Impact of Incorporating ICT Skills into the Curriculum of the Bhutanese Education System

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Information and Communication Technology is considered as an important tool for the development of modern education in the 21st century. This research aims to provide insights into the impact of integrating ICT skills into the curriculum of the Bhutanese education system on students' academic performance, including their proficiency in using technology for communication, collaboration, and problem-solving. It is seen that most of schools in Bhutan do not have sufficient computers and internet connection in the schools. Recently, the Government of Bhutan has emphasized the implementation of ICT in all sectors and education was given higher priority. Bhutan has launched its first telecommunication network only in 1963. Only in 1999, Bhutan had officially launched with internet and television. Study was carried out using the survey questionnaires, data were collected, analyzed and represented in different graphs and table forms. Shortage of ICT infrastructures and technical expertise is seen to be major barriers to ICT integration in the schools of Bhutan.

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1. INTRODUCTION

ICTs are technologies or devices that facilitate us to receive information and communicate or exchange with others. It refers to technologies that provide information through tele-communications. CT is similar to Information Technology (IT), but focuses more on communication technologies. This includes the internet, wireless network, cell phones, and other medium of communication. Reddi [1] stated that, ICT education means "ICT supported education" or "ICT enabled education" which means the use of ICTs as a primary channel of educational interaction. According to Anderson [2], ICT comprise many technologies for capturing, interpreting, storing and transmitting information. In brief, according to Khan, Hasan & Clement [3], ICT in education are those technologies include computers, internet, broadcasting technologies (radio and television), and telephony that can facilitate both delivery of instruction and learning processes.

Bhutan is a small and peaceful country lying between China in the north and India in the south. Bhutan was first unified by Zhabdrung Ngawang Namgyal a Tibetan Lama in 17th century and was ruled by various leaders under the dual system of governance (secular and spiritual) initiated by the unifier till the monarchy system was established in 1907. In 1907, the first monarch was enthroned to rule the country belonging to Wangchuck Dynasty. Bhutan has constitutional monarchy today and the first parliamentary election was held in 2008. Under the leadership of His majesty King Jigme Singye Wangchuck, Bhutan had pursued a unique development philosophy of 'Gross National Happiness'. The Ministry of Education has provided support in the form of training for school principals and teachers to implement GNH principles in teaching and learning as well as management [4]. The country has celebrated hundred years of modern education in 2012, since the establishment of first school in 1912 in Haa District. Prior to that, the most common form of education was monastic education [5].

Bhutan launched its first telecommunication network only in 1963. It was in 1998 that a fully digital national telecommunication network was established connecting all districts and major towns of Bhutan [6]. Until 1999, the only medium of sharing the news and events were through newspaper (Kuensel) and radio (Bhutan broadcasting service). Internet and television was first officially launched in 1999 [7]. Hence forth, ICT has been recognised by the Royal Government of Bhutan (RGoB) as important developmental tool for the people of Bhutan. The Government of Bhutan has emphasized the implementation of ICT in all sectors and education is given the high priority. National Education Policy (NEP), 2012 emphasized that all schools in Bhutan shall have high-speed internet connectivity and Student should access to the internet in schools to enhance their learning.

Ministry of Information and Communication (MoIC), 2004, further emphasized that, ICT is paramount to school education, both from the perspective of the students' future as well as providing tools to improve teaching and learning. The ICT plays a vital role in the economic development of the country. The first diffusion of ICT is now evident and its influence on economic systems in both developed and developing countries has increased during the last two decades [8]. According to Tobgay & Wangmo [6], ICT becomes an essential tool for achieving international goals such as the United Nations Millennium Development Goals (MDGs).

Realizing the importance of ICT in the country, the government has launched the Chiphen Rigphel (broadly meaning "empowering society, enabling a nation")Project, the largest ICT skill building project in the country [9].The project was initiated in 2010, with financial assistance from government of India amounting to Nu 2.05 billion and started with National Institute of Information and Technology (NIIT) as an enabler. It is a comprehensive programme that provides ICT training for Government and local leaders, senior and middle level managers, ICT professionals, teachers, youths, monks, entrepreneurs and children in rural communities [10]. Theprogramme also involves in equipping schools with computer laboratories, setting up of ICT training centers in the University, Vocational Institutes and Community Centers.

It is evident that, Information and Communication Technology plays a crucial role in the development of education system. It facilitates the teaching and learning and enriches the skills of individual learners. According to Dhanwani [11], ICT develops the interest among the students and make the students to gain the mastery over the content. ICTs play a vital role in redefining education in respond to contemporary information society needs [12]. ICT is an

important source for the students and the teachers to keep themselves abreast of emerging issues and share knowledge.

