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The role and potential of ICT and Web-Based E-learning in early childhood education: The new ABC for Socio-emotional development

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Abstract

The present paper highlights importance and impact of ICT on teaching and learning in pre-schools. Along with this, it will however, discuss the advantages and disadvantages of web-based e-learning system over traditional learning in preschools. Based on a strong theoretical foundation, this paper will propose how web-based teaching learning process can contribute to the development of cognitive, and psychomotor skills such as recognition of numbers and alphabets, logical thinking. The concerned paper suggests three reasons for using ICT in early childhood education. First, there is an influence of technology on the people and environment that surround young children's learning. Second, new opportunities are provided by these technologies to strengthen many developmental aspects of early childhood education practice. Third, the whole education sector is supporting the development and integration of ICT into education policy, curriculum, and teaching-learning practice.

Keywords: Concrete preparation; cognitive challenge; metacognition; social construction; bridging; web-based e-learning

1. Introduction

Preschool age is one of the most critical and important stage in life of a human being (Priyankara, *et al.*, 2013). A good reading ability and understanding of any child depends on the training and background upon that the child is brought up. This currently matters for parents and guardians to invest more time and money on materials and tools that may facilitate their children to gain knowledge and become successful in the future education and profession. In the youth, teaching and learning were more formal and being conducted in classrooms; however the rise in technology nowadays has changed the child's approach of learning (Agudo, *et al.*, 2010) [1]. Learning and teaching materials has shifted from the black board to technology that supports teaching and learning at any level of learning, ranging from the preschools to higher educational institutions. Therefore, there has been a lot of home schooling for children due to the new changing approach of teaching and learning in recent years.

1.1 What is ICT and why does it matter in early childhood education?

Anything that provides information and helps us to communicate with each other or to have an influence on the environment using electronic or digital equipment can be called as Information and communication technology (ICT). Not only computer hardware and software, digital cameras and video cameras, the Internet, telecommunication tools but also the programmable toys, virtual platforms, websites and many other devices and resources are included in ICT tools. These resources can be used in preschools in the process of teaching and learning and make lesson interesting. However, researches and studies have revealed that the introduction and use of ICT in preschools should be grounded in a clear understanding of the purposes, practices, and social context of early childhood education (ECE) and there are many ways in which ICT can contribute to the activities, roles, and relationships experienced by children and adults in early childhood education settings.

1.2 Reasons of using ICT in early childhood education

- A. In one way or the other technology already has an influence on the people and environment that surround young children's learning. ICT is becoming a globally used source of communication and interaction in the physical and social world inhabited by young children.

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- It has taken its own toll in the private and work lives of most people; let it be parents, family members, caregivers, or early childhood educators. It has been often shown in the studies that experiences gained by young children in their early childhood days are most likely to reflect and connect with their experiences in the wider world. Therefore, ICT matters in early childhood education and should be integrated in preschool curriculum. There is a strong debate across the studies that it is important to examine the role and potential of ICT in the early childhood education sector critically.
- B. Various opportunities are provided to support and enhance children's learning and play experiences, and strengthen various developmental aspects. It also provides opportunities to assist relationships and communication between early childhood centres, parents, and other people connected to the early childhood education setting and strengthen them as well. Researches revealed that only technology can never drive the process of ICT development in this sector (Downes & Fatouros, 1995)^[19] but for better results, the introduction and use of ICT by children and adults in early childhood education should be well planned beforehand by taking into consideration the purposes, practices, and social context of early childhood education (O'Hara, 2004; Sheridan & Pramling Samuelsson, 2003)^[35, 39]. A study conducted by Brooker (2003)^[6] has stated that early childhood education in UK is taking the lead in all over the world for developing best practice in the use of ICT to support positive and natural learning experiences for children. In many of the studies, clear evidences are given revealing that some of the most exciting and appropriate uses of ICT are found in early years settings. This is because there is less pressure to meet strict targets and more opportunity to experiment with child-centred practice. (Brooker, 2003, p. 261)^[6].
- C. Development of web based learning and integration of ICT in curriculum and practice across the whole education sector have been given importance all over the country. ICT and "e-learning" have emerged as important concepts since few years in high schools and in higher educational institutions. Most of the studies revealed that policy and curriculum support for the development of ICT in the early childhood education sector have lagged behind in comparison to the support given in school sector since ICT was not used as main teaching learning tool in early years of education (O'Hara, 2004; Sheridan & Pramling Samuelsson, 2003; Stephen & Plowman, 2003)^[35, 39]. ICT strategies have been developed in recent years by some of the countries like Scotland to be used in early childhood education (Learning and Teaching Scotland, 2003b). Information and guidance about ICT in early childhood education have been provided in the published books, articles, and guidelines by various researchers, academicians, and practitioners. The aim of these literatures was to support teachers and practitioners for using developmentally appropriate resources and ICT in early childhood education sector (Downes, Arthur, & Beecher, 2001; O'Hara, 2004; Siraj-Blatchford & Siraj-Blatchford, 2003)^[20, 35].

