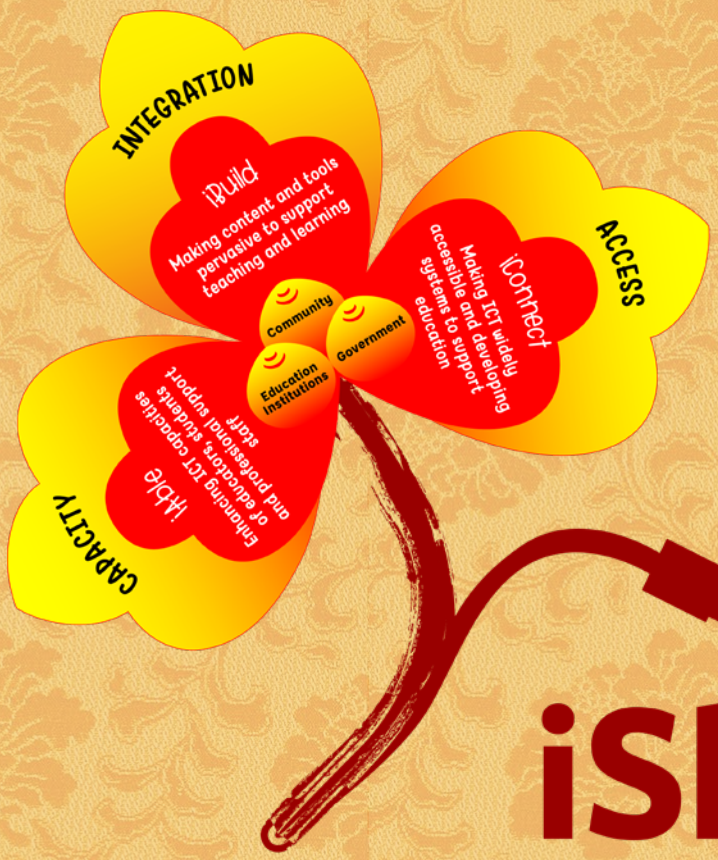
iSherig-2
Education ICT Master Plan
2019-2023



2 iSherig

Ministry of Education
Royal Government of Bhutan
Thimphu

iSherig-2
Education ICT Master Plan
2019-2023

Ministry of Education
Royal Government of Bhutan
Thimphu

Published by the Ministry of Education
Kawajangsa, Thimphu 11001, Bhutan

ISBN 978-99980-41-00-4

Technical Advisors
Jonghwi Park, ICT in Education, UNESCO Bangkok
Jian Xi Teng, ICT in Education, UNESCO Bangkok

Review and Editing
Pelden, NFCED, DAHE, Ministry of Education
Phurba, PPD, Ministry of Education
Thinley, CDC, Royal Education Council
Tshering Phuntsho, TPSD, DSE, Ministry of Education
Tsheyang Tshomo, ICTD, Ministry of Education
Ugyen Dorji, IMD, Royal Education Council
Yeshey Lhendup, SPCD, DSE, Ministry of Education

Design and Layout
Ugyen Dorji, IMD, Royal Education Council

iAble

Table of Contents

iBuild

iConnect

Abbreviations

ADB	Asian Development Bank
AES	Annual Education Statistics
AMFIE	Asia-Pacific Ministerial Forum on ICT in Education
BCSEA	Bhutan Council for School Examinations and Assessment
BPST	Bhutan Professional Standards for Teachers
CBLM	Competency Based Learning Material
CDC	Curriculum Development Centre
CLC	Community Learning Centre
CS	Central School
DAHE	Department of Adult and Higher Education
DEO	Dzongkhag Education Officer
DITT	Department of Information Technology and Telecom
DKAP	Digital Kids Asia-Pacific
DoS	Directorate of Services
DrukREN	Druk Research and Education Network
DSE	Department of School Education
ECCD	Early Childhood Care and Development
EIT	Elective Information Technology
EMD	Education Monitoring Division
EMIS	Education Management Information System
FYP	Five Year Plan
G2C	Government to Citizen
GNHC	Gross National Happiness Commission
GovNet	Government Network
GPMS	Government Performance Management System
HSS	Higher Secondary School
ICTD	Information and Communications Technology Division
ICT	Information and Communications Technology

IMD	Instructional Media Division
IR 4.0	Fourth Industrial Revolution
LG	Local Government
LSS	Lower Secondary School
MIS	Management Information System
MoE	Ministry of Education
MoF	Ministry of Finance
MoIC	Ministry of Information and Communications
MoLHR	Ministry of Labour and Human Resources
MSS	Middle Secondary School
NBIP	National-Based In-service Programme
NFCED	Non-Formal and Continuing Education Division
NFE-MIS	Non-Formal Education Management Information System
NFE	Non-Formal Education
OER	Open Educational Resources
PD	Professional Development
PHCB	Population and Housing Census of Bhutan
PPD	Policy and Planning Division
REC	Royal Education Council
RUB	Royal University of Bhutan
SEN	Special Education Needs
SDG	Sustainable Development Goals
SPCD	School Planning and Coordination Division
STEP-UP	Skills Training and Education Pathways Project
TBD	To be determined
TEO	Thromde Education Officer
TPSD	Teacher Professional Support Division
TRC	Teacher Resource Centre
TVET	Technical and Vocational Education and Training

Foreword

Bhutan has made a commendable progress in terms of expanding access to education over the past six decades. We are close to achieving universal primary education with adjusted net enrolment ratio at 96.8 percent as of 2018. This has been accelerated by expansion of educational facilities and support mechanisms in the previous five-year plans. With the advent of modern education, different initiatives and reforms were undertaken to improve the quality of education. However, challenge of providing quality education to our children still remains.

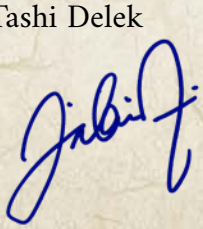
With the objective to address this critical challenge, the 12th Five Year Plan focuses on progressive education in keeping with the need of hour to improve the quality through imparting transferable skills. It is generally accepted that Information Communications Technology (ICT) plays a pivotal role in improving quality and equity of education. ICT is regarded as one of the important and effective tools that can support and lead to an improved student learning and better teaching methods.

To harness the potential and benefit of ICT to enhance the quality of teaching-learning process, the Ministry of Education has developed iSherig-2, Education ICT Master Plan after a successful completion of iSherig-1 (2014-2018). As we stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another, it is important we prepare our children for this fast-changing world. Therefore, in addition to the provision of ICT infrastructure on an equitable basis to our schools and educational institutions across the country, iSherig-2 will focus on building and applying their digital skills.

I urge all relevant agencies to ensure timely and proper implementation of all projects identified in the document over the next five years.

Lastly, I would like to thank UNESCO, Bangkok for their technical and financial support. My sincere appreciation goes to the competent iSherig-2 core team for their commitment and professionalism in formulation of this relevant and realistic master plan.

Tashi Delek



Jai Bir Rai
Minister

Foreword

Education has always been a national priority in every plan period. Taking forward from numerous achievements in the past six decades, the focus of the Ministry of Education in the 12th Five Year Plan (FYP) is improving Quality of Education and Skills, which is identified as one of the National Key Results Areas.

In order to achieve the plan objective and realize Bhutan's vision of becoming knowledge-based society in its true sense, the education system must address the needs of the Fourth Industry Revolution which is evolving at an exponential pace. Integration of ICT in education is one of the critical means that is expected to impart transferable skills and improve the quality of education.

The Ministry of Education has undertaken various initiatives in the use of ICT in education. Since 2014, for the first time, this has been done through a comprehensive iSherig, Education ICT Master Plan 2014-2018 with the intention to lay the foundation and create enabling environment for future ICT initiatives in education. Towards the end of implementation cycle of the first master plan, the Ministry of Education initiated the development of iSherig-2 to take ICT in education further as a means to improve teaching and learning, and continue focused investment in ICT.

iSherig-2 is essentially built upon the recommendations of iSherig-1 Review held in April 2018 with strong alignment to the 12th FYP. In this second iteration, the master plan still maintains linkages of the three thrust areas: iAble – capacity building; iBuild – content development and iConnect – system building, internet connectivity and provision of infrastructure but with inclusion of focused projects on Non-Formal Education (NFE) and Special Education Needs (SEN).

The success of iSherig-2 hinges on the support and commitment from implementing partners such as Royal Education Council, Colleges of Education, and Dzongkhags and Thomdes in addition to relevant departments and divisions within the Ministry. Therefore, I would urge all the implementing partners to ensure that all projects planned in this master plan are implemented properly and in a timely manner.

Finally, iSherig-2 is an outcome of technical and financial support from the UNESCO Bangkok, and commitment and professionalism of the Core Team. Therefore, I would like to extend my heartfelt thanks to UNESCO Bangkok for both technical and financial support. My special appreciation goes to Ms. Jonghwi Park and Mr. Jian Xi Teng, UNESCO, Bangkok for guiding and providing their technical inputs throughout the process of formulating this document. I would also like to congratulate and thank my highly competent Bhutanese colleagues for their commitment and professionalism in coming up with this master plan that will stay relevant in this fast-changing world.

Tashi Delek!

Karma Yeshey
Secretary

Acknowledgement

The Ministry of Education would like to thank everyone who contributed in the development of the Education ICT Master Plan 2019-2023. While the Core Team ideated to provide a draft framework to work with, the Consultative Working Groups discussed, debated and provided implementation-level perspectives during the two national workshops to draw up realistic and practical projects.

This publication was made possible with guidance from the two technical advisors, Ms Jonghwi Park and Mr Jian Xi Teng, UNESCO Bangkok. Their support began with the review of the implementation of iSherig, Education ICT Master Plan 2014-2018. Subsequently, they facilitated the development of the Education ICT Master Plan 2019-2023 by providing valuable and substantive feedback.

The Ministry of Education commends the hard work of the technical advisors, the Core Team and the Consultative Working Groups.

Introduction

Since the Third Industrial Revolution, ICT has been impacting how we live, work, and communicate. The impact will be felt even more in the Fourth Industrial Revolution (IR 4.0) where data are exchanged over the internet of things and cloud computing to provide intelligent automation using artificial intelligence (cognitive computing). This requires education system to leverage on emerging technologies that will prepare our children to participate meaningfully and productively in the era of IR 4.0.

Considering the important role ICT plays to keep abreast with this trend, the Ministry of Education has been prioritising in taking ICT to schools. Since 2014, this has been done through a comprehensive Education ICT Masterplan to rationalize and guide government's investment in ICT in education. To take the ICT in education further as a means to improve teaching-learning, the Ministry of Education aspired to develop the next master plan.

Accordingly, the Ministry of Education sought UNESCO's assistance in October 2017 to review the progress of the Education ICT Master Plan 2014-2018, iSherig (referred "iSherig-1" hereafter) and subsequently to help develop the Education ICT Master Plan 2019-2023, iSherig-2. With the technical assistance from UNESCO, iSherig-2 was developed under the "ICT to Facilitate SDG4 in South Asia" project supported by the Japanese Funds-in-Trust.

This document presents the programmes and projects of iSherig-2 which were essentially built upon the key findings and recommendations of iSherig 1 Review held in April 2018. In this second iteration, the master plan still maintains linkages of the three thrust areas of iAble, iBuild and iConnect of iSherig-1 but with an inclusion of focused projects on Non-Formal Education (NFE) and Special Education Needs (SEN).

iSherig-2 emphasis on the pervasive use of ICT in teaching and learning as clearly stated in the vision of iSherig-2 in making our learners "nationally rooted and globally competent citizens through equitable and pervasive use of emerging and relevant technology". This "pervasiveness" is also evident in the projects, in the way how learners, teachers and instructors are nudged unobtrusively to access electronic resources available on a platform using their knowledge and skills in digital pedagogy.