The main aim of incorporating ICT in the Bhutanese education is very genuine because ICT becomes the vital part of teaching and learning in the 21st century. The educators believe that, ICTs improve the learning process through the provision of more interactive educational materials and facilitate the easy acquisition of basic skills. With emphasis on providing wholesome and relevant education, integrating ICT for education will prepare our future citizens for the Information Age [10]. The Ministry of Education (MoE) also felt that, students should learn the basic concepts of ICTs and their role in the knowledge society in meeting the development goals of a society. Schools can learn and share new information and expertise if they are well equipped with ICT facilities. It is believed that the use of ICT in education can increase access to learning opportunities which enhances the quality of education with advanced teaching methods and learning outcomes [13]. The objective of this study is to contribute to the ongoing discussions and debates about the role of ICT in education, specifically in the context of Bhutan, and to identify opportunities for improving the effectiveness of the ICT curriculum to better meet the needs of students in the 21st-century workplace.

2. LITERATURE REVIEW

Literature review is the crucial task while writing the policy report. Although there has been very limited literature and information available of a Bhutanese context on integration of ICT in Bhutanese curriculum, but the research and publications done by others on ICT education has provided huge amount of relevant information.

2.1 Need for ICT in Teaching and Learning

Khan et al. [3] claims that, ICT as an important means to promote new methods of instruction in teaching and learning. The use of ICT offers powerful learning environments and transforms the learning so that students can deal with knowledge in an active, self-directed and constructive way (Volman & Van Eck, 2001; de Corte et al. 2003). The Ministry of Education (MoE) is fully committed to ICTization of schools

and introduction of ICT classes into the school curricula at all levels by 2010. This is clearly spelt out in the MoE's "IT in Education Implementation Strategies [EIS] 2003" [10]. Anderson [2] stated that Schools, colleges and universities are an integral part of any society, in the same way ICT are indispensable to the functioning of modern societies.

Understanding the significance of ICT in the school curriculum, ICT training was introduced in the two teachers training colleges to enable new teachers to acquire ICT skills and use of ICT in teaching in 2000 [14]. The programme is supported by Singapore International Foundation (SIF), a nonprofit foundation, for assistance in developing an ICT enhanced curriculum for teacher education and for assistance in building capacity so that the colleges would be able to provide ICT training.

According to RGoB, Tenth Five Year plan, (2008-2013) Bhutan's ICT Policy and Strategies (BIPS), provides a clear direction for the sectors to harness the potential of ICT. The ICT sector will be developed by improving its infrastructure and upgrading and expanding the existing nationwide ICT backbone network. Recognizing information and communication technology (ICT) as an important tool for social, cultural, political and economic development, the Royal Government established the Ministry of Information and Communications in July 2003 [10]. The policy has further supported the development of e-services and carried out the flow of information between the governmental agencies to deliver the public services. Bhutan Telecommunications and Broadband Policy (BTBP) 2013 targetedto achieve 100% of the entire primary and secondary schools to have broadband access by the end of the 11th Five Year Plan.

According to Reddi [1], the Republic of Korea and Singapore are advanced Asian countries with integrated ICT in the education system. Almost all the classrooms are equipped with computers and ICT tools, internet access is available and delivery of education is increasingly online. The second group of countries includes, China, India, Japan, Malaysia, Philippines and Thailand where various ICT integration policies have been formulated but ICT are not fully integrated into the education system. The third group of countries includes Bhutan and Nepal where ICT integration has just begun with good progress but

ICT infrastructure and penetration are still limited in the rural areas.

According to UNESCO Institute for Statistics (2014), many countries yet need to develop policy specifically on ICT in Education. The countries include India, Maldives, Lao People's Democratic Republic and Bhutan. While Bhutan with the support of UNESCO office New Delhi has recently prepared a draft plan on ICT.

From the table it is seen that, Kyrgyzstan implement ICT education only in the lower secondary education, Kazakhstan, Cambodia, Myanmar, Nepal and Sri Lanka implement in higher secondary education. Armenia, Bhutan, Lao PDR, Philippines and Samoa give important to ICT education only to Lower and higher education, but neglected the ICT in primary education. Australia, New Zealand and rest of the Asian countries gives equal importance to ICT in all the level of education.

In the 21st century Bhutan believes that ICT can help in achieving poverty reduction and has recognized it as an important tool to achieve its development objectives. Bhutan as well as many other developing nations felt that, ICT as a bridge to reduce the gap between the developed and the developing nations [15]. BIPS [16], claims that ICT can be used to create business, jobs, tap international markets, preserve and promote cultural heritage and support good governance. In its entirety, ICT helps to create information and knowledge-based society. ICT provides a number of facilities to students to study at their own pace and clear the doubts of the students as they can learn through the material [11].

According to Tobgay and Wangmo [6], tenth five year plan (draft) gives higher priority on the usage of ICT in the schools to enhance the quality of education to achieve competency in languages including ICT, comparable to international standards [17]. The draft also focused on long term target to meet a computer-student ratio of 1:10 in higher secondary schools by 2012 and 1:20 in lower secondary and primary schools by 2020. "Hundred community primary schools were provided with two computers and a printer each, with free internet facilities where feasible. One teacher from each of these schools was trained in basic computing skills" [18]. The importance of ICT has been recognized as an interactive medium to learning and it is incorporated into the school curriculum to enhance ICT skills in teaching and learning

[18].Compared to some of the neighbors in Asia, Bhutan has shown higher per capita growth in terms of Internet user penetration in the recent time [6].