The evidence provided by the researches made it clear that by simply providing ICT equipment to schools or teachers will not necessarily bring any difference to the education sector rather it will make positive change in the learning environment by changing the way in which this equipment and other resources are used in the entire structure and teaching learning experience.

Useful guidance and conditions of using ICT in the early childhood education sector can be provided to the teachers and practitioners through various workshops, seminars and conferences introducing school-sector ICT literature. These literatures can provide help to the practitioners regarding the use of developmentally appropriate resources and ICT in early childhood education. Effective teacher professional development can be conducted with respect to ICT, and the conditions that facilitate innovation in the use and integration of ICT in teaching and learning (e.g. Harris & Kington, 2002)^[24]. Before planning to set up ICT in early childhood education, there is a need to translate school-based research findings to early childhood education contexts.

2. How can ICT play an effective role in Early Childhood Education?

There are various styles and methods of using ICT and its resources in early childhood education with the help of which it can contribute to, or transform, the activities, roles, and relationships experienced by children and adults in early childhood education settings in an effective way.

2.1 Possible role for ICT in early childhood education

A. Imaginative play

There are various virtual platforms and softwares which provide ample amount of facilities for the teachers and practitioners for making classes interesting and useful for young children. They may include video recorder for recording all kinds of imaginative play, such as dressing up and puppetry for young children in early childhood education. The teachers can use such technologies for playing back which was previously recorded by them. It will provide the children an audience and appreciation for the creativity imposed by them in the class. They can also make use of overhead projectors for showing pictures to the young children which can not only make a backdrop scene for drama, storytelling, a show or a puppet theatre.

B. Aesthetic Development

The Minidisk or voice recorder/player is a very flexible learning resource which can be used to listen quietly to music and can be used either in face to face communication or in virtual mode with the young children. Children enjoy moving and dancing to the music. Such software can help children to listen, imitate and experiment with sounds and movements which leads to the psychomotor development in children. Teachers can use tape recorders with karaoke devices not only to encourage children singing simple songs from their memory but also facilitate role play sessions. These applications and facilities are also available in virtual platforms which can be a great source for connecting with young children even at home.

Overhead projectors can be used in discovering and creating pattern and shape. Teachers and practitioners can help children in exploring colour, shape, form and space by placing and moving objects in different positions by using

this device which can provide a tool to recreate the children's pictures on a larger scale and display for their friends and parents to admire later. On the other hand, scanners can be used to import pictures into a paint programme for children to use as a backdrop, or to scan objects or collage materials and make patterns which can make children learn different shapes, form, color and objects around them. There are many software programmes available that can be used to paint and draw both in traditional approach of teaching and learning and virtual mode of teaching and learning.

C. Imaginative Constructions

Children's imaginative constructions can be recorded in digital cameras by their teachers in early childhood environment and these recordings can be further used when they need to be disassembled. In fact children's friendly digital cameras can be used by the children themselves for collecting patterns from objects in the world around them and adding the printouts to their 2D or 3D creations which is more interesting and playful for young children. It will enhance their abilities to learn new technologies which will further lead to cognitive and psychomotor development.