The vision of iSherig-2 is aligned to the vision outlined in the Qingdao Declaration on ICT in education (May 2015), which is a reaffirmation of Incheon Declaration of Education 2030 adopted in May 2015. As a first global declaration on ICT

in education, the Qingdao Declaration highlights the significance of using ICT to foster access and equity in education, and promote elective pedagogical use of ICT. It stresses the need to promote the culture of open educational resources, recognize the important roles of teacher development and support and ensure quality and recognition of online learning.

In support of SDG4, Education 2030 and the Qingdao Declaration, the Asia-Pacific Ministerial Forum on ICT in Education (AMFIE) in May 2017 adopted the Asia Pacific Regional Strategy on Using ICT to Facilitate the Achievement of Education 2030. The regional strategy identified four priority areas as (a) expanding relevant skills in secondary education, Technical and Vocational Education and Training (TVET) and higher education, (b) improving quality of teaching and teaching practices, (c) enabling inclusion and equality in education and (d) supporting data-driven monitoring and evaluation.

Six action points were formulated to set immediate focus for actions by all member states in the four priority areas. The action points were:

1. developing ICT in education policies,
2. engaging in partnership across the four priority areas with regional and international organizations for sharing of good practices and experiences on challenges,
3. enhancing access to and the quality and relevance of secondary education, TVET and higher education using ICT-based solutions that enable the provision of alternative, open and flexible pathways,
4. developing competency standards for teachers towards ICT-integrated transformative pedagogies,
5. setting concrete measures in the national ICT in education policies to ensure inclusive, equitable and quality learning opportunities for all, and
6. monitoring progress in the four priority areas through a comprehensive Education Management Information System (EMIS) that leverages the potential of new technologies.

The broad areas highlighted above are valid and pertinent to Bhutan's school education and non-formal education. iSherig-2 has 21 projects, subsumed under six programmes, which are organized under three thrusts, all of which align together to address the issues mentioned above. These are the steps toward seamless integration and pervasive use of ICT in curriculum, pedagogy and assessment for engaging and meaningful learning.

Background

Bhutan's ICT vision "an ICT-enabled, knowledge-based society as a foundation for Gross National Happiness" was formulated when the five-year eGov Master Plan was developed in 2012. The eGov Master Plan was aimed at setting a clear roadmap of ICT initiatives in three broad areas of good governance, Bhutanese information society and enabler for sustainable economic development that would cut across the whole government.

Within the eGov Master Plan, the sectoral level ICT roadmap was first initiated in 2013 in the form of five-year Education ICT Master Plan with technical and financial support from Ministry of Information and Communications (MoIC), Infocomm Development Authority of Singapore, Temasek Foundation, Singapore and Swiss Development Corporation. The focus of iSherig-1 was on rationalising and streamlining ICT activities and systems under the Ministry of Education and the colleges of education that has a direct bearing on the school education.

Prior to the completion of iSherig-1 in 2018, the Ministry of Education sought technical assistance of UNESCO to review iSherig-1 and help develop the next master plan. For the development of iSherig-2, a participative master planning process was adopted. A core team was formed to ideate, coordinate and drive the three thrust areas in the master plan. It comprised of key people responsible for education planning, curriculum development, teacher professional development, teacher education, non-formal education, and ICT infrastructure and services for schools. A consultative working group, comprising of teachers, principals, Dzongkhag Education Officers (DEOs), was formed to consult ideas, provide perspectives from their implementation level, and to confirm the programmes and projects.

The review report on iSherig-1 by the UNESCO's Review Mission in April 2018 formed a strong basis in developing iSherig-2. With the technical guidance from UNESCO Bangkok, goals, programmes and projects were identified in collaboration with the Core Team and the Consultative Working Group during the national workshops held in August and December 2018. Some of the ongoing projects and some which could not be started under iSherig-1 but relevant to the present context were carried over to iSherig-2. Subsequently, the draft iSherig-2 was presented to the Project Steering Committee to define the scope, report on the progress, align with other national plans and to seek policy directions. The draft was also presented during the 19th National Education Conference 2018 for wider consultation and endorsement.

In the whole master planning process, conscious effort was made to align the projects to the goals and outcomes of the 12th Five Year Plan (FYP), which coincidentally has the same timeline as iSherig-2 (2019-2023). This ensures most projects in iSherig-2 would be funded fully or partially within the 12th FYP outlay. However, there are few projects which are not part of the 12th FYP that would require an additional funding.

Overview of iSherig-2

VISION

Nationally rooted and globally competent citizens through equitable and pervasive use of emerging and relevant technology.

The essence of the vision is in consonance with the first Education ICT Master plan which aimed to leverage the power of ICT to enhance quality of education. ICT provides the opportunity to bring learners together to collaborate on preserving, showcasing and promoting knowledge, content, culture and values that are indigenous to Bhutan.

ICT provides vital tools for global competence. It bridges distances and increases students' opportunities to learn through collaboration at a local, regional and global level. Besides building ICT skills, this strengthens their intercultural understanding, languages proficiency and knowledge of the world that will help them navigate the world in the 21st century and beyond.

However, in this vision, certain aspects have been highlighted to bring emphasis on equitable and inclusive access, and on making ICT vibrant, integrated and ubiquitous. These highlights are what differentiates this vision from the vision of iSherig-1.

OUTCOMES

Through the implementation of iSherig-2, the Ministry of Education aims to achieve the following three outcomes:

Motivation for lifelong learning

ICT facilitates equipping learners with right transferable skills and values to make them productive, socially responsible, culturally grounded, ecologically sensitive, spiritually aware and globally competent. These attributes help them to participate meaningfully, productively and responsibly in the 21st century and beyond, and lead them to lifelong learning.

Effective teaching and learning

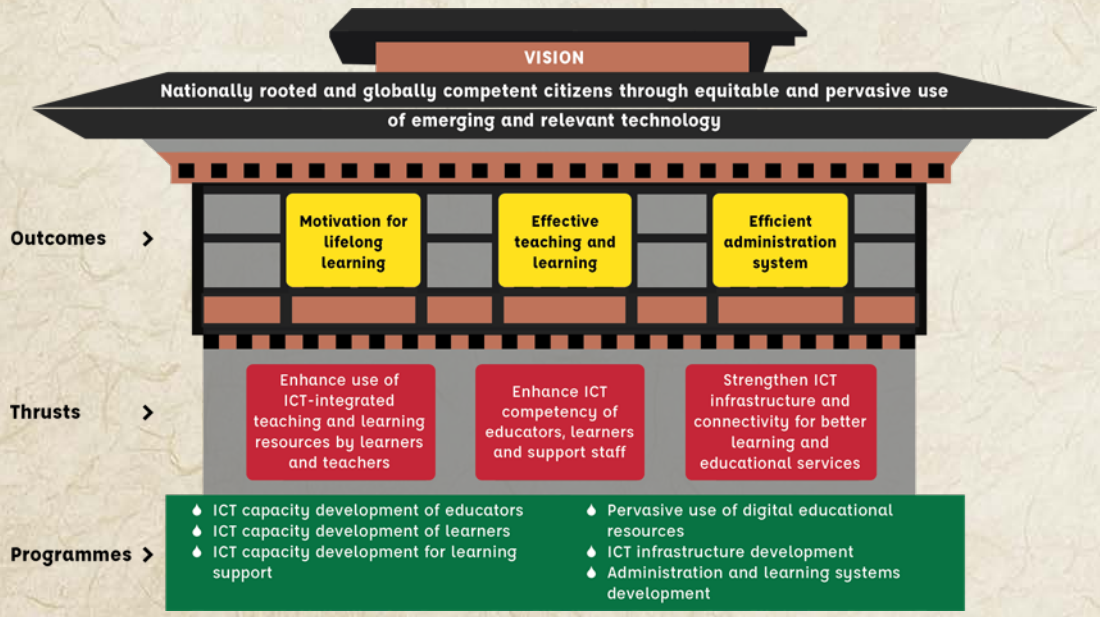
ICT-integrated curricula and interdisciplinary digital pedagogy facilitates collaboration among educators and learners. It provides learners with personalised and active learning experiences through the use of digital resources which are curated or created.

Efficient administration system

A comprehensive and integrated management information system that streamlines the collection and provision of data for informed decision making and evidence-based planning, monitoring and evaluation.

STRATEGIC THRUSTS

iSherig-2 aims to achieve the above desired outcomes through the programmes and projects under three key areas of iAble, iBuild and iConnect. The overview of iSherig-2 is summarized in the diagram below:



A total of Nu 1.729 billion is estimated for the implementation of iSherig-2. The details of the programmes and projects under each strategic thrust are provided in the tables given below:

Thrust 1: iAble ***Enhance ICT competency of educators, learners and support staff.***		**185.68m**
Programme 1.1 ***ICT Capacity Development of Educators***	Project 1.1.1 *ICT competency standards for teachers* Project 1.1.2 *Digital pedagogy in colleges of education* Project 1.1.3 *Digital pedagogy for in-service teachers*	110.86m
Programme 1.2 ***ICT Capacity Development of Learners***	Project 1.2.1 *ICT competencies of students* Project 1.2.2 *Digital citizenship for students* Project 1.2.3 *TVET-based ICT competencies of students* Project 1.2.4 *Digital literacy for NFE and CLC learners*	37.72m
Programme 1.3 ***ICT Capacity Development for Learning Support***	Project 1.3.1 *ICT competencies of educational leaders* Project 1.3.2 *ICT competencies of library and laboratory assistants*	37.10m

Thrust 2: iBuild ***Enhance use of ICT-integrated teaching and learning resources by learners, teachers, NFE instructors and CLC managers.***		**38.79m**
Programme 2.1 ***Pervasive Use of Digital Educational Resources***	Project 2.1.1 *Digital interactive textbooks* Project 2.1.2 *Content adaptation for special needs* Project 2.1.3 *Digital educational resources for schools* Project 2.1.4 *Digital educational resources for NFE*	38.79m

Thrust 3: iConnect ***Strengthen ICT infrastructure and connectivity for better learning and educational services.***		**1,505.28m**
Programme 3.1 ***ICT Infrastructure Development***	Project 3.1.1 *ICT standards and guidelines for schools, TRCs and CLCs* Project 3.1.2 *Digital devices for schools and TRCs* Project 3.1.3 *Internet connectivity for schools* Project 3.1.4 *Multimedia studio* Project 3.1.5 *Digital devices and Internet connectivity for CLCs*	1,463.28m
Programme 3.2 ***Administration and Learning Systems Development***	Project 3.2.1 *E-learning platform* Project 3.2.2 *Education Management Information System* Project 3.2.3 *NFE Management Information System*	42.00m

iAble

Goal

Enhance ICT competency of educators, learners and support staff.

Rationale

ICT is transforming the way we live, work and communicate, and our learners are growing up in a world characterised by rapid technological changes. These changes present both opportunities and challenges. The Ministry of Education plans to harness the potentials of Information and Communications Technology (ICT) to enhance quality of teaching and learning. This aspiration is clearly reflected in Shift Six of the Bhutan Education Blueprint 2014-2024. It articulates the need to develop capabilities and capacities of students, educators and supporting staff to best utilize the investments made in ICT infrastructure, systems and content. Similarly, Pineida (2011) insists that to ensure improvement of learning outcomes by leveraging ICT, students and educators should develop teaching, learning and technological competencies. The Qingdao Declaration (2015) under 'quality learning' recognizes the ability to leverage ICT for learning as no longer a specialised skill but foundational to success in today's societies.

International trends in education show a shift from the traditional "teacher centred" to "student centred" approach (Kenedy, Hyland & Ryan, 2006) which focusses on achieving the intended learning outcomes. Technology can help meet the desired learning outcomes, but it requires competency of both teachers and students to use technology for teaching and learning. Teacher educators, pre-service and in-service teachers must possess the competencies to meaningfully tap the potentials of ICT in education. Although efforts have been made to equip teachers with competencies to integrate ICT in teaching, sporadic and inadequate training programmes impede its successful implementation (Kawai, Wangdi, Galay, Miwa, & Yamada, 2016) in absence of systematic professional development. With the development of ICT competency standards for teachers, it is expected to serve as a basis for the design, development and implementation of training programmes as well as progression of teachers' proficiency along the identified set of competencies.

