

# Use of ICT for Primary science Teaching and Learning at the Primary Schools in Bangladesh

A K M Obaydullah<sup>1</sup> and Md Abdur Rahim<sup>1</sup>

<sup>1</sup>Instructor, Upazilla Resource Center(URC), Ministry of Primary and Mass Education, Bangladesh.

## ABSTRACT

*The primeor ultimate objective of teaching science is to develop such skills in a student which helps him to know the facts, principles of science, its applications, identify the objects and to make concept celerity through the use of teaching learning materials. This study investigated primary school teachers' perceptions of the barriers and challenges preventing them from integrating ICTs in the Primary science classroom. The study adopted a qualitative and quantities mixed approach research that is in line with the phenomenological perspective as it sought to acquire knowledge through understanding the direct experience of others by engaging with participants through semi structured interviews and classroom observations. The participants of this study were 40primary School teachers from 20 schools purposively sampled based on qualities like class level, working experience and gender. According to the findings of the study primary school science teachers are not yet ready to integrate ICTs into their classrooms due to a number of obstacles that include unavailability of infrastructure, equipment and web based resources in the classrooms. Teachers also lacked competence, in service training and technical support, as well as technological pedagogical content knowledge on how to integrate ICTs into teaching and learning of primary science subject. Teacher education programs should therefore adequately prepare new teachers and equip them with skills and pedagogical skills necessary integrate ICTs into their teaching. The study recommends that government forms partnerships with public and private sector to enable internet access, affordability, connectivity and coverage for all schools.*

**Keywords:** *ICT, Teaching and Learning, Integration, Barriers, Technological Pedagogical Content knowledge*

## I. Introduction:

About 20 years ago, I'd have said probably nothing. But as the years have gone by and technology has advanced, the role of ICT in education has become a major player in the delivery of teaching and learning and has transformed the education system as we once knew it. Let's rewind 20/25 years, back to when I was a little one at primary school. Handwriting and sums were done in our school books, teachers wrote on actual whiteboards or blackboards with chalk, the register was taken on paper and handed in at reception and being allowed to write with a pen instead of a pencil was a real achievement! Technology was sparse.

Now, don't get me wrong I'm not saying there wasn't a single PC in that building, but the point I'm trying to make is back then, ICT wasn't seen as anything but a rarity. Fast forward 20 years and the spectrum have totally changed.

In today's educational landscape there's an abundance of digital and networked technologies in place. From the widespread use of interactive whiteboards and virtual learning environments, to educational computer games and an increasing reliance on the use of cloud based technologies such as the internet, email and e-learning platforms. ICT and computing today is huge, so much so that it's even become part of the curriculum. The important role that information and communication technologies (ICTs) play in many educational and business institutions of the 21st century cannot be overemphasized. Information and communication technology (ICT) has become an unavoidable reality in human's life in this information age. Bangladesh has made primary education compulsory but not ICT education. The idea of digital Bangladesh has been trying to ensure education for all by vision 2021 to achieve the Sustainable Development Goals (SDG) (Islam, 2010, p.5). To achieve this target, government of Bangladesh has been trying to introduce ICT in primary education all over the country. Global experience is that everyday life is mostly dependent on the current technological interventions. There are remarkable advancement occurred in the ICT areas in last few decades. Different organizations and disciplines want touse this electronic potential for service delivery in order to be more beneficial. The education system is not apart from this dimension. The use of ICTs in the classroom in this information age is very essential in providing opportunities for students to learn.

## II. Statement of the problem:

Despite the political will be shown by the government through the presidential computerization program, rapid growth in ICT access by teachers and students both at home and school and availability of educational software, most primary science teachers are reluctant in adapting and integrating ICT tools during teaching and learning. It appears that they are facing challenges in adopting and using efficiently the ICTs in the classroom. It is against this background that an investigation of the challenges preventing teachers from adoption and using ICTs in primary science teaching and learning in the district of Dhaka and Gazipur of Bangladesh was conceptualized.

## III. Research Questions:

The study was guided by the following questions:

- What are teacher perceptions on challenges and barriers that prevent primary science teachers from using ICT in the primary school classroom?
- What can be done to enhance primary science teachers' adoption and integration of ICTs into their teaching and learning?
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## IV. Methodology:

The research work was qualitative and quantitative in nature. Different types of data collection tools were used in the study- Document Analysis, Questionnaire, Literature review, personal experience gained from school visit, observation during ICT training for primary school teachers conducted by primary teachers training institute (PTI). Purposive sampling technique was used to select the school. To collect opinion of respondents, purposively forty science teachers were selected from forty government primary school (GPS) in Dhaka and Gazipur district of Bangladesh. They should be encouraged to understand how ICT can be used, to explain what is occurring, predict how things will behave and analyze causes.

