



Implementation of National Information and Communication Technology Curriculum in Grade Nine: A Case of Trashigang Dzongkhag

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study aims to study the impact of the information and communication technologies (ICT) on students' learning. A quantitative method was used with cross sectional research design. A questionnaire was designed to comprehend the questions related to the objectives and a sample of 10 teachers, 10 principals and 109 class IX students was enrolled from various middle, higher and central schools under Trashigang dzongkhag, Bhutan. Data was presented in tabulated form and the Pearson correlation test was applied to determine the relationship among the dependent and independent variables. The findings revealed that students have access to various kinds of ICT applications and resources, have an adequate number of ICT equipment available for their use, and are familiar with ICT applications.

Additionally, a strong positive linear correlation exists between availability of human, ICT resources, user-ability of using ICT resources and the student's educational learning. It is recommended for students to learn ICT related skills and to make the best use of the different communication

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technologies in their pedagogical activities. Additionally, stakeholders should focus on developing ICT-based infrastructure and ICT skilled human resources to bring beneficial results in the learning process of students' educational endeavors.

Keywords: Curriculum; information and communication technology; implementation; school.

ABBREVIATIONS

ADB: Asian Development Bank

B.Ed: Bachelor of Education

BIPS: Bhutan Information and Policy Strategy

CAPSSD: Curriculum and Professional Support Services Division

FYP: Five Year Plan

GNH: Gross National Happiness

ICT: Information and Communication Technology

MDG: Millennium Development Goals

MoE: Ministry of Education

M.Ed.: Master in Education

REC: Royal Education Council

1. INTRODUCTION

"Bhutan launched its first telecommunication network in 1963 connecting a few major parts of the country. In 1989, all parts of the country were linked by a modern telecommunication network. However, it was only in 1998 that a fully digital national telecommunication network was established connecting all districts and major towns in the country [1]. Since then, the Information and Communication Technology (ICT) was recognized by the Royal Government of Bhutan (RGOB) as an unmatched developmental tool as well as an area of new business and employment opportunities for all Bhutanese youth.

"The Information and Communication Technology in the Bhutanese education system was introduced in the late 1990s with Indian Certificate of Secondary Examination (ICSE) Computer studies offered in a few high schools. The project established computer labs in 168 schools, introduced ICT literacy curriculum for all students from grade VII to XII and trained more than 5,000 teachers in basic ICT skills" (Yeshey, 2018). Information and Communication Technology is a very important tool for all developmental activities in Bhutan towards enhancing Gross National Happiness (GNH). In addition, Gross National Happiness is a unique concept of economic development pioneered by His Majesty the Fourth King of Bhutan. The concept encompasses the development of human resources with ICT repertoire, thereby

allowing them to invest across the globe. As such people will get opportunities to make choices and get equitable access to schools, hospitals, jobs, security, justice, and other basic services.

Bhutan has clearly articulated in various policies and public the significance of ICT both as a subject and as a tool to improve the quality of education. The policies focus on creating access to infrastructure as well as content and application. In line to this, Curriculum and Professional Support Service Division (CAPSSD) (2019) developed a standard ICT literacy framework and curriculum. Schools are urged to initiate and carry out ICT literacy programme to achieve one of the goals of education preparing children to compete in the world of ICT.

The National ICT curriculum was introduced in 2006 into the education system from grade nine and above. The Ministry of Education (MoE) provided fund support for training to ensure that the ICT teachers are well equipped to handle the new curriculum. The MoE (2007), developed a standard curriculum for schools and other training centres. The future use of ICT tools and facilities should become systematic and automatic and a second nature to the teaching and learning process. At the moment, the teachers and students are becoming more confident in using ICT facilities and tools in the teaching learning process. ICT is rapidly becoming an integrated curriculum in the schools today.

The ICT plays a vital role in the delivery of the lessons and content enhancement. For instance, in the current situation, ICT is used for learning new things, for remedial learning, for regular instructions, teaching learning tool for specific subject, development of critical thinking, creativity, and problem-solving skills among many others. It is also used for researching and accessing information, communicating with others, entertainment and helping with school administration. The importance of ICT is also echoed by *His Excellency the Prime Minister of Bhutan (2004), that Information and Communication Technology is changing the way world works, and will continue do so into the*

future. By its unprecedented power to move and process information, it is impacting on global trading patterns, culture and governance, in fact ICT impacts on every aspect of our society today.

The ICT has become an important tool for all the developmental activities in Bhutan both in government and private organizations with the introduction of television in 1999 and Internet in 2000. By embracing ICT, Bhutan has been harnessing the benefits in the schools and in other areas, thereby realizing the Millennium Development Goals and enhancing the Gross National Happiness. His Majesty the King expressed that “we have always steered our country in the right direction and have successfully navigated through great geo-political and socio-economic changes in the past amidst difficulties. Now this decade requires us to yet again skilfully navigate the new digital and technological landscape” [2]. This statement has sensitized every Bhutanese citizen that the ICT is the main tool to connect with the people around the world and access to resources we require in life.

Similarly, Dr Lotey Tshering, the Prime Minister of Bhutan *while addressing the audience during the launch of Bhutan Information and Communications on Technology policy and strategies (BIPS) in Thimphu, 2nd February 2020* asserts that the need to master ICT skills is inevitable as it is like a third language when he expressed that “We all know that our first language is Dzongkha, and second, English in the context of education. But now, in this century, ICT has to be the third language.

Therefore, considering the importance of ICT in education and national development, this study is intended to find the impact of implementation of ICT in grade IX students and other associated issues.