It is critical to create a supportive academic and management environment in schools to realize the effectiveness of ICT capacity development of educators and learners. Similarly, ICT capacity development of educational leaders and support staff will improve their knowledge and skills, and their beliefs and attitude towards use of ICT in education. These competencies will enable them to become positive users and advocates of ICT for learning and living.

The three programmes and nine projects under iAble are expected to enhance the ICT competencies of educators, learners, educational leaders and support staff.

Programme 1.1 ICT Capacity Development of Educators
Project 1.1.1 ICT competency standards for teachers Project 1.1.2 Digital pedagogy in colleges of education Project 1.1.3 Digital pedagogy for in-service teachers

Programme 1.2 ICT Capacity Development of Learners
Project 1.2.1 ICT competencies of students Project 1.2.2 Digital citizenship for students Project 1.2.3 TVET-based ICT competencies of students Project 1.2.4 Digital literacy for NFE and CLC learners

Programme 1.3 ICT Capacity Development for Learning Support
Project 1.3.1 ICT competencies of educational leaders Project 1.3.2 ICT competencies of library and laboratory assistants

Programme 1.1
ICT Capacity Development of Educators

Goal

All educators pervasively use ICT to enhance teaching and learning process.

Rationale

ICT has impacted the nature of jobs and livelihood in all fields. Teaching profession is not an exception in this wave of ICT- driven change. The role of educators is unique in the context of this change as they have to embrace it as a way of life and also be the agents of ICT-based human capital development (Alazam, Bakar, Hamzah & Asmiran, 2012). The need to enhance ICT capacity of educators, at both college of education and schools, is considered a key intervention to ensure ICT is successfully integrated into teaching.

Quality teacher preparation depends on quality of teacher educators and teacher educators cannot teach what they do not know (Goodwin & Kosnik, 2013). Like any other professional competencies, to better prepare pre-service teachers with the competencies to integrate ICT effectively in teaching, the teacher educators must possess and model the very skills.

Continuous professional development is needed to keep in-service teachers current and relevant in terms of any educational shifts and innovations, including ICT in education. Recognizing the importance of continuous professional development, the Ministry of Education commits to sustain its initiatives and programmes to enhance the competencies of teachers. Development of digital pedagogical competencies has been accorded priority to enable teachers to embrace ICT for living and teaching.

Although a general need for ICT competency development of educators is recognized, currently there are no standards and framework that specify the ICT competency requirements for teacher graduates and practicing teachers. The development of standards and framework is expected to guide in identifying the learning goals of pre-service teachers and capacity development needs of in-service teachers.

The three projects under this programme are intended to accomplish a holistic approach towards capacity building of teacher educators, student teachers and practicing teachers in the use of ICT in education. It is expected to translate into ICT-mediated quality learning experiences for students.

Project 1.1.1 ICT competency standards for teachers

Rationale

Recognizing the importance of developing teachers' capacity for successful integration of ICT into their classroom practices, the government initiated different training programmes for teachers. One notable initiative was the *Chiphen Rigphel* project that started in 2009. However, teachers' actual use of ICT in the classroom is limited to use of slides merely reinforcing the traditional teacher-centred approach. As per the experience of UNESCO Bangkok in ICT in education projects, it revealed that issues in Asia-Pacific region are associated with lack of alignment and coordination between national ICT in education policy and actual teacher development in using ICT to enhance pedagogy.

One-time and one-size-fits-all training for teachers are seen to have no clear and sustained impact on teachers' instructional practices. The school survey conducted as a part of the review of iSherig-1 revealed that 47% of schools do not have school-based ICT training for teachers. The development of an ICT competency standards will guide systematic competency-based professional development programmes to support teachers' meaningful employment of ICT in teaching. It will also serve as a learning goal for teacher education programmes at colleges of education.

This project aims to develop national ICT competency standards for teachers that are aligned to the Bhutan Professional Standards for Teachers (BPST) 2019. The ICT competency standards are expected to guide the development of a comprehensive roadmap that promotes competency-based ICT training programmes which would systematically guide, monitor, assess and track teachers' development at policy and institutional levels.

Objective

Develop ICT competency standards for teachers.

Responsible Bodies

Department of School Education, MoE (Lead)
Colleges of Education, RUB for aligning ICT and pedagogy modules to ICT standards

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Develop national ICT competency standards for teachers	2019	2019	0.96
2. Align pre-service training curriculum and in-service training programmes to ICT competency standards	2019	2019	1.00
		Total	**1.96**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Number of pre-service teacher training modules on digital pedagogy aligned to ICT competency standards	NA	All	Module feedback	Once
2. Number of in-service ICT training modules aligned to ICT competency standards	NA	All	Training reports	Annually

Project 1.1.2 Digital pedagogy in colleges of education

Rationale

Bhutan Education Blueprint 2014-2024 states that teachers need to pervasively use ICT in their teaching to improve the quality of education. The teacher education programmes at the colleges of education should be designed and delivered to meet this need. With the development and implementation of Bhutan ICT Competency Standards for teachers, every teacher graduates is expected to meet the first level (Beginning Teacher) standards. Thus, teacher educators of the colleges of education must be equipped with digital pedagogical skills to enable integration of ICT in their subjects of specialization.

A study conducted by Choeda et al. (2016) on integration of ICT in the colleges of Royal University of Bhutan (RUB) recommended that adequate training should be provided to lecturers to enhance the use of ICT in teaching and learning. Most importantly, the training need is critical to the colleges of education as it has direct impact on the competencies of teacher graduates, who in turn impact classroom practices.

As per the iSherig Review Report (2018), there are issues pertaining to the alignment of elective IT (EIT) modules with school ICT curriculum in both colleges of education. The EIT modules currently offered at Samtse College of Education

requires alignment with ICT curriculum for classes VII to XII while Paro College of Education requires alignment with ICT curriculum for classes IV to VI.

This project comprises of activities to enhance digital pedagogy of teacher educators, ICT integration in subjects of specialization and alignment of elective IT modules with the school ICT curriculum. This project is expected to contribute in producing teacher graduates who are competent in integrating ICT in classroom practices.

Objectives

1. Enhance digital pedagogical skills of all teacher educators.
2. Equip all teacher graduates with knowledge and skills on using ICT as teaching-learning tool in their subject areas.
3. Equip ICT teacher graduates with knowledge and skills to teach school ICT curriculum.

Responsible Bodies

Colleges of Education, RUB (Lead)
Department of School Education, MoE for support
Royal Education Council for collaboration and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Provide professional development on digital pedagogy to teacher educators in two colleges of education 1.1 Conduct needs analysis (2×0.10m) 1.2 Develop training package (2×0.50m) 1.3 Conduct professional development (2×0.10m) 1.4 Strengthen policy on use of digital pedagogy (2×0.50m) 1.5 Carry out impact study (2×0.50m)	2019	2022	3.40
		Total	**8.90**

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
2. Equip pre-service teachers in using ICT as teaching-learning tool 2.1 Develop and validate training module (1.00m) 2.2 Carry out impact study (0.50m)	2020	2023	1.50
3. Align pre-service primary programme to school ICT curriculum 3.1 Develop and validate module (1.00m) 3.2 Evaluate (0.50m)	2022	2023	1.50
4. Align pre-service EIT programme to secondary school ICT curriculum 4.1 Review existing EIT module (1.00m) 4.2 Develop or revise EIT module (1.00m) 4.3 Evaluate (0.50m)	2019	2023	2.50
		Total	**8.90**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of teacher educators confident in using digital pedagogy in their modules	70%	100%	Case study	Once
2. Percentage of teacher graduates confident to integrate ICT in their area of specialization	NA	100%	Teacher assessment as per Bhutan ICT competency standards	Annually
3. Percentage of ICT teacher graduates confident to teach school ICT curriculum	NA	100%	Module feedback	Biannually

Project 1.1.3 Digital pedagogy for in-service teachers

Rationale

Bhutan Education Blueprint 2014-2024 reveals that the academic performance of students does not meet the expected standards. Teacher competency is identified as one of the factors affecting teachers' performance, which in turn is attributed to lack of continuous and quality professional development programmes. Therefore, there is a need to provide quality professional development programmes on ICT-integrated in teaching-learning process as one of the core areas of professional development programme.

Qingdao Declaration (2015) proposed that integration of ICT into teaching and learning requires rethinking the role of teachers and reforming their preparation and professional development. Therefore, it is important to provide relevant training to teachers not only to improve their ICT competency and knowledge but also to improve their beliefs and attitude towards the use of ICT in education (Semerci & Aydın, 2018).

Studies show that there is a close relationship between teachers' capacity in ICT-integrated pedagogy and student learning (Kawai, Wangdi, Galay, Miwa, & Yamada, 2016; Choeda, Penjor, Dukpa, & Zander, 2016). As a national effort towards sustainable and systematic professional development, guided by ICT competency standards, this project is expected to enhance the capacity of teachers to integrate ICT in teaching and learning.

Objective

Equip all in-service teachers with knowledge and skills in using ICT for teaching and learning.

Responsible Bodies

Department of School Education, MoE (Lead)
Colleges of Education for technical support
Royal Education Council for technical support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Provide professional development on digital pedagogy to teachers 1.1 Conduct needs assessment (0.50m) 1.2 Develop training package based on ICT competency standards and recommendations from the needs assessment (1.00m) 1.3 Conduct nationwide professional development programme (95.00m) 1.4 Carry out impact study (2.50m)	2020	2023	100.00
		Total	**100.00**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of teachers competent in using digital pedagogy in their teaching-learning process	NA	100 %	Nationwide teachers assessment	Once

Programme 1.2
ICT Capacity Development of Learners

Goal

Learners use ICT positively for their learning and living.

Rationale

The world is witnessing a phenomenal growth in communication technology, computer networks and information technology. With such exponential growth in ICT, the use of ICT has become inevitable in all aspects of our lives. With development, economies around the globe moved from agriculture to manufacturing and service sectors. Bhutan followed this in its developmental trajectory. Such shifts in structure of economy only highlights the importance of the need of higher-level skills including ICT to lead a productive life.

In the recent past, the government invested in the development of ICT infrastructure and curriculum in schools to provide appropriate skills to students. However, according to UNESCO (2018), youth in South Asia, South-East Asia and Pacific regions lack creative and innovative competencies as well as basic work-related skills and are four to six times more likely than adults to be unemployed. Therefore, there is a pressing need to develop ICT capacity of our learners.

With the increase in access to digital devices and Internet, the probability of becoming vulnerable to the cyber security risks is ever increasing. The children, youths and the non-literates are at a higher risk. Therefore, it is of paramount importance to build ICT literacy and competency. The ICT capacity development and awareness on digital citizenship under this programme should be provided to school students and NFE learners.

As per the TVET Blueprint 2016-2026 (2016), Bhutan is faced with the dual challenge of high youth unemployment and increasing number of youths entering the labour market. Since TVET is seen as a means of empowering individual with adequate skills and enhancing their employability, Bhutan aims to strengthen and expand technical and vocational education and training in schools (12th FYP, MoE). Therefore, ICT trade is seen as one of the areas for diversification of TVET in schools.

There are four projects in this programme designed to enhance ICT competencies of learners.

Project 1.2.1 ICT competencies of students

Rationale

Bhutan Education Blueprint 2014-2024 explicitly states that the students must be productive users of technology, especially ICT as an indispensable tool for success in all areas of learning. Several curricular and informal strategies have been initiated to enhance ICT competencies of students.

The Ministry of Education, in line with iSherig-1, started implementation of ICT literacy curriculum in 2017 for classes IV-VI and in 2018 for classes VII-VIII. The Literacy with ICT curriculum will replace Computer Application subject currently offered in classes IX and X. Similarly, the classes XI and XII computer studies will be replaced by a new curriculum. These changes had also been recommended during the National School Curriculum Conference held in 2016.