## V. Significance of the study:

The findings and recommendations of this study are expected to provide strategies that can be adopted to assist primary schools and teachers in making decisions on how to adopt and use ICTs in primary science teaching. Furthermore, the findings of the study can be used by policy makers and planners to revamp the current ICT policy in order to overcome the challenges hindering smooth adoption and use of ICTs in primary science teaching and learning. Further, this study will also be helpful for primary science teachers to take into consideration the obstacles that they face in during adoption and integration of ICTs into teaching and prepare themselves to become better teachers. The findings would be helping the policy makers to improve early ICT education in primary school for achieving MDGs as well as government goal. At present experiences indicate that ICT education programs have significant contributions to reduce overall dropouts and grade repetitions. Research Methodology Research design This study adopted a qualitative and quantitative mixed research approach that is in line with the phenomenological perspective as it sought to acquire knowledge through understanding the direct experience of others by engaging with participants through semi structured interviews and classroom observations (McMillan & Wergin 2006). As pointed by Creswell (2006) a phenomenological study describes the meaning for several individuals of their lived experiences of a concept or a phenomenon by focusing on a description of what all participants have in common as they experience a phenomenon. In this research, the participants of this study were 40 people primary school teachers. Their selection was influenced by the aim of the study and also on the aspect of trying to get variations in experiences as far as possible (Kimaryo, 2011). In this study, the phenomenon of our interest was to explore primary school teachers' perceptions of the barriers to integration of ICTs into primary science teaching and learning at the primary school level. The participants were purposively sampled based on based on qualities like class level, working experience and gender. Since the researcher wanted to gather useful information relating to the phenomena being studied, limit of teaching experience was not set because the researchers wanted to get experiences of both short and long servicing teachers. Teacher professional qualifications were not considered as a criterion for selection because almost all the participants had the same qualifications.

### Why technology in primary schools is important:

Some reason given below:

- **Extends the learning experience** – raises standards across the curriculum to improve the delivery of lesson content and allows students to engage in class in a variety of ways.
- **Extends learning** – takes teaching and learning beyond the four walls of the classroom for an anytime, anywhere approach. Meaning students and teachers can continue to work and access resources even from home.
- **Enriches the curriculum** – provides access to a whole host of information and encourages collaborative working and communication with others. The world is effectively brought into the classroom and pupils become more engaged in their learning.
- **Expands learning horizons** – access to fast internet connections allows for learning materials to be viewed, downloaded and worked through quickly. As well as this, the use of tools such as Skype for Business can be a great way of broadening the learning horizon by collaborating with others anywhere in the world!
- **Helps with assessment** – Teacher's data can be recorded and analyzed more efficiently for accurate assessment of students learning abilities. It then allows teachers to see which areas of learning need a higher level of support.

### VI. Potential of ICT in Education:

Among different technological interventions, computers and multimedia have become an integral part of the presentation of a subject in effective way. Yelland (2005, p.233) argued that ICT has a vital role in the way of acquiring knowledge about content and it also work as a vehicle for communicating ideas in effective ways. The uses of computers are rapidly increasing because experience shows that computer has power to make significant difference in the workplace. As a result traditional manual work is replacing by modern computer application. There are many evidence found in various research that computer can enhance learning. Children feel attraction to work with computer because it is visual. As a media, visual presentation has its own power to its audience. Moreover computer has speed, color which lead children to develop their imagination and thinking. Research shows in England that 'ICT is becoming increasingly valuable in supporting learning across the curriculum and for developing spoken language in particular' (Broker and Siraj-Blatchford, 2002, cited in Riley, J. 2007). The research examines and came to the conclusion that ICT can help bilingual children's speaking and listening using a computer with developmentally appropriate software in early childhood.