According to RGoB [19], ICT can improve the efficiency of Government as well as the provision of crucial information and services to citizens. The article further highlighted that; ICT can enhance efforts in a number of national priorities, such as de-centralization, private sector development and good governance.ICT can make governance and policy making more transparent by providing citizens with key information and encourage them to participate in policy formulation.

2.2 ICT in Distance Education

ICT is crucial for Distance Teacher Education Program. The Distance Teacher Education Program (DTEP) is a three years Bachelor of Education for Primary teachers (BEdP) [20]. The program is carry out in Samtse College of Education and Paro College of Education for the teachers who need to upgrade their credentials. The authors further emphasis that DTEP will help the students to learn the skills of ICT usage, which is fast growing aspect of today's world. Use of ICT helps the learners to easily obtain the materials for their assignments and to correspond with their tutors. Rao AM. [21] asserts that, ICT is playing a vital role in open and distance learning to meet the requirements and expectations of the learners in large scale. In distance learning, learners are resided far from the institutions and it is difficult for the learners to visit the institutions every day to get the service. At the same time, it is even difficult for the institutions to provide various services to the learners at different phases. Herein, information and communication technology is a prime resource to overcome such limitations [21]. Dhanwani [11] stated that, ICT plays a vital role in open and distance learning to meet the requirements and expectations of learners in wider scales.

2.3 Challenges in Incorporating ICT

However, in many developing countries, teaching and learning still take place predominantly within the domain of textbooks and with minimal interaction with the outside world [7]. Choeda et al. [4] states that, lack of proper infrastructures, low internet bandwidth, inconsistent internet service, and lack of training in ICT-pedagogy are the main barriers to ICT education in Bhutanese

schools. Besides that, Lack of knowledge of computer software, heavy workload and time constraint for teachers are some of the major hurdles affecting integration of ICT in the school. Besides teaching, teachers in Bhutan have to be games and sport in charge, scout teacher, teacher librarian, cultural teacher and different club in charges. With all the workload teachers has to compromise the quality teaching in some cases. Teachers in Bhutan did not get any long-term course on ICT and use of computers. They are hardly provided with short refresher courses for about fifteen days so far.

Tobgay & Wangmo [6] claims that, ICT sector faces numerous challenges in Bhutan such as poor understanding about ICT, lack of ICT expertise, poor content in national language, limited internet access, lack of budget for ICT and poor research and development initiatives the field of ICT. Due to several factors, the price for internet connections in Bhutan is excessively high in Bhutan. The authors further emphasized that, to make ICT facilities affordable to each and every citizen, the price for an internet connection should be reasonable. Jamtsho [22] asserts that, financial constraints and security issues are some of the other barriers for integration of ICT in our country. The author claims that security is the measure issue because Bhutan being very new to the IT world and security has been main problems due to lack of technical experts in the field of ICT. In most developing countries it is very hard when it comes to implementing technology into education systems because it involves substantial funding by government which government cannot effort [23]. The funding is necessary for setting up the infrastructure, maintenance and support of ICT facilities and provide training to the teachers. Implementation

of ICT largely depends on the quality of infrastructure, teachers and school administration. National Statistical Bureau [NSB] report (2012) states that, Bhutan is a developing country with literacy rate of just 63% and still 17 % of Bhutanese population is living below the poverty line purchasing of personal computer and internet access are generally too expensive for them.

According to UNESCO Bangkok [13], provision of ICT education is still a challenge in most part of Bhutan. This is because; the resources available in the training colleges did not match in schools. For example, the Internet access is available in the Paro College but schools where the teacher got placement did not have any Internet access. In some cases, funds were not available to purchase some of the software. Incorporation of ICT demands all the resources such as, computers, printers, multimedia projectors, scanners etc, which are not available all the schools. Khan et al. [3] stated that, computers require up-to-date hardware and software with high-speed internet connection for integrating ICT into the curriculum. Effective implementation of technology into the education system requires substantial funding, that is hard to manage in developing countries like Bhutan, where many people are living below the poverty line [6]. Moreover, ICTization programme came very late in Bhutan and internet and television was officially introduced only in June 1999. It shows that Bhutan is lagging much behind comparing rest of the world. According to Thomas & Kumar (n.d.), in 2006, only 3 percent of Bhutan's population (Internet world status, 2006) have access to internet while 82 percent of the population in western (OECD, 2001) developed countries has access to in internet.