This project is expected to consolidate ICT capacity development of students from classes IV to XII. The literacy with ICT curriculum for classes IX and X aims to equip learners with functional ICT knowledge and skills to perform productively and responsibly in knowledge society. The Computer Science curriculum for classes XI and XII will prepare learners to acquire foundational knowledge and skills to pursue potential post-secondary education and work opportunities in ICT field.

Objectives

1. Equip classes IV to X students with functional ICT knowledge and skills.
2. Equip students of classes XI and XII with foundational ICT knowledge and skills.

Responsible Bodies

Royal Education Council (Lead)
Department of School Education, MoE for implementation support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Implement ICT literacy curriculum in class IX 1.1 Develop training package for orientation workshop (0.30m) 1.2 Conduct teacher orientation workshop (2.00m)	2018	2019	2.30
2. Implement ICT literacy curriculum in class X 2.1 Select, review and moderate outsourced textbook (0.50m) 2.2 Develop training package for orientation workshop (0.30m) 2.3 Conduct teacher orientation workshop (2.00m)	2019	2020	2.80
3. Implement Computer Science for class XI 3.1 Finalize the selected textbook (0.30m) 3.2 Develop training package for orientation workshop (0.30m) 3.3 Conduct teacher orientation workshop (2.00m)	2020	2021	2.60
4. Implement Computer Science for class XII 4.1 Select, review and moderate outsourced textbook (0.50m) 4.2 Develop training package for orientation workshop (0.30m) 4.3 Conduct teacher orientation workshop (2.00m)	2021	2022	2.80
5. Review ICT literacy curriculum for classes IV to VIII 5.1 Carry out review study (1.00m)	2021	2023	1.00
		Total	**11.50**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of class X students who passed the ICT literacy course	NA	100%	National assessment	Annually
2. Percentage increase in class XII students who appeared for Computer Science examination	TBD in 2021 (in old ICT curriculum)	10%	National assessment	Once
3. Percentage increase of class XII students who passed Computer Science	TBD in 2021 (in old ICT curriculum)	10%	National assessment	Once
4. Number of ICT curriculum reviewed from classes IV to VIII by 2022	NA	Five class levels	Review report	Once

Project 1.2.2 Digital citizenship for students

Rationale

Bhutanese are increasingly getting connected to Internet. Internet access has scaled up from 0.4% in 2000 to 36.9% in 2016, which is the highest in South Asia (Tenzin et al., 2018). Access to Internet and digital devices may come with the challenges of dealing with harmful online behaviours such as accessing inappropriate content, excessive time spent on computers, engaging in illegal activities and cyberbullying.

A study on prevalence of internet addiction and associated psychological challenges among college students in Bhutan found that internet addiction is high among students in the age range 18-24 years. It recommended the need to create awareness about internet addiction for policy makers, teachers, students, parents and general public (Tenzin et al., 2018). Most educators and parents are unaware of the approaches that they can take in educating and protecting children from these risks.

In line with iSherig-1, an effort was made in introducing some aspects of digital citizenship through ICT literacy curriculum. However, due to the increase in the use of Internet and digital devices by children, the role of parents has become increasingly challenging. Therefore, it is timely for Bhutan to implement digital citizenship programme for our children and parents to empower them with skills and competencies required in the digital world.

Objectives

1. Empower students to participate responsibly, safely and ethically in the digital world.
2. Enhance parents' capability to guide their children to use technology safely and productively.

Responsible Bodies

Department of School Education, MoE (Lead)
Royal Education Council for partnership and support
Department of Information Technology and Telecom, MoIC for collaboration and support
Directorate of Services, MoE for support
Department of Youth and Sports for collaboration and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Conduct baseline study on digital citizenship 1.1 Adopt and finalize survey questionnaire from UNESCO DKAP project (0.50m) 1.2 Conduct survey on students (0.80m) 1.3 Analyse data and write report (0.50m)	2020	2020	1.80
2. Provide digital citizenship programme to students 2.1 Develop orientation package (0.50m) 2.2 Conduct workshops on digital citizenship (2.00m)	2021	2021	2.50
		Total	**8.60**

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
3. Provide digital citizenship workshops to parents 3.1 Develop training package (0.50m) 3.2 Conduct workshops on digital citizenship (2.00m)	2021	2021	2.50
4. Conduct nationwide survey to evaluate impact of digital citizenship programme 4.1 Adopt and finalize survey questionnaire from UNESCO DKAP project (0.50m) 4.2 Conduct survey on students (0.80m) 4.3 Analyse data and write report (0.50m)	2022	2023	1.80
		Total	**8.60**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage increase in students exhibiting digital citizenship competencies	TBD	20%	Survey	Twice

Project 1.2.3 TVET-based ICT competencies of students

Rationale

Human resource development through well-planned education and training initiatives can contribute significantly in promoting the interests of the individuals, the economy, and the society at large. To this end, an effective TVET can impact directly and positively towards helping individuals for gainful employment.

As per the Annual Education Statistics (AES) 2018, only about 7% of class X graduates take up TVET courses annually in technical training institutes under the Ministry of Labour and Human Resources (MoLHR). Bhutan Education Blueprint 2014-2024 with its new education pathway expects to absorb at least 20% of the students in TVET programme. In line with this, the Ministry of Education aims to expand and diversify TVET as an optional subject for classes IX -XII in the 12th FYP in school education. This initiative will also help in achieving the SDG 4.4 which asserts to substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship by 2030.

One of the initiatives that are planned in the 12th FYP is to develop and establish TVET in the school education system through Skills Training and Education Pathways Project (STEP-UP) funded by the Asian Development Bank (ADB). This particular project will focus on enhancing computer hardware and networking trade in Rangjung Higher Secondary School, Trashigang, and introduction of computer software trade in Babesa Higher Secondary School, Thimphu Thromde.

Objectives

1. Equip students with computer hardware and networking skills.
2. Equip students with computer software skills.

Responsible Bodies

Department of School Education, MoE (Lead)
Royal Education Council for curriculum development
Department of Occupational Standards, MoLHR for collaboration and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Develop and implement TVET hardware trade for classes IX-X 1.1 Develop competency-based learning materials (CBLM) (0.33m) 1.2 Develop orientation package (0.05m) 1.3 Orient instructors on CBLM (0.43m) 1.4 Implement hardware trade	2019	2021	0.81
2. Develop and implement TVET hardware trade for classes XI-XII 2.1 Develop CBLM (0.33m) 2.2 Develop orientation package (0.05m) 2.3 Orient instructors on CBLM (0.43m) 2.4 Implement hardware trade	2019	2022	0.81
3. Develop and implement TVET software application trade for classes IX-X 3.1 Carry out need analysis (0.10m) 3.2 Develop CBLM (0.55m) 3.3 Train instructors/teachers (0.85m)	2021	2023	1.50
		Total	**3.12**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of secondary school graduates with TVET electives employed or enrolled in higher TVET courses within 6 months of completing their course	TBD	60%	Tracer study	Annually
2. Percentage of female students taking up TVET ICT trades	NA	40%	EMIS	Annually

Project 1.2.4 Digital literacy for NFE and CLC learners

Rationale

In recent years, ICT in Bhutan has penetrated most parts of the country making life easier and comfortable, but it has also made people vulnerable to internet scams and risks of harmful and illegal online behaviours. Lizardi (2002) described ICTs including radio, television, audiotape and videotape as an efficient, cost-effective means of supporting the learning for illiterate adults and out-of-school learners. In general, for the Asia-Pacific region, ICT offers huge potential to stimulate and realize the human capital.

Since 2017, the Ministry of Education has started to roll out ICT literacy curriculum in the formal education system to support children's digital citizenship skills and competencies. Similarly, it is important to support NFE and CLC learners. This will enable NFE learners to access the ICT-mediated public services such as government-to-citizens (G2C) services to ease their life and use digital resources responsibly.

This project aims to increase ICT adoption and usage, and to enhance the capability of NFE learners to use ICT for economic empowerment and innovation. It is also intended to create awareness among the group and enable technology adopters to make informed decision.

Objective

Equip NFE and CLC learners with functional digital literacy skills.

Responsible Bodies

Department of Adult and Higher Education, MoE (Lead)
Department of Information Technology and Telecom, MoIC for collaboration and technical support
Department of School Education, MoE for support
Directorate of Services, MoE for support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Develop digital literacy module for NFE and CLC programme 1.1 Conduct needs analysis through consultations (0.50m) 1.2 Develop digital literacy module (1.00m) 1.3 Print and distribute digital literacy module (2.00m)	2020	2022	3.50
2. Implement digital literacy module 2.1 Train/orient NFE instructors and CLC managers on functional digital literacy curriculum (5.50m) 2.2 Implement the module in NFE and CLC centres (5.50m)	2022	2023	11.00
		Total	**14.50**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of NFE centres implementing functional digital literacy module	NA	100%	Survey	Annually
2. Percentage of NFE learners using government G2C services	NA	50%	Survey	Twice

Programme 1.3
ICT Capacity Development for Learning Support

Goal

Enhance capacity of educational leaders and professional support staff to support the integration of ICT in teaching and learning.

Rationale

ICT integration in education conventionally focuses more on equipping schools and institutions with hardware and software. However, for the effective use of hardware and software, appropriate support is necessary. Confirming the importance of support services in schools, it was found that teachers in schools with higher quality ICT support are more likely to use technology in their teaching, and in a wider variety of ways, than teachers receiving lower quality support (Ronnkvist, Dexter & Anderson, 2000).

Recognizing the facilitative role of ICT in making teaching-learning exciting and engaging, training of Science and ICT laboratory assistants was identified in iSherig-1. Although the training of ICT laboratory assistants was initiated and about 46% of them were trained (iSherig Review Report, 2018), the other laboratory assistants could not be trained. Therefore, there is a need to provide training to all laboratory assistants in schools across the country. Further, there is the need to train library assistants in schools since they play an important role in supporting teachers and students to use ICT to access online resources.

Similarly, school leaders also play a key role in the integration of ICT in education. Lack of support from school administration impedes ICT integration. For effective integration of ICT, school leaders must have certain level of ICT competency as well as broad understanding of technical, curricular, financial and social dimensions of ICT use in education. Therefore, they need to be aware of both technical and instructional aspects while considering technology support in educational setting.

There are two projects identified under this programme on the capacity development of ICT laboratory assistants and education leaders. These projects are expected to ensure that ICT infrastructure are functional in schools to support ICT integration in teaching and learning.

Project 1.3.1 ICT competencies of educational leaders

Rationale

Educational leaders (DEOs, TEOs, and principals) are pivotal in making any educational programme successful in schools. Their active support and sound understanding of the values and merit of educational technology is one of the factors for successful implementation of ICT in education. Moreover, ICT-based educational management programme enhances educational leaders' efficiency in managing and assessing students' progress for quality and timely feedback.

Besides facilitating ICT integration in instruction, school leaders can leverage technology to build efficient management practices, which will have positive influence on the quality of teaching-learning process. In other words, the ability of school administrators to plan, inspire and lead technology usage in a school strongly influences the success of ICT in education. In Bhutan Education Blueprint 2014-2024, capacity development of education leaders is highlighted as an important intervention to realize the potential of ICT in education management and support.

This project aims to provide professional development on ICT-based management and instructional support for DEOs, TEOs and principals.

Objective

Enhance competency of educational leaders in ICT-based management and instructional support.

Responsible Bodies

Department of School Education, MoE (Lead)
Directorate of Services, MoE for collaboration and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Provide professional development to principals/ DEOs/TEOs on ICT-based management and instructional support 1.1 Conduct needs assessment (0.20m) 1.2 Develop framework and training packages (1.00m) 1.3 Conduct training of trainers (1.00m) 1.4 Roll out (6.00m)	2019	2022	8.20
		Total	**8.20**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of principals oriented on ICT-based management and instructional support	NA	100%	Training reports	Once
2. Percentage of DEOs/TEOs oriented on ICT-based management and instructional support	NA	100%	Training reports	Once
3. Percentage of school leaders using ICT tools to enhance management and instructional support	NA	100%	Survey	Once

Project 1.3.2 ICT competencies of library and laboratory assistants

Rationale

Currently, there are library and laboratory assistants deployed in schools to support teaching and learning. With right training and supervision, they can help teachers and students to successfully integrate ICT in teaching-learning process.