1.1 Objectives of the Study

This research is aimed to achieve the following objectives:

1. To study availability of resources to integrate ICT in the lessons and observe the implementation of curriculum.
2. To study the administrative support rendered on the implementation of ICT curriculum in the schools.
3. To assess competencies of students regarding basic ICT skills.

2. LITERATURE REVIEW

Considering the impact made by ICT in the schools, the related literature concerning the problems and importance of the implementation of ICT Curriculum in the Schools in Bhutan and in other countries is reviewed in this section. The main sources of literature are from books, journals, articles, online articles and reports which are reviewed in detail below.

During the 14th convocation of the Royal University of Bhutan in May, 2019, His Majesty the King shared his concerns about the dramatic changes brought about by the emerging technology, its scale of growth and scope, and the consequences lagging behind. If we are not able to embrace and leverage technology, we will be invariably left behind. Further, the Bhutan Education Blueprint (2014-2020) recommended upscaling the ICT ecosystem to raise the quality of education. To maintain continuity on the ICT project, iSherig-1, the Ministry of Education has now developed iSherig-2 - 2019-2023 (ICT Masterplan-2) for the effective implementation of National ICT Curriculum across Bhutan.

According to Kofi Anan [3], “the former UN Secretary General said, “We must ensure that information and communication technologies are used to unlock the door to education”, conveyed in a message delivered by Jose Antonio Ocampo, UN Under-Secretary-General for Economic and Social Affairs and Chair of the UN ICT Task Force, during a two-day Global Forum in Dublin, Ireland [4]”. Similarly, one of the Millennium Development Goals (MDG) is to achieve universal primary education and ICT literacy by 2015. In this way, the UN has set up its Millennium Development Goals for 2015 in terms of education that promises to implement free standardize education for every child on the earth giving importance for the implementation of ICT program in the schools.

The factors that are associated with the implementation of ICT curriculum with special focus on grade nine and ten in the schools of Bhutan are discussed under following themes namely importance of ICT education in Bhutanese Schools, ICT in Teaching and learning, National ICT curriculum, Literacy and Coding Component of ICT education, factors affecting the implementation of ICT curriculum.

The ICT is an exciting subject to teach because it is a crucial component of the school curriculum.

Its importance in the current economic climate has been recognized, and it is constantly changing. The ICT in schools is developing rapidly in order to prepare young people to take their place in the 'information society. Further, the current government has implemented a number of initiatives such as providing fund to improve resources, enhancing and improving internet and providing training opportunities to teachers. Such initiatives will help in improving the competency of individual teachers and the school at large. A school equipped with this resource will be able to make good use of the new technologies in raising standard of achievement in schools through effective use of ICT in teaching and learning [5-9].

The ICT has the potential to bridge the knowledge gap in terms of improving quality of education, increasing the educational opportunities, making knowledge building possible through borderless and boundless accessibility to resources and people, and reaching population in remote areas to satisfy their basic right to education [10-15]. As various ICT tools become increasingly affordable, accessible, and interactive, their role at all levels of education is likely to be all the more significant in making educational outcomes relevant to the younger generations, in revolutionizing educational content and delivery, and in fostering information literacy [16-20].

According to the report shared by the Ministry of Information and Communication [1], stated that "hundreds of community primary schools were provided with two computers and a printer each, with free internet facilities for a year where feasible. Furthermore, one teacher in each of these schools was trained in basic computing skill (A special report, MoIC, 2007)". Further, the students in rural areas were briefed to create ICT awareness amongst the children and promote the usage of ICT in Bhutanese context. As of now, the ICT programme is introduced throughout the schools in Bhutan to educate the children with new technologies [21-26]. The national ICT curriculum is designed from grade four and is implemented as per the policy of the education to equip the learning children with different skills of new technologies.

"The 10th five-year plan gave emphasis on the usage of ICTs in the schools. One of the objectives and targets of the 10th five-year plan was to enhance the quality of education to achieve competency in languages including ICT,

comparable to international standards" (MoE, 2008). Moreover, the biggest development in ICT education was brought by Chighen Rigpel Project, which was spearheaded by the Ministry of Information and Communications in collaboration with NIIT, India (2011). Therefore, "the project established computer labs in 168 schools, introduced ICT literacy curriculum for all students from grade seven to twelve, and trained more than 5,000 teachers in basic ICT skills" [27].

"As recommended in the e-Gov Masterplan 2012, the Ministry of Education (MoE) initiated the development of the education Sector ICT Master Plan iSherig (2014-2018) to harness ICT as an enabling tool in teaching and learning, as well as to rationalize and streamline ICT activities, systems, and projects under the MoE and across the education sector. As a part of iSherig implementation, the MoE reviewed the ICT literacy curriculum of the Chiphien Rigphel Project and introduced ICT literacy curriculum from PP-XII" [28].

The government's education flagship programme on enhancing ICT in education will be reinforced in the plans and programme recommended in iSherig-2. Through the flagship project, MoE is looking at providing access to ICT for all primary school children. It will introduce coding education to bridge the gap between the existing education system and the demands of the 21st century and integrate ICT in other disciplines, especially science and mathematics [29-33].

In "Bhutan 2020" vision document the Royal Government of Bhutan (RGOB) refers ICT in education as a strategic objective in education sector. One of the six strategic education objectives has been identified as taking advantage of new educational innovations and technologies. The introduction of ICT in teacher training institutes and schools were to improve the quality of education, increase the computer literacy rate, and contribute to overcome the digital divide and cope with the upcoming information society. The importance of ICT in education was also emphasized in the Education Sector Strategy Master Plan which is incorporated in Bhutan's 9th FYP (2002-2007).