Table 1. Percentage of internet user adult population in 2013 from some of the countries of South Asia

Countries	Adult Popn.	Internet User	% Of Internet user
Singapore	2.66	1.06	39.92
Hong Kong	5.34	0.075	14.06
Japan	102.64	10.3	10.44
Taiwan	16.09	1.8	11.19
S. Korea	34.2	0.9	2.63
Malaysia	12.58	0.16	1.27
China	869.93	2.47	0.28
Philippines	44.69	0.12	0.27
Thailand	42.72	0.11	0.26
India	598.88	0.27	0.05
Vietnam	46.25	0.01	0.02

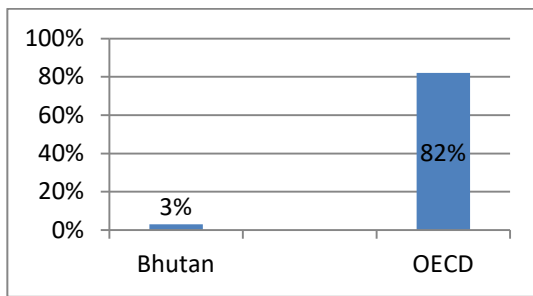*Source: Technology Pedagogy Combine: Need for Quality in Distance Open Learning*

Fig. 1. Bhutan and OECD access to internet in 2006
Source: Geographic Information System - A Tool for Bridging Digital Divide in Bhutan

3. RESEARCH METHODOLOGY

3.1 Population and Sample

There are 19 public schools in Thimphu. With random sampling method, four schools were taken which is 20 percent of the total. Names of different levels of schools were written in small chits and picked up randomly. A total of thirty-two respondents, twenty-eight teachers and four principals from four different schools were interviewed using semi-structured self-administered questionnaires. Out of thirty-two teachers three of them were teaching computer as well. Seven teachers and a principal each from four different schools that is one primary, one lower secondary, one middle secondary and a higher secondary were distributed with survey questionnaires. The majority of the respondents were female teachers with twenty-two female and only ten males. The questions include demographic and ICT related questions. All the thirty-two respondents completed the questionnaires however the response rate varied across the different questions (some respondents left out some questions). The formal signed participants' written consent was sort before the execution of the collection of data through the Ministry of Education.

3.2 Data Collection

The data were collected in the month of October 2014. Data have been collected using mixed approaches. Survey questionnaires were administered to get the quantitative data and IBM SPSS statistics version 21 has been used to analyze the same. Data were collected using the survey questionnaires. Each participant has to answer thirty-three questions related to their personal information and the ICT infrastructures of their schools. All the participants completed the questionnaires, however some of the participants left out some questions. The schools were randomly selected to collect the data. Survey questionnaires were distributed to the teachers through their principal and all the respondents were clearly explained about the purpose of my research.

3.3 Research Instruments

Only survey questionnaires are used as research instrument. Questionnaire is one of the most reliable forms of primary data collection. Researchers felt that questionnaires reduce bias as the respondents can freely express their opinions. Survey questionnaires are easier and quicker to administer as compared to interviewing because interview requires face to face present of interviewee [24]. In this research study, the questionnaires consist of two parts, Part A and Part B. There are nine questions on part A regarding personal and professional information. Part B consists of 24 questions in which respondents were required to give their views and understanding. The questionnaires were distributed to seven teachers each from four different schools and the four principals. The questionnaires took twelve to fifteen minutes to be completed. After consulting with the principals, questionnaires were distributed to the teachers and the ICT lab in charges. All the filled questionnaires were collected on the stipulated date. All the thirty-two questionnaires were given back.

3.4 Data Analysis

The research study involves both quantitative and qualitative methods. Data have been collected using mixed approaches. From the set of questionnaires about four questions required qualitative research method. Survey questionnaires were administered to get the quantitative data and Statistical program for scientific studies (SPSS) has been used for data analysis. Quantitative research involves the collection of data in numerical form for quantitative or statistical analysis. It provides real facts about the agency or an organization. Qualitative research mainly is collecting, analyzing and interpreting data by observing what people do and speak. Survey questionnaires include more of quantitative and a few qualitative questionnaires. Different groups of teachers and principals from different schools were involves which gives holistic picture of

implementation of ICT education in Thimphu public schools. Within the four schools a higher secondary, a middle secondary, a lower secondary and a primary school were taken through random sampling to compare and find out the ICT integration using descriptive analysis.

4. RESULTS

4.1 Demographic Representation

The findings are based on the data collected from the total of thirty-two respondents out of which 68.75 percent represented female and 31.25 percent represented male respectively. The Table 2 below represents the total number of respondents from different level of schools:
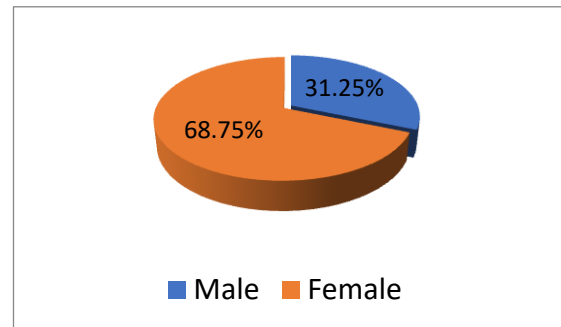
4.2 Gender Representation

As shown in the Fig. 2 below, there were 22 females representing 68.75% of the respondents 10 males representing 31.25%involved in answering the survey questionnaires regarding

the access of ICT education into the Bhutanese curriculum.

Fig. 2. Figure showing the gender representation

4.2.1 Age distribution of respondents

Age distribution of the respondents varied from 21 years to 55 years. The majority of the respondents belong to age group of 31 - 40 years. All the respondents were very cooperative and willing to share their information.