As per iSherig Review Report (2018), most of the computer laboratory assistants were employed without ICT background. The review found out that only 46% of the ICT laboratory assistants received training. In addition, 32% of the respondents recognized that ICT laboratory assistants were somewhat or very competent, while 54% regarded their competency as neutral.

With the use of ICT, science laboratory assistants have the opportunity to make learning science meaningful and interesting. To realize this, they require training to equip them with knowledge and skills to support students and science teachers.

Similarly, library assistants help both teachers and students in locating and sharing information related to learning and teaching. Over the years, the use of ICT in the library has become important. About 177 library assistants were trained on Koha online cataloguing in 2017. Extending this initiative to train all library assistants on need-based capacity development programmes, it is important to enhance their professional services.

This project aims to train ICT and Science laboratory assistants, and library assistants to use ICT to support teachers and students in their teaching-learning process while enhancing the management of their laboratories and libraries.

Objective

Enhance the quality of service delivery by library and laboratory assistants through the use of ICT.

Responsible Bodies

Department of School Education, MoE (Lead)
Department of Information Technology and Telecom, MoIC for support
Directorate of Services, MoE for collaboration and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Train ICT laboratory assistants on hardware maintenance, software installation, and network setup 1.1 Conduct needs analysis (0.10m) 1.2 Develop competency standards and training package (0.20m) 1.3 Conduct training (9.00m)	2019	2023	9.30
2. Train science laboratory assistants on the use of science experiment apps and software. 2.1 Conduct needs analysis (0.10m) 2.2 Develop competency standards and training package (0.20m) 2.3 Conduct training (10.00m)	2019	2023	10.30
3. Train library assistants on digital cataloguing and online information 3.1 Conduct needs analysis (0.10m) 3.2 Develop competency standards and training package (0.20m) 3.3 Conduct training (9.00m)	2019	2023	9.30
		Total	**28.90**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of ICT laboratory assistants trained	46%	100%	Training report	Once
2. Percentage of Science laboratory assistants trained	NA	100%	Training report	Once

Indicator	Baseline	Target	Data Source	Frequency
3. Percentage increase in schools using library management system	NA	20%	Survey	Once
4. Percentage of teachers satisfied with services provided by ICT laboratory assistants	NA	60%	Survey	Once

iBuild

Goal

Enhance the use of ICT-integrated teaching and learning resources by learners, teachers, NFE instructors and CLC managers.

Rationale

Traditional educational environment does not prepare learners to function or be productive in the workplaces of the 21st century. Realizing that students are already using technology, it creates opportunities for integration of ICT in the classroom to make teaching-learning effective and enriching.

Over the years, education has evolved from classroom lectures to the use of ICT-mediated teaching-learning resources such as online courses, video tutorials and e-books. Well-designed ICT-integrated resources can improve student engagement and knowledge retention, and encourage collaboration and individual learning, resulting in active and meaningful learning (Savvidis, 2016). By using digital resources, it also becomes easier, cheaper and faster to update content, reducing the time gap in providing up-to-date information to learners and educators.

Since the current ICT integration efforts are small, siloed and not well coordinated, teachers face difficulty accessing reliable resources relevant to their subjects. Neither CLC managers and NFE instructors have access to digital resources nor do the students have access to curated repository of digital resources. Hence, there is a need to streamline the initiatives for unified and easy access to learners, especially the students with special needs.

This thrust with one programme and four projects aims to curate and customize free e-resources as well as create media-rich resources to enrich teaching-learning process in schools, CLCs and NFE centres. A multimedia studio shall be established under Project 3.1.4 in iConnect thrust to support content development.

Programme 2.1 Pervasive Use of Digital Educational Resources

Project 2.1.1 Digital interactive textbooks
Project 2.1.2 Content adaptation for special needs
Project 2.1.3 Digital educational resources for schools
Project 2.1.4 Digital educational resources for NFE

Programme 2.1
Pervasive Use of Digital Educational Resources

Goal

Ensure availability and accessibility of digital educational resources to learners, teachers, NFE instructors and CLC managers.

Rationale

A study by Plomp et al. (2009) indicates that access to ICT infrastructure and resources is a necessary condition for effective adoption and integration of ICT in education. The importance of equitable access to ICT in schools is also highlighted in Education 2030 Agenda and its Framework for Action. The SDG indicator 4.a.1 also underscores the importance of "Internet and computers for pedagogical use". As a step towards ICT integration in education, provisioning of ICT infrastructure and development of e-resources for schools were identified and initiated in iSherig-1. However, due to financial constraint, the progress has been small and incremental.

Current ICT integration efforts include the use of PhET Interactive Simulations in Science and GeoGebra in Mathematics curriculum, curation of resources to support teaching of textbook-less World History and the use of Google Classroom as a pedagogical tool.

Bhutan Education Blueprint 2014-2024 recommends developing "content for an ICT-driven curriculum to support a vibrant ICT-led teaching and learning environment across Bhutan". This recommendation applies to schools, NFE centres and CLCs. Since the needs mostly pertain to competencies, this programme intends to support building digital resources to assist teachers and students in schools, CLC managers and learners, and NFE instructors to bring about deeper and meaningful teaching and learning.

Four projects are identified to support ICT integration in education under this programme. This includes development of digital interactive textbooks for schools, accessible e-resources for students with visual and hearing impairment, curated resources for schools, and digital resources for NFE instructors and CLC managers.

Project 2.1.1 Digital interactive textbooks

Rationale

As students become more technologically proficient, it is important to embrace the digitization of traditionally printed textbooks. Digital textbooks employ multimedia content such as embedded videos, animated presentations, hyperlinks and assessments to make learning interactive and engaging. Research by O'Bannon, Skolits & Lubke (1997) indicates that besides providing a new way of learning, the interactive textbook makes learning more exciting, motivates learners and increases their attention toward instruction.

Other benefits of digital textbooks include improved access to textbooks for students with disabilities. And for content providers, a major selling point is that it is easier and cheaper to update the content, potentially saving substantial costs on new editions of printed textbooks. Digital textbooks are not planned and intended to replace the printed textbooks, but to provide an alternative, richer learning environment for students and teachers, provide quick updates of content and to better support those with special needs.

A feasibility study carried out in iSherig-1 recommended pilot testing the digital textbook in selected schools to ascertain its effectiveness. Accordingly, a prototype of digital textbook on class V ICT was developed in iSherig-1 and it will be implemented in iSherig-2.

iSherig Review Report (2018) recommends to continue with the initiative, ensuring their compatibility with the learning platform and digital devices proposed under iConnect thrust. Therefore, two other textbooks (class V Social Studies and class VII Geography) are identified to be developed into digital textbooks as these subjects were recently reformed and no major changes in content are anticipated for some years.

Objective

Implement digital interactive textbooks for class V ICT and Social Studies, and class VII Geography.

Responsible Bodies

Royal Education Council (Lead)
Directorate of Services, MoE for e-learning platform

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Pilot class V ICT digital textbook 1.1 Orient teachers from pilot schools (0.40m) 1.2 Monitor and provide on-site support to pilot schools (0.30m) 1.3 Refine digital textbook (0.30m)	2019	2019	1.00
2. Develop digital textbooks through Writers' Workshop 2.1 Develop digital textbook for class V Social Studies (1.00m) 2.2 Develop digital textbook for class VII Geography (1.00m)	2020	2021	2.00
3. Implement digital textbooks through National Based In-service Programme 3.1 Orient class V ICT teachers (2.50m) 3.2 Orient class V Social Studies teachers (2.50m) 3.3 Orient class VII Geography teachers (2.00m)	2020	2022	7.00
4. Conduct monitoring and review	2023	2023	0.50
		Total	**10.50**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of subject teachers oriented on ICT, Social Studies and Geography digital textbooks	NA	100%	NBIP report	Annually
2. Percentage of schools using interactive textbooks	NA	80%	School assessment	Once

Indicator	Baseline	Target	Data Source	Frequency
3. Percentage increase in learning scores in digitized subjects	TBD	10%	School assessment	Twice

Project 2.1.2 Content adaptation for children with special needs

Rationale

One of the key indicators in the 12th FYP is using the standards for inclusive education to improve access and quality of education for children with disability. The Bhutan Education Blueprint 2014-2024 under 2.1.4 Access to Special Education Needs (SEN) also lays emphasis on strengthening special education services with appropriate support services and facilities including teaching-learning materials and assistive devices.

ICT can help improve accessibility to learning resources for visually impaired students with the use of text-to-speech software, high contrast displays and font resizing, thus bringing equity in terms of access to learning resources. Similarly, ICT can assist learners with hearing impairment through visual medium such as videos and pictures. Currently, students with visual and hearing impairment face challenges accessing learning materials like textbooks designed for general students.

ICT for special education services was mentioned implicitly in connection with other projects in iSherig-1, owing to which it was not emphasised during the implementation. Therefore, a separate project for special education needs was identified in iSherig-2.

This project will look into curating and developing appropriate learning materials for secondary school students with visual and hearing impairment and creating a digital learning resources bank. Creating digital learning resources that are accessible for visually and hearing-impaired students will enable them to access information instantly and adapt to their own specific needs. Appropriate digital devices and technology to facilitate access and usability of the digital learning resources shall be guided by the technology standards developed under Project 3.1.1 in iConnect thrust.

Objective

Curate accessible digital learning resources for secondary school students with visual and hearing impairment.

Responsible Bodies

Department of School Education, MoE (Lead)
Royal Education Council for partnership and technical support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Develop e-resources for class IX subjects 1.1 Conduct consultative workshops with the teachers of Muenselling Institute and Wangsel Institute (0.50m) 1.2 Review existing learning content and identification of topics (1.00m) 1.3 Develop and curate learning materials (2.00m) 1.4 Provide online/offline access to learning materials (1.00m)	2019	2022	4.50
2. Develop e-resources for class X subjects 2.1 Conduct consultative workshops with the teachers of Muenselling Institute and Wangsel Institute (0.50m) 2.2 Review existing learning content and identification of topics (1.00m) 2.3 Develop and curate learning materials (2.00m) 2.4 Provide online/offline access to learning materials (1.00m)	2020	2023	4.50
		Total	**9.00**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Number of subjects accessible in digital format for classes IX and X	NA	All	Workshop report	Annually
2. Percentage of students with visual and hearing impairment using digital resources	NA	100%	Survey	Annually

Project 2.1.3 Digital educational resources for schools

Rationale

Students might be digital natives, comfortable with and immersed in technology, and they might be "media multitasking", using several media concurrently, but they depend on teachers to learn through digital means. In a sea of free and open educational resources (OER), finding the relevant, high-quality resources continues to be a daunting and time-consuming task for teachers and students.

Building a repository of carefully vetted digital resources for schools is seen as a way to ease the pressure on teachers while integrating ICT in their teaching process. This is especially relevant for subjects such as teaching of higher secondary World History, which has gone textbook-less to encourage investigative, self-directed and collaborative learning for students.

Use of varied digital resources - videos, animations, presentations, flipbooks - is expected to supplement and enrich existing print-based textbooks and other teaching and learning materials. Research indicates that the use of and exposure to digital media do not displace but operate in concert with older forms such as traditional print media (Rideout, Foehr & Roberts, 2010). As digital natives, students these days tend to "media multitask" (Bittman et al., 2011) and therefore it helps to provide varied multimedia resources to engage students meaningfully.