D. Language Development and Socio-Emotional Development through Communication

Computer play an important role in encouraging speech and the development of fluency of the children to a greater extent in comparison to those who are not exposed to computers and technology. According to studies, higher levels of spoken communication and co-operation are found in those children who interact with the computers on a daily basis. Language development, early literacy and socio-emotional development can be enhanced and promoted through conversations and interactions with caring adults, storytelling, drawing and painting and pretend play. Children get to know and understand the latest technologies which is helpful in enhancing their language and fluency. Other than that, coming in contact with different children, and adults through face to face interaction and technology increase their socio-emotional skills. Learning through various applications having animated rhymes, stories, role play etc. increase their moral and social values as well. Pretend play activities encourage children to express and communicate their ideas, thoughts and feelings with other children in the class and adults in their surroundings. It provides them opportunities to share, solve problems, and talk about daily events by letting them reflect their real worlds. ICT tools facilitate children to work and learn in a group which develop abilities to share, to take turn, to cooperate and to collaborate with others.

E. Enhancement of Reading skills

Teachers can help children learn in a meaningful way by using computers in the childcare setting where software programmes can be used which create a virtual environment encourage children to 'read' the screens and help them discuss with their peers about what is happening. Tape recorders can be used to give freedom to the children to listen, as well as to share comments and actions with an adult or friend as the story or rhyme is being read. It will enhance reading and listening skills in young children in a very productive way. By joining in an activity with other peers children learn the things very easily. The benefits of

group learning can be therefore expanded beyond the immediate learning environment with the use of ICT and developmentally appropriate resources.

F. Understanding the Real World They Live in

ICT and its resources play an important role in 'developing crucial knowledge, skills and understanding in young children about their immediate real environment. Digital cameras, voice / video recorders and webcams can be used by the teachers in early childhood setting to provide opportunities for the children to investigate, discover and learn about the living things, objects and materials, some of which might not be accessible otherwise, for example with a webcam placed in a wildlife area.'

G. Preparation for Future

Technology prepares children for the future and makes them ready for a formal school setting which is one of the main objective of early childhood education. Nowadays computers are used almost everywhere and by making young children exposed to the technologies from the beginning years, it will help them to be usual with the technologies and they will not face difficulties in understanding them in the future which boosts their confidence and skills in using such technology throughout their school and working lives ahead. In this competitive world of technology it is very significant to train children in such a way that they will not be left behind. If a child has access to online learning or training, learns how to play a game and reads along someone from his early years then it is more likely that the child learning abilities are polished and ready for kindergarten (Stube & Patrick, 2010).

Since most of the researches have been conducted on the use of ICT in terms of computer use only. There are key issues arising from these studies regarding use of ICT with young children in early childhood education or their good and bad influence on children. The first question that emerge out of these issues in the mind of people is like why use ICT with young children? What can be the influence of using ICT on the small minds of young children? Will it be benefitted to the children in their future endeavours?

Recent studies are viewing use of ICT in early childhood education from a socio-cultural perspective. Some of the researches stated that ICT can be integrated in a wider context of interactions with the total environment of early childhood education. Children can use ICT and its resources under proper guidance and attention during interactions with their total environment and other people, including their peers, and adults. The questions that arise from these studies are: what are the appropriate and meaningful uses of technology with young children in early childhood education? And how can ICT tools be used to enhance children's learning and development by the teachers and practitioners in ECE settings?

3. What are the areas of concern about use of ICT in Early Childhood Education?

Questions are raised by parents, teachers, and practitioners regarding the relationship of ICT with the cognitive, emotional, social, and developmental needs of young children due to the increasing pervasiveness of ICT (Stephen & Plowman, 2003, p. 4). But all the questions and debates have centred on the use of computers and computer games by young children. According to the studies,

computer use may lead to anti-social behaviour, including isolation or aggressive behaviour in young children. Some of the studies also demonstrate that excessive use of computer can not only have a negative impact on eye sight of children but also make them expose to unsuitable contents. These may contain material of a sexual or violent nature, inappropriate gender, cultural, or social stereotypes and it may displace other necessary learning and play activities.