### VII. ICT in Bangladesh:

ICT is currently considered as the most priority sector for development in Bangladesh that ever had. Government takes this area for development so seriously that it has made significant difference in many planning, policies and financial allocation. Bangladesh government is in line with the world summit on information society (WSIS) in Geneva in 2003 and in Tunis in 2005 (Tunis Commitment) (MOICT). In line with that Government declare its 'Digital Bangladesh by 2021' vision. The vision plans to mainstreams ICT as a tool to eradicate poverty, establish good governance, ensure social equality through quality education, healthcare and law enforcement for all, and prepare the country for climate change (PMO, 2010). Currently to give more thrust for ICT sector the division has upgraded as Ministry of Information & Communication Technology in 2011. The change is the evidence of understanding of the importance of ICT from the highest policy level and also an indication that the government is keen to keep pace with modern changing world. The change has brought new life to the activities of Ministry of Information & Communication Technology (MOICT).

### VIII. ICT in Primary Education in Bangladesh:

Ministry of Primary and Mass Education is committed to ensure quality primary education for all children in Bangladesh. Doing so it has started to utilize the opportunity of using the contemporary technology like computer, multimedia to enhance teaching learning process in government primary school. Currently it has incorporated digital Bangladesh agenda in its plans and program and has been taken initiatives to introduce multimedia as a learning tool in the classroom context. It has already provided one laptop and one multimedia in all Model Primary School in Bangladesh (DPE, 2011a). Its ongoing program Third Primary Education Development Program (PEDP-III) has been more specifically planned to implement the program objectives.

### IX. Third Primary Education Development Program:

Government of Bangladesh has completed Second Primary Education Development Program (2003-2011) and started Third Primary Education Development Program (2011-2018). The objective of the program three is to provide quality education for all children of primary school age population. To achieve this goal it has specified different objectives and two are more closely related to the ICT in education. They are, firstly, to improve the quality of teaching learning environment in the primary schools and secondly, to impart proper training to teachers and staff. These objectives will be addressed under the 'Component One' called 'learning and teaching' among the four components of program three. ICT in Education is incorporated with necessary financial allocation as a subcomponent. The objective of the subcomponent is to formulate a realistic action plan to provide a multimedia based classroom in one model school in each Upazila and to provide every primary school with access to new technology for learning. Moreover, Diploma in Education is in process of replacing C in Ed training for primary school teacher by 2013. ICT in Education introduced as a separate subject of study in this course for teacher training.

### X. Training on Digital content:

Currently directorate of primary education of Bangladesh organized training on preparing digital content for the primary school teachers of primary schools and it conducted by primary teachers training institute (PTI). Both head teachers and assistant teachers are participated on that training. The objective of the training was to prepare teachers to develop power point presentation and using internet.

### XI. Data collection and analysis:

The data was collected from between April to July 2018. The observations took place in primary school elementary science classrooms. Each teacher was observed for one lessons lasting 35 minutes each. After the classroom observations, the researchers interviewed the participants. A semi structured interview guide designed by the researchers was used to elicit information for this study. The interviews lasted for one hour and were digitally audios recorded and then transcribed. The reliability of the data was enhanced through probing and restatement of questions in a slightly different form later in interviews. Further probing beyond the answers given was done to obtain clarification and to provide opportunity for elaboration. The data was analyzed in a manner consistent with approaches suggested and outlined by Bell (2005). The data was sorted into categories with identifiable commonalities and recurring themes which reflected the purpose of the research for interpretation and analysis. Results and discussion Data were analyzed for themes and patterns in reference to the two research questions. The focus of the questions was in discovering the barriers teachers face in integrating ICTs into primary science teaching and learning and how these can be overcome.

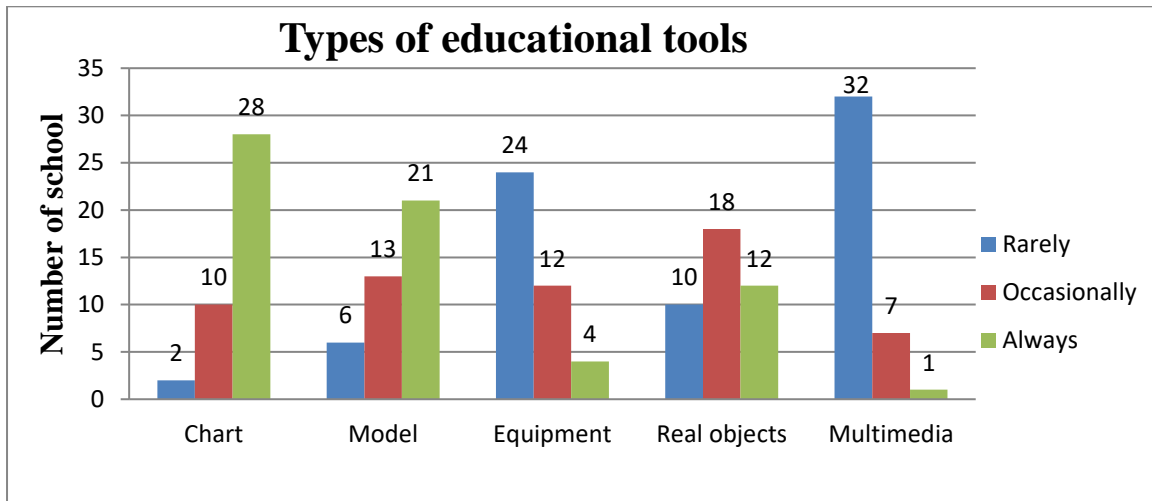
**Table1: trained teacher in the school of study area**