Within the time frame of iSherig-2, the project aims to build a database/repository of curated digital resources for Science and Mathematics since there is a need to deepen students' knowledge and understanding in STEM to prepare them for higher education or competitive economy (Bhutan Education Blueprint 2014-2024). World History will be continued in this project since the prototype was earlier developed in this subject. The development of digital resources shall conform to the standard framework for integrating ICT into curriculum, which shall also be developed through this project. The digital resources shall be hosted on e-learning platform that will be developed under Project 3.3.3 in iConnect thrust.

Objectives

1. Build multimodal digital educational resources in Science, Mathematics and World History by 2022.
2. Orient teachers on the use of multimodal digital resources for the above three subjects by 2023.

Responsible Bodies

Royal Education Council (Lead)
Directorate of Services, MoE for e-learning platform

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Develop guideline/framework on ICT integration in curriculum 1.1 Conduct review and research (0.10m) 1.2 Consult with stakeholders (0.30m) 1.3 Publish the guideline (0.10m)	2019	2019	0.50
		Total	**12.70**

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
2. Develop digital resources for three subjects 2.1 Review and identify learning content (1.00m) 2.2 Curate or outsource development of digital resources for Science (2.00m) 2.3 Curate or outsource development of digital resources for Mathematics (2.00m) 2.4 Curate or outsource development of digital resources for World History (2.00m)	2020	2022	7.00
3. Implement digital resources 3.1 Host resources on e-learning platform (0.10m) 3.2 Develop training package (0.60m) 3.3 Orient Science teachers (1.50m) 3.4 Orient Mathematics teachers (1.50m) 3.5 Orient History teachers (1.50m)	2021	2023	5.20
		Total	**12.70**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Number of guidelines on ICT integration in curriculum	NA	1	REC annual report	Once
2. Percentage of teachers oriented on the use of digital educational resources	NA	100%	Workshop report	Annually
3. Percentage of students using digital educational resources	NA	100%	Survey	Once

Project 2.1.4 Digital educational resources for NFE programmes

Rationale

Bhutan has made a considerable progress in terms of expanding access to literacy services in the past few decades. This is evident from the increase in adult literacy rate from 53.8% in 2005 to 66.6% in 2017 (PHCB 2017). Such success can be attributed to efficient NFE programme in the country. To take this further, Bhutan aims to achieve 75% adult literacy rate by the end of 12th FYP and 80% adult literacy rate by 2024 as indicated in Bhutan Education Blueprint 2014-2024. Dighe et al. (2009) argued that ICT can be effectively used to support non-formal education. Similarly, Lizardi (2002) described ICTs including radio, television, audiotape and videotape as an efficient, cost-effective means of supporting the learning of "illiterate adults and out-of-school learners".

To achieve the targeted adult literacy rate, some issues and challenges such as non-uniformity in recruitment of NFE instructors, lack of proper training and orientation, and delay in the delivery of teaching-learning materials need to be addressed.

CLCs are intended to provide diversified vocational skills training to meet the demand of the learners and strengthen lifelong learning. However, due to limited skills of the CLC managers in other trades, tailoring has been predominantly offered in the centres. Therefore, building video tutorials and other digital resources on relevant vocational trades would provide the CLC managers an opportunity for self-directed learning by accessing to resources relevant to the courses they teach.

To this end, ICT can serve as the key enabler in making education more accessible and engaging for learners to foster a culture of lifelong learning. Thus, this project will focus on curation and creation of appropriate digital learning materials for NFE instructors and CLC managers. Provision of digital resources is expected to address some of the issues that the programme is grappling with today.

Objective

Build digital educational resources for NFE and CLC programmes.

Responsible Bodies

Department of Adult and Higher Education, MoE (Lead)
Royal Education Council for collaboration and technical support
Directorate of Services, MoE for e-learning platform

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Digitize NFE and CLC teaching and learning materials 1.1 Consult and identify contents and format (0.20m) 1.2 Conduct digitization workshop (0.60m)	2021	2021	0.80
2. Develop digital learning resources for NFE programme 2.1 Conduct needs analysis (0.20m) 2.2 Develop digital learning resources (0.44m) 2.3 Orient NFE instructors (0.60m)	2021	2021	1.24
3. Develop digital learning resources for CLC programme 3.1 Conduct needs analysis (0.40m) 3.2 Develop digital learning resources (2.00m) 3.3 Orient CLC managers (1.50m)	2021	2021	3.90
4. Monitoring and evaluation			0.65
		Total	**6.59**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of NFE instructors using digital educational resources	NA	90%	NFE-MIS	Annually

Indicator	Baseline	Target	Data Source	Frequency
2. Percentage of CLC managers using digital educational resources	NA	100%	NFE-MIS	Annually
3. Percentage of CLC offering diverse vocational courses with the use of digital resources	NA	100%	NFE-MIS	Annually

iConnect

Goal

Strengthen ICT infrastructure and connectivity for better learning and educational services.

Rationale

ICT in education can facilitate universal access to education, help bridge learning divide, enhance the quality of inclusive teaching and learning (Tinio,2003) and help improve education planning and governance. Recognizing these enabling roles and benefits of ICT, countries worldwide has embarked on ICT integration in education. Similarly, in the last few decades, the Ministry of Education has initiated many projects for ICT integration in Bhutanese education system.

Literature informs access to infrastructure and Internet as prerequisites for successful ICT integration in education (Camelo, Torres, Reche, Costa, 2018). CSR-Asia (2017) also specifies that the minimum requirement for an effective ICT system for educational settings includes Internet access and broadband connectivity and/or Wi-Fi network, computers and mobile devices and display technologies.

Major efforts have been made by the Ministry of Education to provide ICT equipment and Internet access for teaching and learning in the last decade. However, schools, Teacher Resource Centres (TRCs) and CLCs are still challenged with insufficient ICT equipment and inadequate Internet bandwidth, which if not addressed will result in inequity and digital divide.

iSherig-1 intended to develop and provide access to localised knowledge repository through e-learning platform but the project could not be initiated due to the lack of resources. With focus on ICT pedagogy and digital resources in iSherig-2, a learning platform to host digital educational resources is required. The e-learning platform is expected to promote self-paced learning, encourage learning by doing and enrich learning through collaboration.

Various automated services and information systems have been developed by the Ministry of Education to enhance service delivery and improve efficiency. However, there is a need to consolidate and strengthen the existing systems for effective use by the relevant stakeholders to make evidence-based decisions.

The iConnect thrust comprises of two programmes and eight projects to enhance ICT infrastructure, develop learning platform and information management systems for both formal and non-formal education.

Programme 3.1 ICT Infrastructure Development
Project 3.1.1 ICT standards and guidelines for schools, TRCs and CLCs Project 3.1.2 Digital devices for schools and TRCs Project 3.1.3 Internet connectivity for schools Project 3.1.4 Multimedia studio Project 3.1.5 Digital devices and Internet connectivity for CLC centres

Programme 3.2 Administration and Learning Systems Development
Project 3.2.1 E-learning platform Project 3.2.2 Education Management Information System Project 3.2.3 NFE Management Information System

Programme 3.1
ICT Infrastructure Development

Goal

Strengthen ICT infrastructure and connectivity for schools and CLCs.

Rationale

ICT has enabled the teaching community to redefine some of the strategies and concepts of teaching and learning apart from improving the learning environment and learning process for students (Klimov, 2012). Presence of vast and diverse online resources has enriched and made the learning process more inclusive, collaborative and interesting for both teachers and students. Integration of ICT in education is predominantly dependent on the connection to high-speed networks but also technological equipment or the definition of spaces for their secure and adequate use (Camelo, Torres, Reche, & Costa, 2018). Further, Geladze (2015) concluded that use of computers and Internet in teaching-learning process makes the learning interesting and diverse and leads to increase in cognitive activity.

Recognizing the importance of Internet and computers in enhancing the quality of education, the SDG indicator 4.a.1 emphasises the need for member countries to increase proportion of schools with good access to Internet and computers for pedagogical purposes. Currently, all secondary schools and few primary schools have a computer lab each with 10-32 working computers (AES, 2018). However, the computer labs in most of these schools are adequate only for delivering ICT literacy curriculum. Although, majority of secondary schools and few primary schools are connected to the Internet, iSherig Review Report (2018) indicates that most of these schools are still challenged with inadequate bandwidth. Furthermore, teachers have limited access to digital devices and Internet, while students' access to computers and Internet is confined to ICT classes.

To provide opportunities for CLC managers and learners to upgrade their skills, the iSherig-2 plans to develop digital tutorials on vocational trades offered in CLCs. To support this initiative, CLCs need to be provided with Internet connectivity and digital devices.

This programme is expected to enhance and upscale ICT facilities to support teaching and learning in schools, TRCs and CLCs.

Project 3.1.1 ICT standards and guidelines for schools, TRCs and CLCs

Rationale

ICT infrastructure does not only encompass a set of equipment - it is a complex combination of a set of hardware, software, services, procedures, processes and persons (Baquero, Aguilar, & Ayala, 2006). All these resources have to be designed, developed and managed uniformly in all schools, TRCs and CLCs. This uniformity can be ensured through standards that define the basic technological architecture, infrastructure and its usage.

While much has been achieved in establishing ICT infrastructure, the absence of standards and guidelines has created non-uniform development of ICT infrastructure and its usage in schools, TRCs and CLCs. This increases digital divide and uneven opportunity for learning. Further, the gap is likely to increase with the decentralization policy in the 12th FYP which expects the Local Governments (LG) to develop the ICT infrastructure.

Therefore, ICT standards and guidelines will be developed to streamline the provision and usage of ICT facilities. This document will set minimum infrastructure requirements and provide directions for effective use of ICT facilities.

Objective

Develop ICT standards and guidelines for schools, TRCs and CLCs to ensure uniform and equitable ICT infrastructure and usage.

Responsible Bodies

Department of School Education, MoE (Lead)
Department of Information Technology and Telecom, MoIC for collaboration and support
Royal Education Council for collaboration and support
Directorate of Services, MoE for collaboration and support
Department of Adult and Higher Education, MoE for collaboration and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Develop standards and guidelines 1.1 Consult with stakeholders (0.13m) 1.2 Develop standards and guidelines (0.15m) 1.3 Orient DEOs/TEOs on standards and guidelines (0.50m)	2019	2021	0.78
		Total	**0.78**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of schools meeting the minimum standards	TBD	50%	EMIS/ AES	Annually

Indicator	Baseline	Target	Data Source	Frequency
2. Percentage of CLCs meeting the minimum standards	TBD	100%	EMIS/ AES	Annually
3. Percentage of TRCs meeting the minimum standards	TBD	100%	EMIS/ AES	Annually

Project 3.1.2 Digital devices for schools and TRCs

Rationale

Teachers and students must have access to adequate and appropriate infrastructure and resources for effective teaching and learning (Internet Society, 2017). Therefore, schools must be equipped with essential devices to foster ICT integration in teaching and learning.

During the 11th FYP, the Ministry of Education continued strengthening of ICT facilities in schools. Although, 98% of secondary schools and 20% of primary schools have at least one computer lab, the labs do not have adequate computers, which affects the effective implementation of ICT curriculum and integration of ICT in teaching and learning. Moreover, the access to digital devices for students is limited to ICT classes only.

Teachers must be equipped with requisite soft skills and essential devices to enhance their competence to facilitate ICT for pedagogical practice (Bingimlas, 2009). Except for the initiative of the Ministry of Education in 2009 to provide soft loan to buy laptops, provision of computers to teachers has received minimal support. Further, the focus on digital pedagogy in iAble, creation of digital educational resources in iBuild and e-learning system in iConnect in iSherig-2 necessitates the need to improve access to digital devices for teachers in schools and TRCs.

This project aims to improve access to digital devices for both students and teachers as per the standards and guidelines developed in Project 3.1.1. The supply of digital devices to schools and TRCs has been decentralized to Local Governments (LG) in the 12th FYP.

Objective

Strengthen provision of ICT devices for students and teachers.