From the previous study and investigations on the use of ICT in early childhood education, it is observed that:

- Most of the existing system does not support assessment and this will make it difficult for parents and teachers to evaluate the development level in children and their progress as well as their performance.
- Since mostly the websites are exposed to external links for advertisements purposes for earning extra income for some of the creators of online learning websites; hence children may be exposed to some of the unsafe contents in the name of advertisements and may have negative impact on them. These contents may include adult contents or violence videos.
- Another problem associated with the applications is that the lessons might not suite the syllabus of what children will be learning in their schools.

On the other hand most of the researchers argued that computer use in early childhood education should be encouraged in terms of “the essentials of a healthy childhood” for which ECE practitioners and teachers are required to be aware of the limitations within which ICT and its resources can be used in ECE settings. Children’s health and development need to be safeguard particularly regarding the use of desktop computers in the classrooms. They should take into consideration the time for spontaneous, creative play; a curriculum rich in music and the arts; reading books aloud; storytelling and poetry; rhythm and movement; cooking, building things, other handcrafts; gardening and other hands-on experiences of nature and the physical world and also set limitation for children in using software and other devices (Cordes & Miller, 2000, p. 98) [12]. Use of ICT in early childhood education have been criticised or rejected. Many researchers have criticised the Fool’s Gold position and they have characterised this position as representing a “death of childhood” thesis. They ideologically reject the positive role of ICT in early childhood education. Studies found that use of ICT encourages children to be passive recipients, and they cannot learn from these kinds of experiences. (Buckingham, 2000, cited in Stephen & Plowman, 2003; Luke, 1999; Whitebread, 2003).

For the safeguard of the children’s health, social outlook and cognitive behaviour, most of the authors have set some rules and limitations on the timing of children’s use of computers. It is stated that the use of computers should occur in relatively short spells. It should usually no more than 10 to 20 minutes for 3-year-olds, extending to no more than 40 minutes by the age of 8. However, newer, “child-sized” technologies, and alternative interface technologies such as touch-screens, modified keyboards, and hand-held computers must also be evaluated and taken care of by the ECE practitioners and should be well planned of beforehand.

It has been revealed from the studies that all computer games do not contain violence and do not harm children mentally or socially in the longrun if used under proper guidance and limitations. In fact some of them argue that use of ICT have benefits on young children which include the development of reasoning and problem solving abilities when they get exposed to immersive, interactive environment of computer games. Apart from this, computer games helps in enhancing skills in making inferences, and dealing with multiple sets and layers of information throughout each and every learning session. However, the need of the hour is practitioners and teachers should be well trained and skilled in the appropriate uses of ICT with young children in early childhood education and they should be aware of the negative and positive impact of ICT on the development of young children which should be taken care of (Siraj-Blatchford & Whitebread, 2003, p.6) [41].

4. What is Developmentally Appropriate Technology?

There are various literatures available providing guiding principles on ICT in ECE settings emphasizing developmental appropriateness. The DATEC (developmentally appropriate technology in early childhood) project in the UK (Siraj-Blatchford & Siraj-Blatchford, 2002; Siraj-Blatchford & Whitebread, 2003) [40, 41], and the American National Association for the Education of Young Children’s position statement on the use of technology with children aged 3 to 8 were highly emphasized by these authors.

The term “developmental appropriateness” has been defined in many theories in different ways. It is observed in a study conducted by Luke that children’s development depends on a step-wise series of “stages” (Luke, 1999; Downes *et al.* (2001) [20]. Some researchers in their studies have suggested that the term developmentally appropriate practice take Vygotskian perspective into consideration. This is to encourage teachers and practitioners in planning experiences that provides challenge to the children within their “zone of proximal development”. ZPD can be defined as an area of difference in the performance between what a learner can do without any help or support and what they could do with the help of a more knowledgeable or capable other.