Table 2. Gender wise Number of participants from different schools

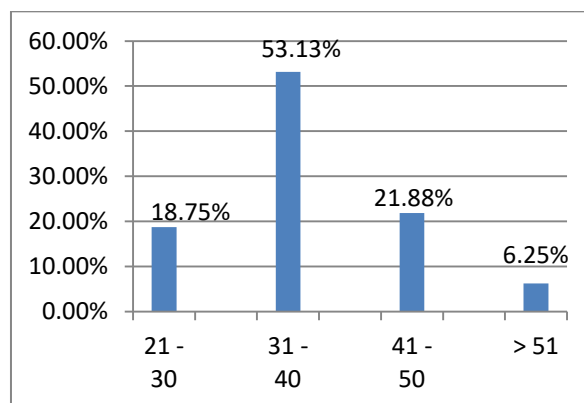| Type of Schools	Male	Female	Total
Primary School	1	7	8
Lower Sec. School	2	6	8
Middle Sec. School	2	6	8
Higher Sec. School	5	3	8
Total	**10**	**22**	**32**

Fig. 3. Age distribution of the respondents

Table 3. Computers access in the schools

No. of Respondents	Frequency	Percent	Valid Percent
32	32	100.0	100.0

All the thirty-two respondents said they have access to computer in the schools. However, computers were access only to the teachers and not to the students. During the field visit to the schools, it was found that, in one of the schools the total numbers of computers were less than ten and the students' computers ratio is about 1:75. The children did not get opportunity to use the computers as these limited numbers of computers are available in the principal's office and the staff room only.

The 43.8 percent of the participants said they get the opportunity to use computers for less than an hour a day. 34.4 percent said they get the opportunity to use one to two hours whereas 12.5 % uses computers for more than two hours in a day. Unfortunately, 3 participants or 9.4 % of the participants said they do not use computers in the school. During the school's field visit it was found that some teachers has not undergone any form of training related to ICT. These groups are not confident enough to use the computers in academic work of the school. It shows that computer is still not access to many of the schools in Bhutan.

According to the survey carried out, 50.0 percent of the participants said they have one computer lab in the school. The other 25.0 percent said they have two computer labs in their schools and the rest 25.0 percent of the respondents said they do not have ICT/computer lab in the school. During the field visit it was found that one of the schools did not have computer/ICT lab. In some schools they have two ICT labs this is because they have introduced 'Chiphen Rigphel' program in the school which is first introduced in Bhutan in 2010 with support from Government of India. However, it is sad to see, 25 percent of the participants said they did not have computer lab in the school This is a clear evident that still Bhutan faces some difficulties in incorporating ICT in the education system and ICT is not equally access to all schools.
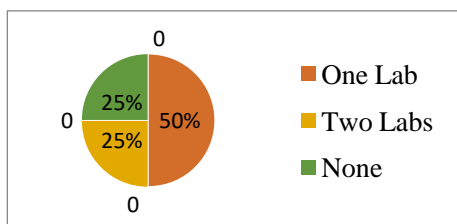

Fig. 4. No of ICT Labs in the schools

According to survey questionnaires, twenty-four respondents (75.0 %) said they have one computer lab attendant. 18.8 percent of the

participants said they do not have any computer lab attendants. Two of the participants did not respond to the question and it was realized that those who did not responds were from the same school in which they do not have the computer lab attendant. During the field visit, it is seen that one of the schools does not have ICT lab and they have less than ten computers in the school. It is felt that, incorporation of ICT is a measure challenge for the school where the students' computer ratio is about 1:75.
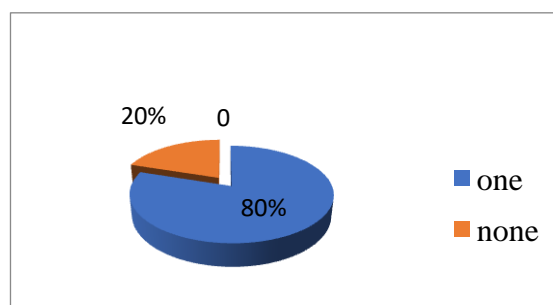

Fig. 5. Pie chart represents schools having ICT lab and not having ICT lab

The above pie chart represent exact number of respondents responds to the questions. 80% of the respondents have one IT/computer lab attendants and 20 % of respondents said they do not have IT lab attendants in the schools.
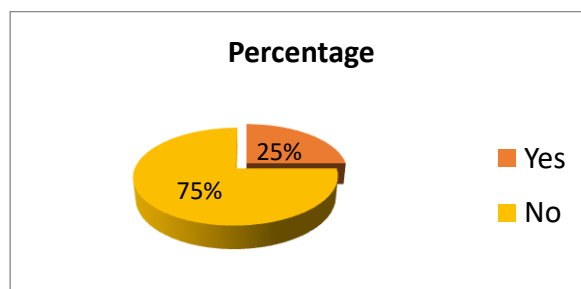