Responsible Bodies

Local Government (Lead)
Department of School Education, MoE for support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Conduct situational analysis of digital devices in schools and TRCs	2019	2019	0.10
2. Supply computers to teachers	2020	2023	360.00
3. Equip and set up computer labs 3.1 Equip primary schools (150.00m) 3.2 Equip secondary schools (100.00m) 3.3 Equip TRCs (6.00m)	2020	2023	256.00
4. Supply projection devices such as projectors, smart boards and smart TVs to primary schools	2020	2023	100.00
		Total	**716.10**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of teachers having computers	TBD	100%	AES	Annually
2. Percentage of secondary schools meeting the standard of computer to student ratio	12%	50%	AES	Annually

Indicator	Baseline	Target	Data Source	Frequency
3. Percentage of primary schools meeting standard for computer to student ratio	8%	50%	AES	Annually
4. Percentage of primary schools using projection devices	TBD	100%	AES	Annually
5. Percentage of TRCs meeting minimum standards	TBD	100%	Survey	Twice

Project 3.1.3 Internet connectivity for schools

Rationale

Adequate and affordable Internet connectivity is fundamental for ICT in education (Internet Society, 2017). Internet in education is useful as it enhances accessibility of education at all levels to the vast repository of information that can enrich teaching and learning.

Considering its importance, the Ministry of Education has invested to provide Internet connectivity to schools. As of 2018, all secondary schools and 20% of primary schools have been connected to Internet (AES, 2018). But inadequate bandwidth is an issue for most schools due to high recurrent cost (UNESCO, 2018).

Leveraging on economy of scale, the government has negotiated subsidy on Internet rates for government agencies and institutions with Internet Service Providers (ISPs) in early 2019. Further, DITT has initiated GovNet and DrukREN, which are high-speed internal networks to connect government agencies and institutions to facilitate effective and efficient delivery of services at a minimal cost.

With support from DITT and LG, this project aims to strengthen Internet connectivity in schools to support ICT integration in teaching-learning process.

Objective

Improve Internet connectivity to all schools.

Responsible Bodies

Department of Information Technology and Telecom, MoIC (Lead)
Local Government for implementation
Department of School Education, MoE for support
Directorate of Services, MoE for support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Provide Internet connectivity to all schools	2019	2021	432.00
2. Budget recurrent cost for Internet connectivity to schools	2019	2023	300.00
		Total	**732.00**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of schools with Internet access	49%	100%	AES	Annually
2. Percentage of schools with Internet bandwidth as specified in the standards	TBD	100%	AES	Annually

Project 3.1.4 Multimedia studio

Rationale

Bhutan Education Blueprint 2014-2024 recommends developing digital content to support ICT-driven curriculum. Use of digital contents is expected to supplement and enrich existing print-based textbooks and other teaching and learning materials. Learners these days tend to "media multitask" (Bittman et al., 2011) and therefore development and provision of localised multimedia resources are seen as a way to engage students meaningfully.

The various projects under iBuild intend to develop variety of digital resources to support teaching and learning. A well-equipped multimedia studio will facilitate and support development of digital resources for these projects. Therefore, this project targets to establish a well-equipped multimedia studio. The multimedia studio will be a dedicated space equipped with multimedia production equipment such as high-end workstations, audio and video tools, interactive smart board and recording facilities. The studio will be connected to high-bandwidth Internet to support production of multimedia learning contents or streaming of audio or video contents for enriching teaching-learning experience.

Objectives

1. Establish a digital studio to facilitate development of e-contents.
2. Develop capacity to manage digital studio.

Responsible Bodies

Department of School Education, MoE (Lead)
Directorate of Services, MoE for collaboration and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Establish multimedia studio	2022	2022	6.00
		Total	**9.00**

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
2. Develop capacity to manage multimedia studio and create digital content 2.1 Recruit instructional designers and technical staff 2.2 Provide training to instructional designers and technical staff (3.00m)	2022	2022	3.00
		Total	**9.00**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Availability of multimedia studio by 2022	0	1	Physical verification	Once
2. Number of digital contents developed in studio	0	12	E-learning platform	Annually

Project 3.1.5 Digital devices and Internet connectivity for CLCs

Rationale

CLC programme in the past decades have benefitted learners in communities by empowering them with livelihood skills especially in tailoring. With the growing societal demand, diversification of vocational courses has been recognized as crucial component of the programme to cater to the needs of the learners (NFCED, 2015).

The diversification of vocational courses calls for expertise to support and impart skills to CLC learners. But, CLCs are challenged with lack of skilled CLC managers. iSherig-2 plans to develop digital tutorials on vocational trades offered in CLCs to provide opportunity for CLC managers and learners to upgrade their skills. To support this initiative, Internet connectivity and digital devices are essential.

This project will build on efforts made in 11th FYP to provide Internet connectivity to CLCs and equip them with digital devices such as computers and projection devices.

Objective

Establish ICT infrastructure and connectivity to all CLCs.

Responsible Bodies

Department of Adult and Higher Education, MoE (Lead)
Directorate of Services, MoE for support
Local Government for implementation

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Conduct situational analysis of existing ICT infrastructure	2020	2020	0.20
2. Supply digital devices 2.1 Supply computers and printers (1.20m) 2.2 Supply projection devices (0.90m)	2020	2023	2.10
3. Connect to Internet and set up internal network	2020	2023	2.00
4. Carry out monitoring and evaluation	2020	2023	0.50
5. Budget recurrent cost for Internet	2020	2023	0.60
		Total	**5.40**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Number of CLCs equipped with ICT infrastructure and Internet connectivity	0	30	NFE-EMIS	Annually
2. Number of sessions ICT devices are used for teaching and learning per week	0	2	NFE-EMIS	Annually

Programme 3.2
Administration and Learning Systems Development

Goal

Enhance efficiency of education management and learning support.

Rationale

Education and learning management systems play a vital role in transforming education at different levels from learning to governance. Fu (2013) mentions benefits of ICT in education such as assisting students and teachers in accessing digital information efficiently and effectively, supporting student-centred and self-directed learning, and promoting creative and collaborative learning environment.

The e-learning platform for schools could not be initiated as planned in iSherig-1. However, it will be pursued in iSherig-2 as it provides accessibility to rich digital learning contents and promotes focussed and customised learning.

Management Information System (MIS) is critical in providing accurate, reliable and timely information to the decision makers for appropriate interventions. Bhutan Education Blueprint 2014-2024 and SDG 4 recommend the establishment of a comprehensive functional MIS to support data-driven monitoring and evaluation.

This programme targets to revamp EMIS and develop e-learning platform and NFE-MIS to enhance efficiency and effectiveness of educational services.

Project 3.2.1 E-learning platform

Rationale

E-learning has immense potential to support active, participatory and meaningful learning. When e-learning is effectively integrated into the teaching and learning process, teachers assume the roles as facilitators, advisors, content experts and coaches, thus helping students construct meaning of their learning. E-learning can also promote the concept of lifelong learning, allowing learning to take place anywhere and anytime.

While the tertiary institutes have adopted virtual learning environment as recommended in iSherig-1, e-learning could not be initiated for school education. However, with the emphasis on curation and creation of educational learning resources in iBuild thrust, an e-learning platform will continue to play a vital role

This project aims to develop an e-learning platform to serve as a repository of digital learning resources where students and teachers can access and share localised contents to encourage self-directed learning.

Objective

Establish e-learning platform to host digital educational resources.

Responsible Bodies

Directorate of Services, MoE (Lead)
Department of School Education, MoE for partnership and support
Royal Education Council for partnership and support
Bhutan Council for School Examinations and Assessment for partnership and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Develop e-learning platform 1.1 Carry out requirement analysis (0.50m) 1.2 Develop e-learning platform (2.00m)	2019	2021	2.50
2. Develop technical capacity to manage e-learning platform	2020	2021	1.00
3. Orient teachers on e-learning platform	2021	2022	3.00
		Total	**6.50**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Number of schools accessing e-learning platform	NA	50%	Survey	Once

Project 3.2.2 Education Management Information System

Rationale

A robust Education Management Information System (EMIS) provides systematic and quality data in a well-structured enabling environment to facilitate utilization of information for planning and monitoring of programs in education (Abdul-Hamid, 2014). Therefore, a comprehensive EMIS is necessary for any education organisation.

The EMIS in the Ministry of Education was developed in 2011 with the objective to help planners make evidence-based decision making. The data from this EMIS is used as the main source of information for AES and for generating other information for education planning and decision making.

With increasing demand for data requirements, there is a need to upgrade the existing EMIS to link it to other relevant systems and make it comprehensive. Similarly, Bhutan Education Blueprint 2014-2024 also emphasises the need to strengthen EMIS to provide comprehensive database of students, teachers and schools for evidence-based decision making and planning at all levels of administration.

The upgraded EMIS also intends to enhance user experience by adding usability features such as ease of data entry, ease of access at various levels, and use of data analytics to track students' performance, attendance, result, movement, etc.

This project plans to develop a robust, integrated and comprehensive EMIS that will inform the stakeholders on the state of education for planning, monitoring and evaluation.

Objective

Develop an integrated and comprehensive EMIS.

Responsible Bodies

Directorate of Services, MoE (Lead)
Policy and Planning Division, MoE
Department of School Education, MoE for collaboration and support
Bhutan Council for School Examinations and Assessment for collaboration and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Develop EMIS 1.1 Conduct requirement analysis (1.00m) 1.2 Develop EMIS (17.00m)	2019	2021	18.00
2. Implement EMIS 2.1 Develop capacity on EMIS usage (10.00m) 2.2 Carry out data cleaning (2.00m)	2021	2022	12.00
		Total	**32.00**

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
3. Develop capacity of technical staff to manage EMIS	2019	2020	2.00
		Total	**32.00**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Number of relevant government agencies using EMIS data	NA	7	EMIS	Annually

Project 3.2.3 NFE Management Information System

Rationale

The NFE programme in Bhutan continues to be an effective programme in providing basic literacy and functional skills mostly to rural population who have missed the opportunity to pursue formal education. While many adult learners have benefitted from the programme, there is inadequate data on non-formal learners that hinders evidence-based decision making.

Currently, the data is manually collected and managed at the Ministry of Education, Dzongkhags, Thromdes and CLCs/NFE centres with varying details and formats. Such a practice is tedious and does not support in-depth analysis of data to improve the programme. Further, the NFE Programme Review Report 2015 recommended to enhance monitoring, evaluation and support services to improve the non-formal programme and services.

This project aims to develop a comprehensive NFE Management Information System (NFE-MIS) to manage information on CLCs/NFE centres, managers, instructors and learners for planning, monitoring and evaluation.

Objective

Develop a comprehensive NFE-MIS.

Responsible Bodies

Department of Adult and Higher Education, MoE (Lead)
Directorate of Services, MoE for partnership and support

Implementation Plan and Costing

Activity	Timeline		Cost (Mil. Nu)
	Start	End	
1. Develop NFE-MIS 1.1 Conduct requirement analysis (0.50m) 1.2 Pre-test NFE questions (0.30m) 1.3 Develop NFE-MIS (1.50m)	2020	2021	2.30
2. Build technical capacity of staff to manage NFE-MIS	2020	2021	0.60
3. Implement NFE-MIS	2022	2022	0.60
		Total	**3.50**

Key Indicators

Indicator	Baseline	Target	Data Source	Frequency
1. Percentage of CLCs and NFE centres using NFE-MIS	NA	100%	NFE-MIS	Annually

Resource Mobilization

Resource mobilization plan is necessary for securing, optimizing and utilizing the resources to achieve the set targets. It ensures prudent resource distribution for effective implementation of programmes and projects. It outlines standard resource acquisition process, utilization and reporting procedures.

It provides an overview of how resource requirements for projects are aligned to agency's overall plan and helps identify the resource gaps. The resource gaps shall serve as the basis for exploring additional support from the government or other potential donors. The support may be in the form of financial, technical or material.