According to Lyonchhoen Jigme Y. Thinley, "a former Prime Minister of Bhutan reiterated and emphasized the government's commitment towards realizing Bhutan's ICT aspirations". Pelden [34], said that "as a managers and

enablers of ICT services in the country, it's crucial that you steer the development of ICT in the right direction, so that our vision of a knowledge society is realized - so that we, as a country and as individuals, are able to derive the benefits of the vast potentials of ICT". Therefore, it prepares the citizens to realize the vision 2020 on ICT literacy through providing different skills and knowledge by educating the competent people.

Implementation of ICT curriculum in all schools would definitely promote overall development of individuals in terms of mental, attitudes and capabilities. ICT education will provide required skills and knowledge of people to be competent in the digital world.

According to the Pelgrum and Law [35], "ICT was first termed by the United Nations in 1992, and is used to connote 'internet services', media, 'telecommunication' and 'network-based information services.' ICT is used mainly for enhancing communication. In this way, the use of ICT is found in the field of education in 21st century in Bhutan providing new skills to the learners".

In Bhutan, for the effective implementation and development of ICT based teaching and learning, the school needs to have faculty who is competent to deliver the concepts clearly. According to Becta (2004), teachers receive pedagogical training rather than on use of ICT tools, which is supported by Gomes who claims that the obstacles of the use of ICT has been the "lack of training in digital literacy and lack of pedagogic training cited in. (pp. 22 - 239).

The ICT in teaching and learning is a lifelong learning in the modern world. It is one of the key factors which makes possible for achieving the four pillars of learning that is very much concerned in the 21st century. The four pillars of learning are learning to know, learning to do, learning to be, and learning to live together. In regard to this, UNESCO Information and Communication Technologies in Teacher Education points out the emergence of new paradigm of teaching and learning process from teacher centered instruction to learner centered instruction that were needed to enable students to acquire the new 21st century knowledge and skills (UNESCO, 2007).

Lifelong learning ICT in education is a process of accomplishing personal, social and professional

development throughout life span. It is a blend of pedagogy that is provided through various modes like in the school, distant learning, e-learning, and continuing education [36]. Moreover, Riel (1998) stated that implementation of the ICT curriculum skills is lifelong learning for all people. He also stated that with the use of ICT curriculum, students can use more primary sources materials and be encouraged to address the problems and develop analytical and interpretive skills. In connection to this, the grade room can be transformed into learning community making it possible for many people to be a part of the learning process in an open and continuing dialogue.

Furthermore, use of ICT to support learning is a function of the curriculum content and instructional strategy such that when appropriate content is addressed using appropriate strategies, students and teachers will benefit [37]. Curriculum is the way in which learning is assessed. It brings positive impact of the students by using the ICT. The positive impact of the ICT Curriculum is: students investigate reality and build knowledge, promote active learning and authentic assessment, engage students by motivation and challenges provide tools to increase productivity and increase learning independent [38].

According to Cunningham [39], "clearly argues that approach to assessment must change to reflect in pedagogical philosophy to implement the ICT Curriculum effectively. Accordingly, the ICT teaching and learning is implemented in the higher secondary and middle secondary schools in Bhutan with developed National ICT literacy Curriculum".

The Royal Education Council has already developed and implemented ICT literacy curriculum from grade four to six in 2017 and grade seven to eight in 2018 as a compulsory subject. This is in line with the Education ICT master plan (iSherig) and Bhutan Education Blueprint (2014-2024).

The iSherig has identified development of comprehensive curriculum for literacy with ICT under the programme capacity development students, which is the literacy subject from grade four to ten was reviewed and developed, the circular stated. The subject is expected to teach technical skills, ethics in use of ICT such as cyber safety, plagiarism and responsible use of computers. With this, the department also

notified all schools with computer laboratories to offer ICT as a compulsory subject from grade four and above with a period each a week.

According to the Annual Education Statistics (2018), "about 205 public schools and 28 private schools have computers. However, only 46 out of 308 public primary schools have computers. Moreover, most of these schools are located in remote places, and some do not have access to electricity".

2.1 National ICT Curriculum

The ICT programme is reflected in the National Curriculum of the schools in the education system to promote the technology. The National ICT Curriculum is being implemented in the higher and middle secondary schools of Bhutan from grade nine is taught by the ICT teachers. The ICT Curriculum is implemented in all the secondary schools of Bhutan despite shortage of trained ICT teachers. It is with a hope to bring the uniformity in the skills that the learning children require in their day-to-day life through the design of curriculum by the Curriculum and Professional Support Services Division (CAPSSD) under the Ministry of Education when the curriculum division was not undertaken by Royal Education Council.

The Royal Education Council (REC) has implemented ICT literacy curriculum from grade four to six in 2017 and grade seven – eight in 2018 as a compulsory subject. This is in line with the Education ICT master plan (iSherig) and Bhutan Education Blueprint. According to iSherig (2014), "identified that development of comprehensive curriculum for ICT literacy under the programme capacity development of students and reviewed the subject from grade IV to X and developed the curriculum".

In 2019 the Royal Education Council and Instructional Media Division developed ICT literacy curriculum for grade IX and provided orientation to teachers on the new literacy curriculum for grade IX during the vacation. Therefore, the Information and Communication Technology (ICT) became a compulsory subject for grade IX students beginning 2019 academic session. This is according to a circular issued by the department of school education in 21st December 2018 which stated that the department would do away with Computer Application subject and implement compulsory ICT in 2020 academic session. In general, the literacy curriculum with ICT is based on the four

strands – knowledge and operation, digital citizenship, communication and collaboration, and computational thinking. Moreover, Bhutan has chosen the ICT Curriculum of the Province of Alberta (Canada) as suitable for students from kindergarten to grade twelve. It specifies what students are expected to know, be able to do, and be like with respect to the technology.