Theoretical understandings about children’s development have been changed over time by the educationists and psychologists (Clements, 2002; Luke, 1999). According to Luke, nowadays children’s early literacy and play experiences are shaped and enhanced by electronic media and technology (Luke, 1999, p. 97).

A useful general framework for practitioners have been provided by DATEC’s eight general principles. These principles are listed below.

It is important to determine or evaluate the appropriateness of ICT applications and resources before using them in the ECE settings and this can be done by eight general principles recommended by The DATEC project. These principles are:

1. An educational purpose should be ensured by the teachers and practitioners before using ICT in the classrooms.
2. Collaboration among children should be encouraged by the teachers.
3. ICT should be integrated with other aspects of the ECE curriculum. For example, if children are required to

- understand ICT and its resources then the use of ICT should be shown to them in a meaningful context. They should be taught the real purpose of using ICT by their teachers.
4. The child should be kept under control by the teachers. Teachers should make sure that the child's interaction should not be controlled through programmed learning or any other behaviourist device.
 5. The teachers should only choose transparent and intuitive applications.
 6. Teacher should avoid those applications that contain violence or stereotyping. It may influence the child negatively.
 7. Teacher should be aware of health and safety issues of children while using ICT and should limit their use of computers and other electronic devices. Rules and regulations should be followed.
 8. Teacher should encourage parents to involve in the educational process in ECE settings.

5. Does Use of ICT help enhancing Language and Socio-Emotional Development?

There are many ways through which ICT can increase the skills of speaking, listening, reading and writing of young children in ECE settings.

In a study conducted by Robertson (2006), it was cleared that mental and social development of children can be enhanced by using five components in daily interaction with them. These components were concrete preparation, cognitive challenge, social construction, meta-cognition and bridging. First one is concrete preparation where the teachers consolidate existing knowledge of the world and bring it in front of the children making it ready for use. The children are given proper chance to interact with the outer world to know different things, to observe the phenomena around them and to facilitate them for creating their own understanding. But the teachers face difficulties in carrying concrete materials to the classroom and using them in front of children. These difficulties may include in choosing the wrong types of materials, making the environment appropriate to support learning from concrete materials, and moreover, failing in connecting concrete representations to abstract representations. Well, linking concrete to pictorial representation is also of utmost necessity for the effective understanding of young children in preschools. Sylvia Ford, an Early Childhood consultant suggested that concrete preparation helps in forming a strong foundation of understanding from the early years of children and since 3 to 6 years of human life is considered as crucial stage of human being, concrete preparation should be used in these years for their learning. Kaminski, Sloutsky, and Heckler (2009) have found out that sometimes realistic concrete materials does not match with the abstract representation and convey superficial information that interferes with learning due to mismatch of information like shape, size, colour etc. It may result into distraction from the proposed objectives of learning. Therefore, the concrete representation becomes irrelevant and distracts learners from the information that educators tries to share with children in the classroom. Some researchers also found out that the properties of physical manipulative are often irrelevant to the concept to be taught, and therefore they are said to be distracting (Sarama, Clements; 2009). Apart from this, children become more dependent on the external

environment for constructing meaningful knowledge for themselves and they sometimes are not willing to adjust with the abstract representation only. It brings a challenge for the teacher of getting concrete materials to the classroom or taking children outdoors which may be expensive for the school and the teachers. When physical manipulative are used in structured environment, it becomes more effective in learning. Teachers need to keep a delicate balance by weighing the costs and benefits of structure versus freedom of the children on the basis of both the goals of the lessons and their cognitive and behavioural strengths and weaknesses. Computers are cost effective and help teachers to show different places, images, videos etc. to the students in an effective way which gives a realistic effect to the students.