Fig. 6. Internet access to teachers and students

From the chart it is understood that only twenty five percent (25%) of the respondents said they are access to internet in the schools. Seventy five percent (75%) of the participants said they did not get access to internet in the schools. From the survey carry out in the field visit, it is found that two of the schools do not have internet access to students, although they have computer classes. Teachers expressed that internet is available only in the principal's office as it is important for the schools to receives and send mails. Most of the schools in Bhutan are using

broadband but some of the institutions are using lease line. From the survey it was found that three schools have broadband connection and only a higher secondary school has lease line connection. Teachers and principals felt that, due to insufficient budgets in the schools, they could not provide better internet connections. Schools in Thimphu and rest of the schools in the country have problems of the poor connectivity and shortage of other ICT infrastructures. Basically, internet is available only in the principal's office in the primary and the lower secondary schools although they have some connections in the staff rooms. In the higher secondary schools, internet connection is completely control by the ICT lab in charges.

From the survey questionnaires it was found out that sixteen (55.17%) respondents said their school has 21 to 30 computers in the lab for teaching and learning. 27.59 percent of respondents said they have 10 to 20 computers in the Lab.17.24 % of respondents said they do not use computers for teaching and learning as their school has less than ten computers. But three participants did not respond to the questions and it was found out that, these three respondents were from the same school where they have less than ten computers and no ICT lab facilities. Principals from these schools expressed their concerns that especially primary and lower secondary schools are given less attention on incorporation of ICT education by the Ministry.

Table 4. Time spend on computer each day

Time spent on Computers	Frequency	Percent	Valid Percent
less than an hour	14	43.8	43.8
1 to 2 hours	11	34.4	34.4
more than 2 hours	4	12.5	12.5
None	3	9.4	9.4
Total	**32**	**100.0**	**100.0**

Table 5. Number of computer labs in the school

Number of ICT/Computer labs	Frequency	Percent	Valid Percent
one	16	50.0	50.0
two	8	25.0	25.0
none	8	25.0	25.0
Total	**32**	**100.0**	**100.0**

Table 6. IT lab attendants in the schools

No. of IT Lab Attendants	Frequency	%	Valid response (excluding missing)	
			Frequency	%
One	24	75.0	24	80.0
None	6	18.8	6	20.0
Missing	2	6.3		
Total	**32**	**100**	**30**	**100**

Table 7. Number of computers for teaching and learning

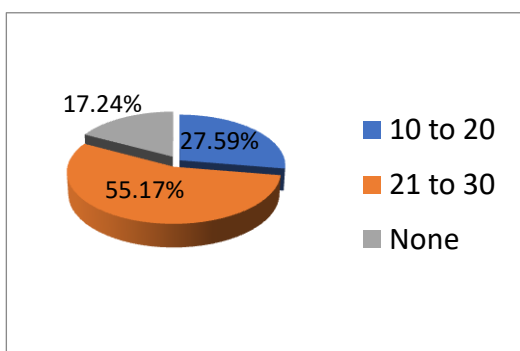| No. of computers in the lab	Frequency	%	Valid response (excluding missing)	
			Frequency	Percent
10-20	8	25.0	8	27.59
21-30	16	50.0	16	55.17
None	5	15.6	5	17.24
Missing	3	9.4		
Total	**32**	**100**	**29**	**100**

Fig. 7. Pie chart represents number of computers in different level of school

From thirty-two respondents only thirty-one respondents respond to the question. Out of thirty-one respondent's 22.58 percent responds as integration of ICT is poor in their schools. The 29.03 percent said ICT is just satisfactory whereas 16.13 percent rated ICT integration is good in their schools. The rest 32.26 percent said incorporation of ICT education is very good in their schools. One respondent did not respondent to the question. Seven respondents rated integration of ICT is poor and it is evident that there is no equal access of ICT education in the schools.
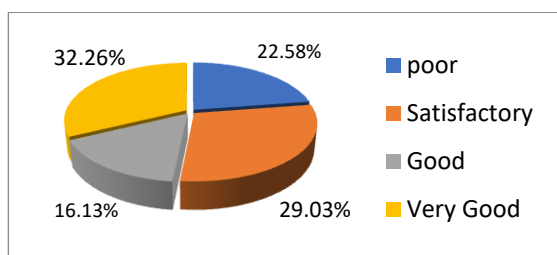

Fig. 8. Percentage of respondents' opinion about ICT integration

The chart shows almost about one fifth of the respondents rated their schools has poor ICT incorporation and only about one third of the participants rated their schools has very good integration of ICT education. This result is evident that, Bhutanese schools need still sometimes to have good access to ICT education.

From the total of thirty-two respondents only thirty respond to the question. From thirty respondents, 80.0 percent of them said the lab can accommodate 31-40 students. The other 20.0 percent of the respondents said, they do not have ICT lab in the schools. Two respondents did not respond to the question. When ICT facilities are not available, it is difficult to have access in the schools.