ICT	Dip Ed/C in Ed	Subject based
4	38	31

In this data shows that only 4 teachers are ICT trained up, maximum teacher DP Ed/C in Ed training and Subject based trained up.

**Table2: Types of educational tools use in the classroom.**

Materials	Rarely	Occasionally	Always
Chart	2	10	28
Model	6	13	21
Equipment	24	12	4
Real objects	10	18	12
Multimedia	32	7	1

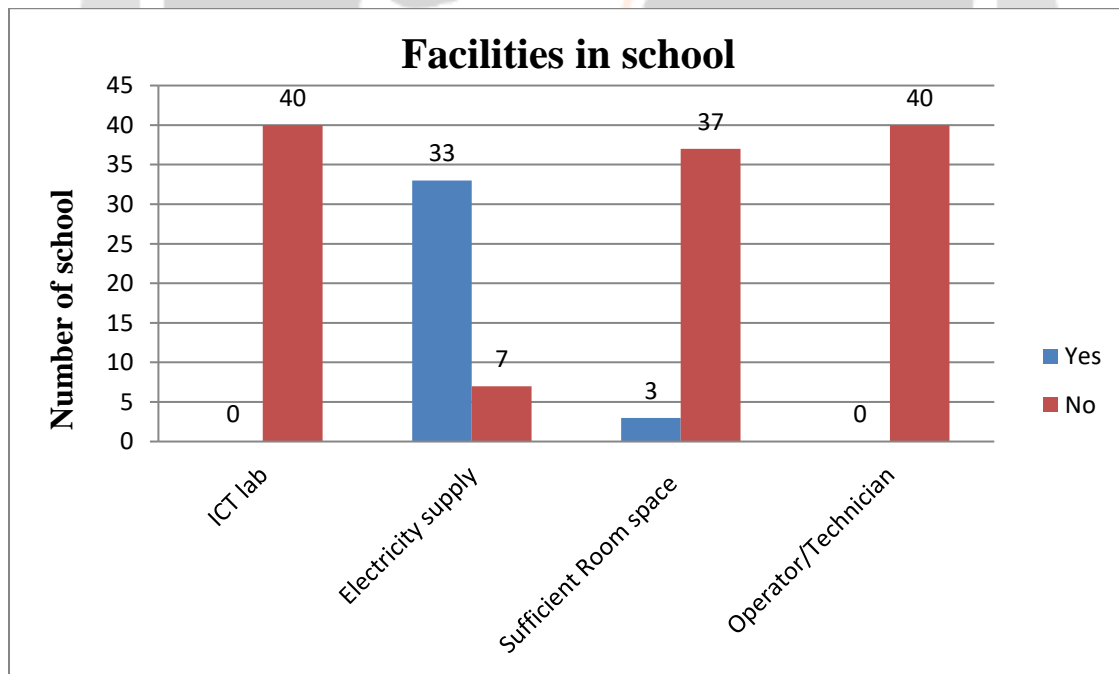


**Figure-1: Types of educational tools use in the classroom.**

In this data shows that 32 school rarely use multimedia, maximum school use traditional materials like chart and model.

**Table3: Facilities in school**

Facilities	Yes	No
ICT lab	0	40
Electricity supply	33	7
Sufficient Room space	3	37
Operator/Technician	0	40



**Figure-2: Facilities in school**

In this data indicate that operator and ICT lab or special class room not available in the school, no electric supply in 7schools. Moreover load shading is available.

## XII. Results:

Data were analyzed for themes and patterns in reference to the two research questions. The focus of the questions was in discovering the barriers teachers face in integrating ICTs into primary science teaching and learning and how these can be overcome.

**Research Question 1:** What are teacher perceptions on challenges and barriers that prevent primary science teachers from using ICT in the primary school classroom?