The Information and Communication Technology (ICT) curriculum provides a broad perspective on the nature of technology, how to use and apply a variety of technology skills. The ICT curriculum is not intended to stand alone, but rather to be infused within core courses and programs. Technology is best learned within the context of applications. Therefore, a multitude of computing tools are now an integral part of education where computer technologies such as email, internet, spreadsheet and word processor all serve to enhance communication and information access, and thus improve work efficiency and productivity. Thus, Knowledge and skills have become a valuable skill, if not a prerequisite, in the job market.

2.1.1 Factors affecting the successful implementation of ICT in the schools

Computers and the internet are increasingly a part of environment in which youths grow and learn today. In the view of this, schools are urged to reap the educational benefits of information and communication technology. Desktop computers remained the most common form of resources in schools in every country. The teachers find guidance and support in integrating information and communication technology into teaching curriculum documents. The information and communication technology are used by every teacher for planning and delivering lesson in the classroom teaching and learning beyond the curriculum.

"Although the ICT in Education Master Plan (2013), emphasizes the integration of ICT in teacher education, school teaching and training programmes" [40]. "In contrary, none of the universities in Nepal has the systematic use of digital technologies in their educational programmes" (Rana, 2018). However, the schools in Bhutan have separate curriculum or modules which focuses on teaching computer programmes due to the rapid growth of digital technology and implementing ICT curriculum making the best use of resources available in the school.

“A policy statement by an organization to undertake specific program directed at the achievement of certain goals” (Jansen, 2000). Further, the UNESCO (2002), reported that “the Malaysian government school policy document known as Education for smart school that was formulated to develop ICT and to be implemented in stages”. Similarly, it is frequently advocated for Bhutan’s ICT policies at the school, Dzongkhag, and national levels to further integrate ICT into classroom instruction. The Ministry of Education has maintained a standard policy for teachers to utilize ICT for daily work and for teaching and learning purposes in order to be smart in the implementation of ICT curriculum. Therefore, considering all the needs of it, teachers are trained to fulfil the policies and make the future citizens more competent in the digital world.

Odera (2011) carried out “a study on computer Education policy and its implementation in Kenya Secondary School. The study found that the majority of principals had policies regarding the use of computers in instruction. Additionally, the Royal Government of Bhutan has a policy of providing computers to all schools across the country in order to maximize the use of technology in the classroom. So, every school in Bhutan has a written policy that shows how to use the ICT curriculum well”.

“School administrative is the main supporting agent who serves for ICT integration in schools. School administrators as technology leaders are responsible for development of computer literacy amongst teachers” [41]. Therefore, to better assist school teachers in better integrating ICT into their teaching and learning and provide support to play an essential role in growing the ICT literacy of teachers and students, the head of the school should equip themselves with proper training in technical leadership. It correlates to the study conducted by Mahmud and Ismail [42] which stated that “ICT literacy, ICT knowledge, and teachers’ ICT skills are still at a moderate level”. Furthermore, Ammah (2017), stated that “every teacher should have information literacy, media literacy, and ICT literacy to develop their ICT competence potential”.

The school Principals should play important role in integrating ICT into teaching and learning. They should give enough time to improve the ICT skills by letting them to feel comfortable using ICT in the classroom. According to Thannimalai and Raman (2018) and Vella et al., (2017)

“further support the importance of administrative support for ICT integration in school by allowing teachers the freedom to create teaching and learning activities using technology, the principle should promote the use of ICT in teaching and learning. Through in-service training, the school administrator should encourage teachers to enrol in ICT-related courses. Support and encouragement from the school administration to the teachers creates possibilities for teachers to grow professionally and inspires improvement in the classroom’s use of ICT”. The influence of teachers’ ICT literacy on ICT integration has been studied by several researchers Amua-Sekyi and Asare (2016); Kim and Lee (2013); Lau and Yuen, (2014); and Salehudin, [41], pointed out that how well teachers know about ICT has a big effect on how well they can use technology in the classroom. Owing to this literature, the school administrator fully supports the implementation of ICT in the school.

According to Sif et al., (2007), argued that “lack of technical, administrative and financial supports that hinder teachers from making use of computers in their instruction. The support and encouragement of school head can increase the interest and acceptance of teacher to use computer in teaching and learning process. Moreover, the assurance of hardware and software items would further encourage in functioning the computer literacy programme in the school without any hindrance”.

The problems faced in implementing ICT program in the schools is due to limited resources and inadequate instructional hours. Some of the problems that usually arise are due to shortage of staff in the ICT department and due to the time constraint in handling ICT across the curriculum. There are less designated ICT teachers to handle ICT as a subject. The present problems effecting the implementation of ICT program in the school is due to limited resources including issues of cost effectiveness. Limitation of infrastructure is the main factor that is bringing about slow developing ICT in the secondary schools. Schools are facing lots of challenges in the implementation of ICT program due to limited understanding and awareness of the role of ICT development, in general, limited pool of ICT expertise and skills, landlocked and small domestic market, capital-intensive nature of investment in ICT infrastructure and systems and lack of foreign investment in the sector.

The most developed countries having good technological management also face challenges in implementing ICT in schools. Those snags may range from teachers' readiness, school supports, and finance. Teachers play a pivotal role in successful implementation of ICT in different grades. As mentioned by Roblyer (cited in Lim & Khine, 2006) "how teachers perceive ICT can determine how well and effective the integration of ICT in grade they teach. It shows that the teachers should be competent and skilful enough to overcome the challenges faced in the schools in implementing the curriculum".

