information and communication technologies (ICT) on their own will not bring about improvements in

educational quality, but when we change our mindsets to use them reflectively and strategically, teaching and learning processes can be deepened (Toure, 2008).

More often than not, teachers' actual use of ICT in the classroom is reported as incremental, merely reinforcing traditional teacher-centred approaches using slides and drill-and-practice exercises. Teachers' use of ICT to innovate teaching is an exception rather than a norm (UNESCO, 2017). The cognitivist and constructivist approaches can actually help to overcome this block.

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Quadrant-IV: (Self-Assessment)

(A) For the given statements, state whether True or False:

1. To some extent the technological revolution has transformed the traditional learning environment to the learning in cyberspace.
2. The meaning of 'literacy' is definite and remains unchanged.
3. The site/space for learning has diminished with the advent of technology.
4. Integration of ICT into teaching and learning has de-valued the role/place of teacher.
5. Skinner proposed the idea that an organism can choose and act on the environmental stimulus.

Answers: 1-true, 2- false, 3-false, 4-false, 5-true

(B) Multiple Choice Questions

1. Behaviourists rationalize and emphasize the study of behaviour because:
   a. behaviour is correct
   b. behaviour is fixed
   c. behaviour is observable
   d. behaviour is stable

2. Who amongst the following in not considered as a 'behaviourist'?
   a. Ivan Petrovich Pavlov
   b. Jean Piaget
   c. John Broadhus Watson
   d. Burrhus Frederic Skinner

3. Which of the following is a correct pair:
   a. Operant conditioning – Pavlov
   b. Cognitivism – Skinner
   c. Constructivism – Vygotsky
   d. Connectionism – Piaget

4. Which of the following is not one of primary laws of learning as postulated by Thorndike:
   a. Law of set
   b. Law of effect
   c. Law of exercise
   d. Law of readiness

5. 'The assimilation/accommodation of ICT related new knowledge into already existing knowledge is feasible.' Which learning theory expounds/implies this?
   a. Behaviourism
   b. Congnitivism
   c. Connectionism
   d. Constructivism

6. According to Vygotsky, the 'elementary mental functions' consist of:
   a. stimuli, attention, sensation, and memory
   b. attention, sensation, perception and learning
   c. sensation, perception, reasoning and learning
   d. attention, sensation, perception and memory

Answers: 1-c, 2-b, 3-c, 4-a, 5-b, 6-d