To have access on ICT facilities it is vital for the schools to have very reliable internet connection. According to the column graph above in Fig. 9, 25.00 percent of respondents said they have very reliable internet connection in their schools. 21.90 percent of respondents respond, they have just reliable internet connectivity. Ten respondents (31.30%) said they have somewhat reliable internet connection, whereas the other 21.90 percent of respondents said, their internet connection in the school is not reliable at all. This clearly indicates that, incorporation of ICT education is just a beginning and takes sometimes to have better coverage.

Majority of the respondents (51.61 %) said, the students can visit the ICT Lab once a week. The 22.58 percent of respondents said, their students visit the computer labs two to four times a week. 25.81 percent of respondents said their students never go to the computer labs. As stated earlier, one of the schools do not have ICT lab and the respondents from the same school said their students never visit the labs.

Table 8. Opinion about integration of ICT

Opinion about ICT integration	Frequency	%	Valid response (excluding missing)	
			Frequency	**Percent**
Poor	7	21.9	7	22.58
Satisfactory	9	28.1	9	29.03
Good	5	15.6	5	16.13
Very Good	10	31.3	10	32.26
Missing	1	3.1		
Total	**32**	**100**	**31**	**100**

Table 9. No. of students accommodate in the ICT Lab

No. of students in the ICT Lab	Frequency	%	Valid response (excluding missing)	
			Frequency	Percent
31-40	24	75.0	24	80.0
None	6	18.8	6	20.0
Missing	2	6.3		
Total	**32**	**100**	**30**	**100**

Table 10. Reliability of Internet connectivity in the schools

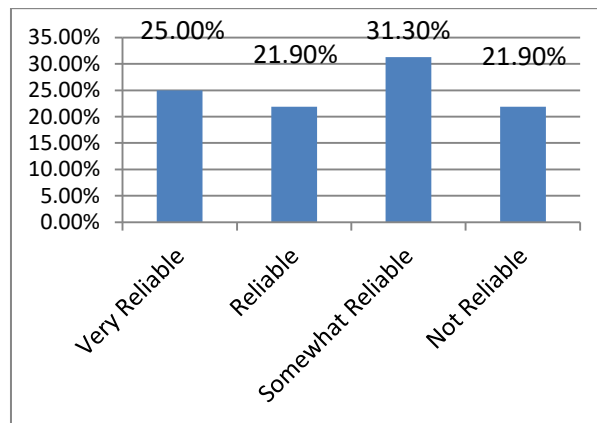| Internet connectivity	Frequency	Percent	Valid %
Very reliable	8	25.0	25.0
Reliable	7	21.9	21.9
Somewhat reliable	10	31.3	31.3
Not reliable at all	7	21.9	21.9
Total	**32**	**100.0**	**100.0**

Fig. 9. Column graph shown Reliability of Internet connection
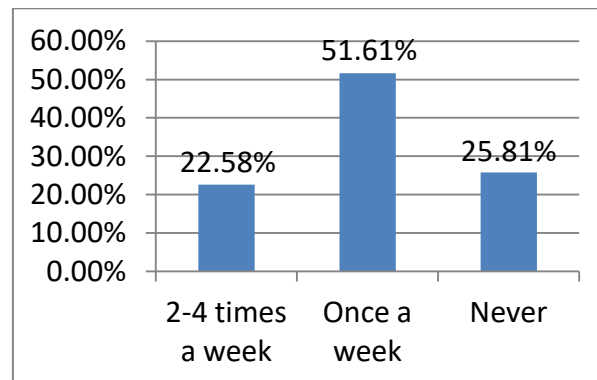

Fig. 10. Percentage of time spend in the ICT Lab

5. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This final chapter highlights the discussions on findings, conclusion and recommendations based on research studies and data analysis. The research questions that were prepared at the beginning of the research have been used as a guideline to find out whether the objective of research has been fulfilled.

Table 11. Students average time spend in the ICT lab

Students average time spend in the ICT Lab	Frequency	Percent	Valid response (excluding missing)	
			Frequency	Percent
2-4 times a week	7	21.9	**7**	22.58
Once a week	16	50.0	16	51.61
Never	8	25.0	8	25.81
Missing	1	3.1		
Total	**32**	**100**	31	**100**

5.1 Discussion

The study was conducted with single objective, to investigate and assess the implementation status of ICT education in Bhutan. To meet the study's objective, thirty-two respondents were tasted with survey questionnaires. All the thirty-two respondents' questionnaires were analyzed using IBM SPSS statistics version 21. A total of thirty-three questions including demographic and ICT related questions were analyzed using frequencies and percentage. The number of female respondents were doubled the number of male respondents as majority were female.

After analyzing the collected data's, it was found that computer student's ratio is very high. In one of the schools in Thimphu the computer student ratio is about 1:75, the school has less than ten computers. Twenty percent of the respondents said they do not have ICT/computer labs in the schools. From the research survey it was found out that, only a higher secondary school has Lease line connection and seventy five percent (75%) of the respondents said, they do not get access to internet in the schools.20 percent of the respondents said they do not have ICT lab attendants and access of ICT education is a challenge at the present situation. During the field visit to the schools, it is found that, two of the schools do not have sufficient computers for the students and they never have access to internet connection. The 17.24 percent of respondents said they do not use computers for teaching and learning as their schools do not have ample numbers of computers. The 32.26 percent of the respondents rated incorporation of ICT education is very good but 22.58 percent of the respondents said their schools have very poor internet connection. Similarly, 21.90 percent of the respondents said the internet connection in the school is not reliable at all. Some schools do not have ICT Labs, 25.81 percent of respondents said their students never go to the computer Labs.15.6 percent of respondents wish to have ICT training for teachers and incorporation of ICT education from Pre-Primary schools. 60 percent

of respondents said, they need sufficient numbers of computers, with good internet connection, trained ICT lab in charge and spacious ICT room.