Becta [43], identifies "some other difficulties in implementing ICT in schools of some developed countries. Those are insufficient access to technological resources (including insufficient hardware, bad management of resources, unsuitable problems and some attitude and belief barriers (including unsupportive belief and negative assumption about the presence of ICT in grade room)".

Malcolm & Godwyl (2000), reported that ICT implementation is hampered by the absence of professional development programs for instructors to improve their knowledge of developing technologies by enabling them to generate possibilities through new technologies and capacity building. ICT teachers must receive training in order to improve the competences of low-level students. Additionally, it includes resistance from the teacher, coordination and lack of ICT professionals and having to negotiate the rugged terrain of the country as detailed below.

"Users' issues are arguably the most visible because teachers' reluctance to integrate computers into the curriculum is attributed to their lack of ICT knowledge and proficiency. Computer applications have not been used as much as they could be because teachers do not have enough experience and do not think about the right problems to solve. All of these barriers may be addressed by considering technical and curriculum support for teachers" (Becta, 2002). "Further, Finland, Singapore, Egypt, Tanzania, Uganda, Mali, Jamaica, Bolivia are the countries, where ICT for education plan is isolated from the national ICT policy. ICT for education plans is often disjointed, as they are developed without considering the infrastructure, costing, and development as defined by the national ICT policy" (ADB, 2009).

While teachers had favourable feelings about the use of technology and perceived its potential to improve students' learning processes, time management was a common issue for teachers in reference to the adoption of ICT in Bhutan, and it was one of the key barriers to ICT integration. The problem with implementing an ICT for education strategy is that the financial consequences (so-called total cost of ownership) are frequently not fully considered, and as a result, the MOE fails to allocate enough operating funding. Most of the time, all expenses following the original hardware expenditure are either disregarded or viewed as part of a child's or parent's responsibility (MoE, 2009). "Related to this setback, is the fact that many policy makers and planners do not fully consider identifying funding sources for long-term development and support of ICT for education projects and programs" (MoE, 2009).

The former Minister of Education, Lyonpo Thakur Singh Powdyel (PCE, 2009), addressed to the teacher trainees and lecturers that "the main challenges that schools faces in the implementation of ICT curriculum is due to the lack of resources, ICT professionals and infrastructures facilities that requires doing with. In this way, the uniformity implementation of the ICT programs in the schools of today is deprived with the non-availability of the expertise and the resources for effective implementation of national ICT curriculum."

"Given the capital-intensive nature of ICT investment, Bhutan currently lacks adequate financial infrastructure to encourage private sector participation" (MoIC, 2007). Lack of funds for significant ICT adoption in schools is cited as a significant problem. Another important challenge faced by Bhutan is its limited domestic resources available for investment in public goods and governance. This is more closely linked to the fact that Bhutan is one of the least developed countries rather than it being landlocked. Moreover, Bhutan's resources are limited with exception to hydro-power in terms of export for national revenue and employment of people. Global trends suggest ICT as a reliable source of employment as well as an exportable commodity. ICT offers avenues of vast for youth (Asia Pacific 2003-2004).

The mainstreaming ICT into the sectoral programs and national strategies faces several challenges. This is partly due to the fact that ICT strategies are often disconnected or considered

a distraction from the core development strategies and programs. Furthermore, the need for adequate capacity to implement and adapt to changing requirements, resource constraints are a significant challenge. A major constraint for Bhutan is the lack of local content, for integrating the use of ICTs in education.

The key challenges in coordinating ICT initiatives in Bhutan such as the lack of coordination which results in inefficient use of budgetary, human, and technical resources. Furthermore, most of the ICT projects are resource-driven rather than needs-driven.

The Bhutan Information and Policy Strategy (BIPS) report acknowledges Bhutan's limited capacity in building a critical mass of ICT professionals and its reliance on outside technical assistance. It also notes that there are less than 400 ICT professionals in the whole country. Which indicates the lack of Bhutanese ICT personnel is somewhat offset by Bhutan's access to a large number of ICT professionals from the region (2004). Another challenge that restrains implementation of ICT in all the schools across Bhutan is the landscape and hilly terrain as discussed below.

Another challenge that restrains implementation of ICT in all the schools across Bhutan is the landscape and hilly terrain. Due to the rugged geographical terrain and dispersed settlement pattern, rolling out ICT to serve the entire population requires high capital investment. Furthermore, since the country is landlocked, installation of ICT becomes an extremely expensive. Since there is a lack of ICT professionals, limited local content is available. Due to slow proliferation of ICT into institutions, schools and communities, most citizens do not have access to computers and other ICT facilities and therefore are not ICT literate.

There is no fair distribution of the ICT resources due to communication and distant location of schools. Moreover, the limited resources of the internet facilities are the major draw backs in the rural community to get access to ICT. The distance settlement also hampers technical ICT expertise for the maintenance of computers.

This present research aims to gather information from ICT teachers concerning the problems facing in the implementation of the National ICT Curriculum. The next chapter authorizes the research objectives and methodology of the study under taken.

3. METHODOLOGY

Researchers employed quantitative research based on the cross-sectional research design [44]. Quantitative data is garnered through survey questionnaires. The research instruments will be questionnaires for Principals, ICT teachers and students. The instruments for the research are both objective and subjective questions to use during survey and interview. A questionnaire a research instruments that gathers data of large sample (Kombo & Tromp 2006). Questionnaires are cheap to administer to respondents scattered over large area and respondents feel free to give frank answers to sensitive questions (Mulusa, 1981).