Second component is cognitive challenge which means to give challenging tasks or activities to the children in a learning environment and helping them to meet these challenges in such a way that the children will learn them from their own experiences and will be able to use these experiences in the future whenever they need it or while solving similar problems by their own. ICT can be used in this context as well. For example, teachers can give a task to the pre-schooler of arranging petals of flowers by using computer games. It will not only engage students in the task but also makes learning interesting. In this way various tasks can be given to the students in a playful way.

Third one is social construction. It enables children to interact with the people around them and it encourages them to share their ideas with others. Teachers can use computers in showing moral stories and small documentary films which can help in inculcating social, moral, spiritual and personal values in children. It enhances group activities which will assess children's abilities in sharing, turn taking and giving their viewpoints and accepting others' as well.

Fourth component is Meta cognition which is mentioned in the theories of both Vygotsky and Piaget. It is found in the mentioned theories that cognitive development occurs in children only when self-awareness is developed. Self-awareness may be defined as knowledge of one's own thought, one's own behaviour, one's own personality and one's own deeds. It leads to self-esteem and self-confidence in children once they attain self-awareness. Therefore it is the prime responsibility of the teachers to involve students in various kinds of activities where they attain self-awareness and self-understanding. This self-awareness and self-understanding may lead to the development of meta cognitive skills. ICT tools can be used to involve children in group activities where they learn about themselves as well as others.

Bridging is the fifth and the last component which means linking or transfer of knowledge. It helps children to link one experience or learning with another which is known as transfer of learning. It is an ability to apply an understanding of one particular context to the similar other context. For example, the values learned by children during group activities can be applied in the outer world. This activity can again bridge to language and vocabulary development. On the other hand, it can also lead to socio-emotional development in children. The values they learn in group are generally applied by them with family and friends. Group activities can be done by using ICT and its resources in different subjects, be it a storytelling activity, singing rhymes, arranging or sequencing numbers, learning about colors, shape, size of different objects.

6. Conclusion

Above five components will help the students to learn by discovery and help them in understanding, remembering, in applying their knowledge in the outer world. These components make a connection with the real world. So, finally it can be concluded that since the style and method of communication has been changed at different educational stages, there is a need to get a change in early childhood education as well with proper care. ICT plays a pivotal role in helping children to develop to their level best. They can explore or find anything that they want rather than just depending on the teacher or guardian to tell them all the things, they get new knowledge by using ICT. ICT prepares them for a better future and makes them accept new ways of learning. Through technology they develop both interpersonal and intrapersonal skills as well which may lead them to develop leadership qualities and positive attitude in their future life.

It is important to design, develop and use a functional advance web based application for early childhood education but yet simple that is able to focus on the understanding of children, rather than destructions. In order to prevent negative impact of ICT and its application, it is necessary to safeguard the physical and socio-emotional health by developing a system that is limited to pre-school learning activities, but not the higher learning achievement and to build up a system that explains the much needed areas taking into consideration development of children and learning ability. ICT not only gives real world experience to the children but also is cost effective. It help them to be attentive and happy to learn by using real world objects like sounds, and graphics that will attract their attention. It also improve the efficiency of teaching and learning at the preschool level and maximize the speed of learning in growing children. Use of ICT may help in meeting all the objectives of early childhood education in a better way. It is also essential that the approach should be evaluated from three different perspectives: parents, teachers and students. Since the present paper focuses only on providing an appropriate solution to the teaching and learning difficulties at pre-school level and using ICT and content web-based e-learning solution to address the gap in the setting of early childhood education. It is essential to study further on how to improve the system with respect to the future technology and innovations. In many countries, web-based e-learning system has been introduced since long and is in use in early childhood education system. It is the need of the hour that ICT and web-based e-learning system should also take place in early childhood education system in India for the betterment of students and their future endeavours. Web-based e-learning will place a healthy connection between the teachers, parents and students even if the schools are closed and prevent them from losing their studies.

7. Declaration

I do hereby declare that research article entitled "The Role and Potential of ICT and Web-Based E-Learning in Early Childhood Education: The New ABC for Socio-Emotional Development" is a record of original work. This work has not been previously published in any journal to any candidate of other university/institution.

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