The following discussion provides a list of all barriers that were mentioned during the interviews or noticed during the observations. Unavailability of infrastructure, equipment and web based resources in the classrooms the effective integration of ICT requires the availability of equipment, infrastructure, supplies of computers and their proper maintenance including other accessories (software and hard ware). The study found that all classrooms were not properly equipped. They lacked equipment such computers, projectors as well as internet connectivity. All the teachers interviewed and observed lack ICT equipment in their classrooms. The teachers also noted that their schools do have computer labs but the computers were lying idle due to unavailability of electricity or had broken down and needed repairs. Internet connectivity does not exist in all the schools under study hence teachers have no/limited access to internet. As noted by teacher A “lack of internet connectivity is one of the barriers against the use of web based resources and materials for primary science teaching. The other barrier is old, obsolete and broken down computers. We are also not connected to the internet due to prohibitive costs” The majority of teachers who participated in the study emphasized on these barriers. The findings of the study are consistent with those of Unal and Ozturk, (2012) who found lack of ICT equipment in social studies classrooms in Turkey. Goktas, Yildirim and Yildirim (2009) also found out that integration of ICTs into pre-service teacher education programs is affected by, lack of appropriate software and hardware materials. Studies by Becta (2005) have also shown that lack of internet connectivity and where connectivity is not readily available hinders the process of ICT integration. On this issue one teacher had this to say “lack of skills is a barrier preventing us from using ICTs for teaching and learning. Furthermore in-service training opportunities are not adequate enough to equip us in the use of ICTs in the primary science classroom” another one Teacher noted that “as teachers we lack training and in-service training programs for primary science teachers are insufficient”. The study also noted that the teachers need technical assistance on the use of ICTs in the classroom. Technicians are required to monitor and fix serious technical problems. The findings of the study are consistent with those of Tsai and Chai (2012) the importance of teachers having design thinking capacities for the effective implementation of ICT integration into teaching and learning. They further call upon the enhancement of such capacities into teachers and its inclusion into teacher training programs. Hence the design thinking capabilities should be developed in every classroom teacher for effective integration of ICTs into teaching and learning.

**Research Question 2:** What can be done to enhance primary science teachers’ adoption and integration of ICTs into their teaching and learning?

Based on the challenges resulting from the findings, respondents interviewed suggested a number of strategies that can be implemented to enhance integration of ICTs into primary science teaching and learning. Among these includes the development of appropriate teaching methodologies for integrating ICT as well as the development of effective strategies the care and maintenance of ICT resources. Furthermore, the respondents also felt the need for the Ministry of Primary and Mass education to empower schools with adequate funding and infrastructural facilities to enable schools to integrate ICTs into teaching and learning.

The interviewed respondents felt that they need also to be equipped with resources, technical as well as pedagogical skills to enable them too effectively to integrate ICT in primary school elementary science teaching. One of the respondents had this to say “ primary science teachers need resources and training on the use of computers and their application in teaching and learning in their subject to enable them to use various application software programs” The respondents also identified the need for internet connectivity to improve communication and collaboration amongst themselves. One of the teachers had this to say ensure the internet connectivity in schools. So that we can be able to access learning materials, update software and content areas from various websites. We also need to communicate educational matters and collaborate with other primary science teachers on matters affecting the teaching and learning of the subject so that student learning can be enhanced.”

The findings of the study have shown that teachers feel that they are not adequately prepared; hence there is a high likelihood that they will not integrate ICT into teaching and learning. In order to address their state of preparedness, the respondents suggested the organization of professional development conferences, workshops and seminars for teachers so that they are equipped with both pedagogical and technical skills on integration of ICT into primary science teaching. The need for further training as well as professional development is the key to successful integration of ICTs into teaching and learning (Yıldırım, 2009).

The respondents further suggested the need for government to harnessing public and private sector investments to enable internet access, affordability, connectivity and coverage for all schools. One of the respondents had this to say “ integration of ICT into teaching and learning requires teachers to have an understanding of the technological tools that will enhance student understanding and should also possess basic technological skills and knowledge on how to use ICTs effectively in the classroom.” As noted by Ihmeideh (2009), teacher training is critical to prepare teachers to use technology of their classes with their students. The respondents also indicated the need to integrate ICTs in teacher training programs as a means to influence how they will use technology upon completion. The study also noted that this essential task of preparing teachers to use information communication technologies has mainly been left to their post university experiences, hence the need to include it their initial teacher training experiences at college level.