3.1 Population and Sample

The populations for this study were ICT teachers of Grade Nine, students and Principals of eleven Secondary Schools under Trashigang Dzongkhag. Survey is administered to all grade IX students, ICT teachers and principals of these 10 secondary schools. The selected teachers, students and principals are involved in the focus group interview. The sample schools were chosen from both urban and rural areas and was comprised of one Secondary School and two Central Schools from the southern Zone, two Central Schools, two middle secondary schools from central zone, three Central Schools and one middle secondary from northern zone. According to Frankel and Wallen (2000), defined sample as any group from which information is obtain or part of a selection of target population. The sample population is that aggregation of data from which sample is collected [45]. Used convenience sampling method and selected 10 teachers, 10 principals and 109 grade IX students through both structured interview and survey to select participants from the selected schools of Higher, middle and central school.

3.2 Data Analysis

This study was a quantitative research based on the cross-sectional research design. A quantitative data analysis was used by applying inferential statistics. For this study data was collected using Google Forms and it was exported to Microsoft Excel and with the assistance of the Statistical Package of the Social Sciences (SPSS) version 22.0 to analyse the data obtained from the questionnaires. The data that was collected were analysed using

statistical inference called using descriptive statistics and correlation test.

4. RESULTS

4.1 Introduction

This chapter presents the results and discussion of this research. The quantitative data analysis was done based on the data obtained from the survey. This section starts with a profile of the teachers and principals, students' demographics, factors and barriers to ICT implementation and inferential test results.

Table 1. Demographic information of IT Teachers

Demographics	Frequency	Percent
Gender		
Male	5	50
Female	5	50
Age		
Below 30	1	10
30-35	2	20
36-40	1	10
41-45	4	40
46-55	2	20
Qualification		
M.Ed.	2	20
B.Ed. (S)	5	50
B.Ed. (P)	2	20
Diploma	1	10
Experiences as ICT Teacher		
1-3 Years	4	40
4-6 Years	3	30
7-9 Years	3	30
Training attended related to ICT		
Yes	5	50
No	5	50

The Table 1 reflects the demographical details of ICT teachers. The total population $N=10$, 5 females (50 %) and 5 (50 %) equally participated as respondents. Out of the 10 respondents, the major part of the participants 4 (40 %) of this study was between the age group of 41 and 45 years. While 1 (10 %) participant belonged to the age group of below 30 years, while 2 (20 %) respondents represented the age group of 30–35 and only 1 (10 %) participant belonged to the age group of 36-40 and 2 (20 %) belong to 46-55 years. A majority of the participants 5 (50 %) only have B.Ed. Secondary qualification, 2 (20 %) have M.Ed., 2 (20%) of them have B.Ed. primary

and 1 (10 %) have only a diploma qualification. Regarding experiences as an ICT teacher a maximum of 4 (40 %) of them have at least 1-3 years of experience, 3 (30 %) of them have 4-6 years of experience. Similarly, 3 (30 %) of them have 7-9 years of experience. Moreover, half of the teachers 5 (50 %) are trained as well as 5 (50 %) are not trained.

Table 2. Demographic information of principals

Demographics	Frequency	Percent
Age		
41-45	4	40
46-50	3	30
51-55	3	30
Qualification		
M.Ed.	10	100

Table 2 shows the demographical information of principals. A total of 10 ($N=10$) principals of various schools under Trashigang Dzongkhag participated in the study who belongs to age group 41- 45 years composed of 4 (40 %), 46-50 years of 3 (30 %) and 51-55 years are 3 (30 %) and all of them have Master qualification in Education.

Table 3. Demographic information of students

Demographics	Frequency	Percent
Age		
Below 15	10	9.2
15-17	95	87.2
18-20	4	3.6
Grade		
IX	109	100

Table 3 represents the demographical information of class IX students studying at various schools in the Trashigang dzongkhag. The majority of the students 95 (87.2 %) fall in the age group between 15-17 years and 10 (9.2 %) of them belongs to Below 15 years. However, only 4 (3.6 %) of them falls into the age group between 18-20 years.

The Fig. 1, represents the factors that affect the successful implementation of ICT in schools. Among the four factors; lack of resources (85.71 %) is found to be the major factor that affects the implementation of the ICT curriculum in the schools under Trashigang dzongkhag. Lack of administrative support (11.76 %) is found to be another factor that affected ICT implementation.

Moreover, due to existence of a policy-implementation gap (2.52 %) was also found to be another factor that affected the successful implementation of ICT in the schools.