From the literature review, it is seen that, ICT is an important tool in teaching and learning in the 21st century and Ministry of Education is striving hard to incorporate ICT in the Bhutanese curriculum.

However, Tobgay & Wangmo [6], Choeda et al. [4] claims that, ICT sector faces several challenges in Bhutan, such as poor understanding about ICT, lack of expertise, lack of proper infrastructures, inconsistent internet connections and lack of training in ICT pedagogy are major hurdles affecting incorporation of ICT in the schools.

After findings all the challenges and short comings, it is evident that, there is no equal access of ICT education in Thimphu Public Schools. It is understood that shortage of ICT infrastructures is the major barrier to ICT integration in the Bhutanese Curriculum.

5.2 Conclusion

In the conclusion, this dissertation has attempted to find the access of information and communication technology in Thimphu schools. It also aimed at examining the incorporation of ICT in the curriculum and finding some of the barriers in integration of ICT into the Bhutanese curriculum. Incorporation of ICT into the curriculum is crucial step taken by the Ministry of Education because internet allows the people from different parts of the globe to interact and collect any information within short span of time. The world is becoming a smaller place and internet is the driving force behind this change [25]. As asserted by Thomas & Kumar (n.d.) proper use of latest Information Technology will be a great help in assessing information that requires for educational institutions. Although Bhutan has targeted to connect all the schools

with proper internet connection by 2018 but as it is a late starter in adopting ICT, the target may not be achieved in time as stated [26-30].

The data analysis (both quantitative and qualitative) reveal that integration of ICT education is found in many of the schools but equal access is not there. The middle secondary and higher secondary schools has all the necessary ICT facilities in place but that is lacking in the primary and lower secondary schools. 20% of respondents said they do not have ICT lab and 17 % of the respondents said they do not have computers for teaching and learning. Besides, low internet bandwidth, inconsistent internet service, poor infrastructures and lack of training in ICT pedagogy are seen as some of the major barriers [4]. Furthermore, since the country is landlocked, installation of ICT facilities becomes an extremely expensive undertaking. ICT has become an indispensable tool for learning and development, however, due to inadequate technological and financial capabilities, it restrains from diffusing into the curriculum [6].

5.3 Recommendations

The effective implementation of ICT in education in Bhutan is hampered by a number of constraining factors. The paper suggests the following recommendations for improving on the current scenario.

It has been found that very little research has been done on access of ICT education in Bhutanese curriculum. Therefore, it is necessary to carry out for further research in the field of incorporation of ICT education into the Bhutanese curriculum. The research should not be restricted to Thimphu but of the whole country.

The schools do not have adequate numbers of computers and other resources for effective implementation of ICT. Successful implementation of ICT largely depends on adequate infrastructures such as computers with continuous internet connection, spacious ICT labs, trained ICT in charge and adequate budget to buy all the computer accessories. The schools need to be provided with sufficient computers with trained lab assistants.

To make ICT facilities affordable to every citizen, the price for internet connection should be reasonable. All the principals and the teachers

should be trained in the use of IT through workshops and seminars. To implement ICT education in the classroom, teachers should feel confident and comfortable by using computers on a consistent basis for instructional activities. Government needs to promote the application of ICT by introducing e-government, e-health, e-business and e-tourism. It is crucial to promote ICT services throughout the country because most of the community schools are located in the rural areas of Bhutan. The acquisition of ICT literacy and skill is depending on how much ICT related curriculum is introduced in the different level of schools in the country. Therefore, it is crucial to provide sufficient numbers of computers with proper internet connection and trained ICT in charges to have sound incorporation of ICT curriculum in the schools.

6. LIMITATIONS OF THE STUDY

This study is designed to assess the implementation status of ICT education in Bhutan basically in Thimphu Public schools. The study is based on present status of ICT implementation in the schools. Some of the limitations found in ICT incorporation are such as, the information available about Bhutan in the websites seems to be old and not up dated. Many journals were printed in 2006- 2009, which are not much relevant to the present context because the ICT infrastructures and facilities has increased in many folds. At the same time, the latest journals and information on Bhutan are very limited in number. It is felt that, the duration of research is very limited and we could not perform detail research due to time constraint. The research is limited to a few schools of Thimphu only; therefore, the result may not be very reliable. The information collected through survey questionnaires from the different schools are views and expressions of different principals and teachers but students' views are missing due to limited time. Although, we are undergoing Masters in Royal Institute of Management (RIM), Thimphu but the academic support we receive from RIM is very limited.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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