### **XIII. Discussion:**

Even though the initiative to use multimedia in the government primary school is no doubt timely and useful for the development of upgraded overall primary education system however there are some issues related with using multimedia in the classroom context in Bangladesh. Government has just started to introduce technology and it has provided one laptop and one multimedia in some primary school in each Upazila. According to this plan at this moment one school has only one laptop which is not sufficient for all students in the school. Therefore and for other reasons, some issues exist which is encountered by the school and the teacher.

**Firstly**, the school condition of using multimedia in the classroom is not well arranged. As at this moment the school has only one laptop, so there is no specific setting arrangement of that. As the school never experiencing the use of current technology so there are not necessary logistic arrangements, for instance, electric point or multiple software installation, antivirus and so on for the laptop and multimedia in the classroom as well. Teachers often confused in which class and who will use the multimedia. Usually the laptop and multimedia kept in the head teacher’s room. In the observation it’s found that, one school decided to use nearly Upazila Resource Centre (URC) training room as a classroom with the help of URC Instructor. In this way, URC Instructor and Head teacher organize the training room of URC as a classroom and the particular teacher conduct the class going to URC with the students. Both teacher and student found happy to walk between the school and URC for new teaching learning process.

**Secondly**, high class size is another factor to use multimedia in government primary school. It is till reality that government schools are overloaded with students. Teacher-student ratio is still low in government primary school. Government published a document named, Bangladesh Primary Education, Annual Sector Performance Report (ASPR) 2014. According to this report, PSQL (Primary school quality level) standard there should be 46 students per teacher. According to this scenario overcrowded classroom is not favorable for creating a joyful class utilizing the power of visual media like multimedia.

**Thirdly**, it is generally known that primary school teachers maintain a very busy schedule. Teacher’s busy life is deeply rooted with lack of teachers in regards with teacher-student ratio and many other factors including their living relatively far from school and so on. Moreover school location is not always making their life easy especially in rural areas. Primary schooling time of Bangladesh is from 9am to 4. 30pm. usually teachers do not enjoy break between classes. Furthermore, sometimes they are busy with training, meeting, and different administrative duties. All these issues make complexities to play a quality teaching in teacher’s life. Although during PEDP-II recruitment of teachers has improved and vacancies have been reduced and PEDP-III aims to increase teachers number and will work in the teacher’s development, in the existing system observation shows that teachers feel lack of time and energy to take preparation for the next class. There are evidence that very few trained teacher use teaching aid in the classroom. When they asked about the reason, generally all teachers mention about their business. In line with that it is assumed that they perhaps do not manage time to take preparation for make digital content and other preparation involved.

**Finally**, pedagogical issue is one important issue involved with ICT application in the education system. Yelland (2005, p.239) argued that ICT has potential to create opportunities for exploration but this could be possible ‘with a clear articulation about the goals of the educative process’ with ICT. Huge pedagogical integration and careful judgment is involved with the computer application in the classroom. Computer can contribute in educational context in many aspects so the proper utilization depends on how efficiently teacher can transform their daily class into digital content without hampering the recommended teaching learning activities by the Cin Ed training. Shelly et al. (2004) suggested two ways of efficient integration of curriculum with ICT that teacher need to determine the learning outcome and identify the appropriate technology tool and find out the pedagogy for innovative teaching.

### **XIV. Recommendation and conclusion:**

If used appropriately and supported properly within the school by a technician, ICT can dramatically improve achievement levels, inspire creative thinking and encourage the development of skills that will prove invaluable in the real world. We live in an age of computers, so the sooner pupils become afraid with technology, the better. While researching and resourcing technology products and equipment can prove time-consuming, it is worth the effort. ICT can save teacher's time and inspire pupils to learn, so let's get tapping those keypads, pointing those cameras and have some fun. It is very appreciable and good sign for the nation that it has started ICT possibly at all spheres of the areas dealt with the development in Bangladesh. Although many background difficulties exists at this moment in the system however it is very common to encounter such trouble in a technical area like ICT. Therefore education system should embrace very positively to utilize the potential in the classroom. Children of Bangladesh should have the right to develop themselves as the children of twenty first century in this information age. In conclusion, more specifically in brief, firstly the relevant authority should emphasis on teacher training on ICT, Secondly, PTI and URC should lead the academic aspect of the teaching learning process in the primary school. Research on teaching-learning, ICT integration with curriculum, education software and related problem areas should be more encouraged.

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