Factors affecting the successful implementation of ICT in the Schools

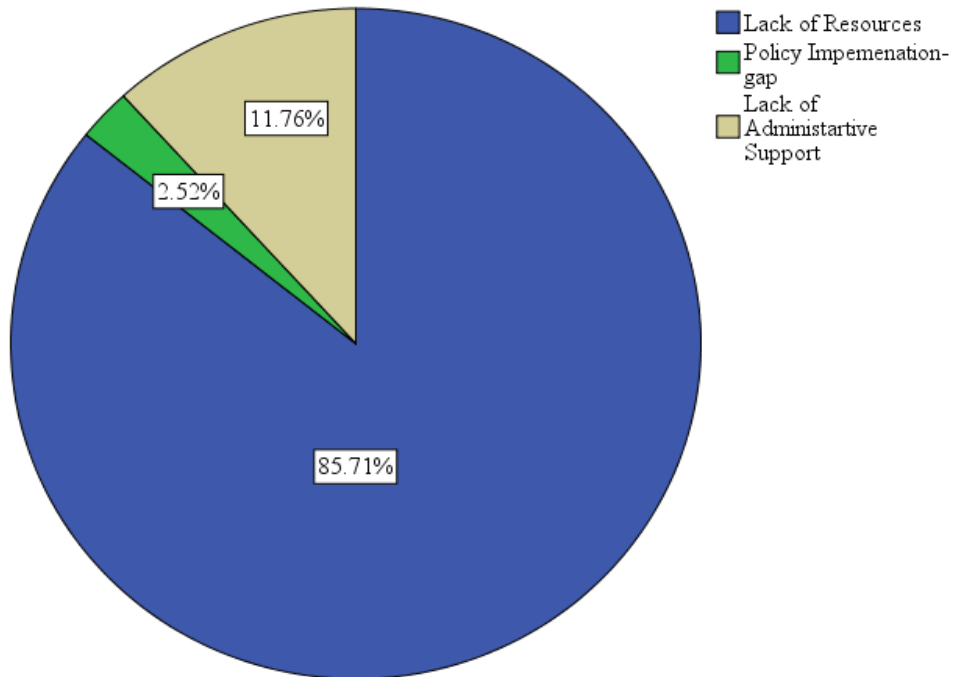


Fig. 1. Factors affecting the successful implementation of ICT

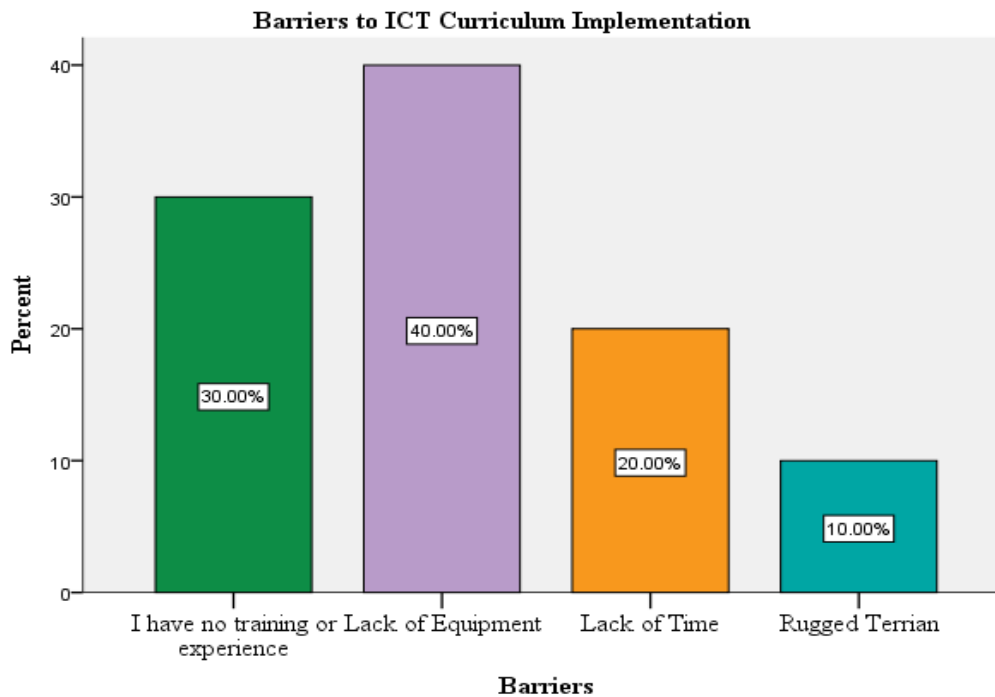


Fig. 2. Barriers to ICT curriculum implementation

Fig. 2 represents barriers to ICT curriculum implementation in schools. Among the four barriers lack of equipment (40 %) is found to be the major barrier to the implementation of an ICT curriculum. Lack of training or experience (30 %) is found to be another barrier. Moreover, due to time constraints (20 %) and rugged terrain and geographical features were also found to be another barrier to the successful implementation of ICT in the schools under Trashigang dzongkhag.

Table 4 shows a Pearson correlation test that demonstrates a strong positive linear relationship between the two variables, including user-ability of using ICT resources and student's learning as indicated by the positive value of the computed correlation index (0.800). The p-value (0.000) being less than the level of significance α 0.01 also demonstrates that the results were statistically significant. Therefore, it is confirmed that the user-ability of using ICT resources positively impacts students' learning in grade IX in various schools under Trashigang dzongkhag.

The results given in Table 5 shows a strong positive linear relationship between the two variables, including the availability of human, ICT resources and student's learning as indicated by the positive value of the computed correlation index (0.973). The p-value (0.000) being less

than the level of significance α 0.01 also demonstrates that the results were statistically significant. Therefore, it is confirmed that the availability of human, ICT resources positively impacts students' learning in grade IX in various schools under Trashigang Dzongkhag.

5. DISCUSSION

This chapter discusses about impact of ICT curriculum to grade IX students studying in different schools under Trashigang dzongkhag. The data was collected from 10 teachers, 10 principals and 109 students from 10schools. It begins with a discussion of availability human resource, ICT resources, students' ability to use ICT tools, significance of ICT and followed by impact of ICT curriculum on students' learning.

The results presented in this study show that students studying at grade IX under various schools under Trashigang dzongkhag have access to various kinds of ICT applications and resources. The result associates with Lhendup (2014) that project had established computer labs in 168 schools, introduced ICT literacy curriculum for all students from grade seven to twelve, and trained more than 5,000 teachers in basic ICT skills. Furthermore, the finding shows that they have an adequate ICT equipment available to use and were familiar with various

Table 4. Correlation between User-ability of ICT resources and student's learning

Correlations			
		User-ability of ICT resources	Student's Learning
User-ability of ICT resources	Pearson	1	.800
	Correlation		
	Sig. (2-tailed)		.000
	N	109	109
Student's Learning	Pearson	.800	1
	Correlation		
	Sig. (2-tailed)	.000	
	N	109	109

***.* Correlation is significant at the 0.01 level (2-tailed)

Table 5. Correlation between the availability of human, ICT resources & Student's Learning

Correlations			
		Availability of Human & ICT Resources	Student's Learning
Availability of Human & ICT Resources	Pearson Correlation	1	.973
	Sig. (2-tailed)		.000
	N	109	109
Student's Learning	Pearson Correlation	.973	1
	Sig. (2-tailed)	.000	
	N	109	109

***.* Correlation is significant at the 0.01 level (2-tailed)

kinds of ICT applications and resources which they use in their educational tasks during studies. Further, the result of this study showed the existence of consistency with previous related studies in the scientific literature. The finding corroborates the ideas of Geoffrey [46] a strong positive linear correlation exists between the availability of human, ICT resources, the user-ability of using ICT resources and the student's educational learning. Further, Nisar et al., [47] supports that the availability of ICT in education is supportive of the students learning. In addition, the usage and impact of ICT in the education sector can be predicted by the availability, usage, knowledge and effectiveness of ICT.

The information and communication technology (ICT) plays a significant role in the student's educational accomplishments. The finding reveals that ICT helps students in completing their assignments, searching and quickly retrieving useful information. Students at all levels sees it as a matter of great importance to acquire ICT-related skills as this can help them to be more productive in their educational accomplishments. However, the results show that challenges in the implementation of national ICT curriculum are due to certain factors such as lack of resources, policy-implementation gap and lack of administrative support. The result confirms by Becta (2004) and (UNESCO, 2007) stated that teachers receive pedagogical training rather than on use of ICT tools, that the obstacles of the use of ICT has been the lack of training in digital literacy and lack of pedagogic training. Further, it aligns to the finding that certain barriers such as lack of experienced and trained teachers, time constraints, equipment and rugged geographical features also act as obstacles to the complete successful implementation of the ICT curriculum of schools under Trashigang dzongkhag. The finding contradicts with Lyonchhoen Thinley, and Pelden [34] that reiterated and emphasized the government's commitment towards realizing Bhutan's ICT aspirations. Moreover, enables ICT services in the country was crucial that steer the development of ICT in the right direction, so that our vision of a knowledge society is realized as a country and as individuals, are able to derive the benefits of the vast potentials of ICT.

The result of this study revealed that there is a need for intervention from relevant stakeholders such as the Ministry of Education, schools and teachers to remind students to realize the importance of ICT in this 21st century and render

necessary support in providing ICT implementation facilities. The result refutes with e-Gov Masterplan (2012) and Lhendup (2021) that the Ministry of Education (MoE) initiated the development of the education Sector ICT Master Plan iSherig (2014-2018) to harness ICT as an enabling tool in teaching and learning, as well as to rationalize and streamline ICT activities, systems, and projects under the MoE and across the education sector. As a part of iSherig implementation, the MoE reviewed the ICT literacy curriculum of the Chiphen Rigphel Project and introduced ICT literacy curriculum from PP-XII. Therefore, the concern agency must be cautious to plan and implement with outmost integrity practically to boost the learning through ICT to build our nation.

6. CONCLUSION

This chapter presents firstly, conclusion of this study, followed by the limitations of this research paper and proposes a recommendation for future studies, followed by a chapter summary.

Information and communication technology (ICT) is used in almost every aspect of human life. According to the findings of this study, the availability of human, ICT resources and user ability to use ICT resources positively impact learning outcomes. As a result, it is highly recommended that students learn ICT-related skills and make the best use of various communication technologies in their teaching and learning process. Furthermore, if relevant stakeholders and educational institutions place a greater emphasis on developing ICT-based infrastructure and ICT-skilled human resources, it can yield beneficial results in the learning process of students' education journey.

7. LIMITATION

- Research in all 56 schools involving primary, lower, middle, and higher secondary schools under Trashigang Dzongkhag was impossible due to rugged geographical features, transportation costs, and logistics. The study was limited to only 10 schools' 10 teachers, 10 principals and 109 grade IX students from middle, higher, central schools located in the urban, semi-urban, and remote.
- Due to communication and internet connectivity issues, we could not cover whole schools under Trashigang Dzongkhag for this research.

- The research data collected from 10 different schools are limited to the few samples that do not integrate all the schools in the Dzongkhag.
- The structured survey questionnaires tools limits to gather of enough data for the research. It might have collected better and more prosperous data if the researchers could have used semi-structured questionnaires and focused group interview.
- The qualitative and mixed methods could have gathered rich data using different tools.

8. RECOMMENDATION

Based on the analysis of the quantitative data and results, the researchers would like to recommend the following strategies for areas where it needs more focus to promote ICT curriculum implementation in the schools under Trashigang dzongkhag to raise the competency of the students.

- Dzongkhag Education Office needs to study the work burden on ICT teachers in consultation with the Ministry of Education and facilitate arrangements for instructional hours so that every teacher gets an enough duration and give their best to teach well to students.
- Dzongkhag Education Office and Ministry of Education to coordinate to appoint qualified resource persons to facilitate any ICT related PD programs or training for the teachers to raise quality updating and benefit students since many teachers have been deprived of the chance due to limited opportunity.
- The Dzongkhag Education Office and Ministry of Education to allocate all the necessary resources for successful implementation of ICT.
- Dzongkhag Education Officers and Principals of the schools to discussed on the common barriers to ICT implementation and find reliable alternative solutions.
- The findings also remind the schools to emphasize more on ICT content and incorporate ICT during teaching and learning process.
- The relevant stake holders should look into the matter of internet connectivity and its bandwidth especially in the school premises.

- Allowing the students in the school to use of cellphone timely will accelerate the use of ICT.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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