The objectives of resource mobilization plan are:

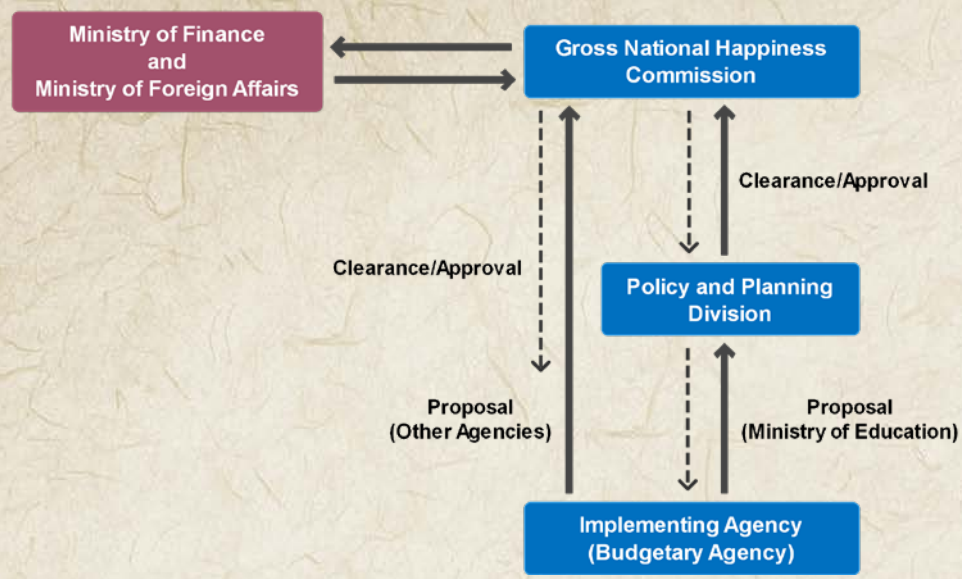
a. ensuring adequate allocation and rational utilization of resources,
b. identifying resource gaps to explore additional resources,
c. identifying potential donors and partnership agencies, and
d. supporting implementing agencies in resource acquisition strategies.

iSherig-2 is largely aligned with the 12th FYP. The total budget estimated is Nu 1.729 billion of which Nu 1.686 billion is part of the 12th FYP outlay. The remaining resource gap of Nu 46.1 million needs to be mobilized for successful implementation of iSherig-2. The implementing agencies shall solicit support from potential donors to address the resource gaps. The following two sections outline the process and potential development partners for the implementing agencies to explore resources.

Resource Acquisition Process

The Gross National Happiness Commission (GNHC) Secretariat is the nodal grant-coordinating agency for Royal Government of Bhutan. It is responsible for coordinating and mobilizing external resources.

The proposal for resource acquisition from donor agencies must originate from the implementing agencies. The proposal must have clearance from the Ministry of Foreign Affairs after endorsement by the GNHC Secretariat. The figure below explains the resource acquisition process:



Financial assistance process and protocol

Potential Development Partners

Bhutan has many bilateral and multilateral development partners supporting in various areas. Besides them, the Ministry of Education and other implementing agencies need to explore for collaboration, and financial and technical support from other international and local agencies having shared vision and priorities in ICT in education.

Implementation Mechanism

iSherig-2 covers a broad range of ongoing and future activities that involve different agencies. One of the main challenges faced in the implementation of iSherig-1 was the absence of a coordinating authority to oversee and monitor the implementation by various agencies. Therefore, it is necessary to institute a strong mechanism that can resolve implementation issues, authorize necessary actions and monitor the progress.

Based on the analysis of other countries' experiences in implementing their master plan, two main implementation arrangements stand out.

a. Creating a dedicated division that oversees and is responsible for all matters related to ICT in education.

b. Creating a high-level committee to oversee and ensure the implementation of the master plan.

Considering the administrative complexity in restructuring and creating a dedicated educational technology division, the implementation arrangement proposed is to create a high-level committee to oversee and monitor the implementation of iSherig-2. The implementing agency shall identify project leads to manage respective projects.

However, in the long run, it may be more effective to establish a dedicated educational technology division that will be responsible for effective use and integration of instructional technology in schools as recommended by iSherig Review Report 2018.

The following arrangement will be made to facilitate effective implementation of iSherig-2.

A. Steering Committee

The Steering Committee for iSherig-2 will be formed comprising members from relevant agencies, and this committee will be the highest decision-making body for iSherig-2. Therefore, it will provide overall policy direction and strategic guidance for the implementation of iSherig-2. In addition, any cross-sectoral issue pertaining to the project will be addressed by the committee.

Members

1. Secretary, Ministry of Education (Chair)
2. Director General, Department of School Education, MoE
3. Director General, Department of Adult and Higher Education, MoE
4. Director, Royal Education Council
5. Director, Department of IT and Telecom, MoIC
6. Director, Directorate of Services, MoE
7. Presidents, Colleges of Education, Paro and Samtse
8. Representative from GNHC
9. Representative from MoF
10. Chief, Policy & Planning Division, MoE
11. Planning Officer, PPD, MoE (Member Secretary)

Working Procedures

The Steering Committee will adopt the following working procedures:

1. The Secretary, Ministry of Education will chair the steering committee meetings.
2. The steering committee meetings will be convened twice a year - in June/July and in December/January to review workplan, and monitor physical and financial progress.
3. Ad hoc steering committee meetings may be convened as and when required to resolve urgent issues.
4. The meeting will be convened if the quorum of two-third of the members is met.

Roles and Responsibilities of Members

1. Provide overall policy direction and strategic guidance to ensure the projects under iSherig-2 are implemented as planned.
2. Address any inter-agency issue pertaining to the projects for smooth coordination amongst the implementing agencies.
3. Monitor the progress of the projects for timely support and intervention.

Roles and Responsibilities of the Member Secretary

1. Coordinate Steering Committee meetings.
2. Prepare the meeting agenda and keep record of the discussions.
3. Liaise with relevant implementing agencies to compile progress reports.

B. Project Leads

The project leads identified from the implementing agencies as reflected in iSherig-2 will be responsible for planning, budgeting and executing their projects in collaboration with relevant agencies. They are also responsible for submitting periodic progress reports to the Steering Committee through the member secretary.

When required, a project lead may propose for a meeting of project leads to resolve issues related to coordination and alignment of planned activities. The member secretary of the Steering Committee shall coordinate and convene the meeting.

Monitoring and Evaluation

Monitoring is considered as an important mechanism for effective implementation of the project while evaluation assesses the extent to which the project has achieved its intended objectives as mentioned in the project document.

Considering the importance of monitoring and evaluation, the iSherig-2 will follow the National Monitoring and Evaluation System Framework of Bhutan. As per the framework, the cabinet is the apex institution that monitors implementation and provides strategic direction, guidance and support. The GNHC carries out overall monitoring and evaluation of 12th FYP, and makes strategic and timely interventions.

At the agency level, the monitoring and evaluation will follow the existing Government Performance Management System (GPMS). The monitoring and evaluation shall be based on the indicators, targets and data sources that are identified under each project.

Specific to iSherig-2, the Steering Committee shall monitor the progress through periodic reporting by the implementing agencies. As per the directive of the Steering Committee, a mid-term review of iSherig-2 may be carried out to monitor the overall implementation status. An independent evaluation will be carried out to assess the entire master plan at the end of the implementation period.

References

Abdul-Hamid, H. (2014). What Matters Most for Education Management Information Systems : A Framework Paper. *SABER Working Paper Series; No. 7.* World Bank Group, Washington, DC. Retrieved from https://openknowledge.worldbank.org/handle/10986/21586

Alazam, A., Bakar, A. R., Hamzah, R., & Asmiran, S. (2012). Teachers' ICT Skills and ICT Integration in the Classroom: The Case of Vocational and Technical Teachers in Malaysia. *Creative Education, 03*(08), *70-76.*

Baquero, P., Santana, A., Zubiria, I., & Prieto, M. (n.d.). Basic Architecture for ICT Integration in the Canary Educational System. *Information Technology and Educational Management in the Knowledge Society, 181-198.* doi:10.1007/0-387-24045-4_17

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education, 5*(3).

Bittman, M., Rutherford, L., Brown, J. and Unsworth, L. (2011). Digital Natives? New and Old Media and Children's Outcomes. *Australian Journal of Education, 55*(2), 161-175.

Blanche W. O'Bannon, Gary J. Skolits & Jennifer K. Lubke. (2017). The Influence of Digital Interactive Textbook Instruction on Student Learning Preferences, Outcomes, and Motivation. *Journal of Research on Technology in Education, 49, 3-4, 103-116,* doi:10.1080/15391523.2017.1303798

Camelo, G. E. H., Torres, J. M. T., Reche, M. P. C., & Costa, R. S. (2018). Using and integration of ICT in a diverse educational context of Santander (Colombia). *JOTSE, 8*(4), 254-267.

Choeda, Penjor, T., Dukpa, D., & Zander, P. O. (2016). The state of integration of the virtual learning environment and ICT into the pedagogy of the Royal Government of Bhutan: A descriptive study. I*nternational Journal of Education and Development Using Information and Communication Technology. 12*(1), *71-88.* Retrieved from https://files.eric.ed.gov/fulltext/EJ1099582.pdf

Community Learning Centres Network Based on Open-Source Technology (With Special Reference to Non-Formal Education in Thailand). (2014). I*nternational Conference on Intelligent Systems, Data Mining and Information Technology (ICIDIT 2014) April 21-22, 2014 Bangkok (Thailand).* doi:10.15242/iie.e0414053

CSR-Asia & Huawei. (2017).The Role of ICT in Realising Education for all by 2030 – Achieving Sustainable Development Goal 4. Retrieved from https://goo.gl/BDtzdZ

Hyland, A., Kennedy, D., & Ryan, N. (2006). Writing and using learning outcomes: A practical guide. *EUA Bologna Handbook. Making Bologna Work, 41, 1-30.* Retrieved from http://sss.dcu.ie/afi/docs/bologna/writing_and_using_learning_outcomes.pdf

Dabas, N. (2018). Role of Computer and Information Technology in Education System. *International Journal of Engineering and Techniques, 4(1), 570-574.* Retrieved from from http://www.ijetjournal.org/Volume4/Issue1/IJET-V4I1P78.pdf

Fu, J. (2013). Complexity of ICT in education: A critical literature review and its implications. *International Journal of Education and Development using ICT, 9*(1), *12-125.*

Geladze, D. (2015). Using the Internet and Computer Technologies in Learning/Teaching Process. *Journal of Education and Practice, 6*(2), *2015th ser., 67-69.* Retrieved from https://files.eric.ed.gov/fulltext/EJ1083835.pdf.

Goodwin, L., & Kosnik, C. (2013). Quality teacher educators = quality teachers? Conceptualizing essential domains of knowledge for those who teach teachers. *Teacher Development*: *International Journal of Teachers' Professional Development, 17*(3), *334-346.*

Internet Society. (2017). Internet Access and Education: Key considerations for policy makers. Retrieved from https://www.internetsociety.org/wp-content/uploads/2017/11/Internet-Acc ss-Education_2017120.pdf

Kawai, A., Wangdi, T., Galay, P., Miwa, M., & Yamada, T. (2016). Project report ICT-enhanced GNH society in Bhutan. *Journal of the Open University of Japan. 34, 137-151.* Retrieved from http://lib.ouj.ac.jp/nenpou/no34/34_13.pdf

Kim, J.Y. & Jung, H.Y. (2010). South Korean digital textbook project. *Computer in the School. 27, 247-265.* doi:10.1080/07380569.2010.523887

Klimov, B. F. (2012). ICT versus traditional approaches to teaching. *Procedia-Social and Behavioral Sciences, 47, 196-200.*

Ministry of Education. (2014). iSherig, Education ICT Masterplan 2014–2018. Thimphu, Bhutan

Ministry of Education. (2014). Bhutan Education Blueprint 2014-2024; Rethinking Education. Thimphu, Bhutan

Ministry of Education. (2018). *The 12th Five Year Plan.* Thimphu, Ministry of Education, Bhutan

Ministry of Labour and Human Resources (MoLHR), Royal Government of Bhutan. (2016). TVET Blueprint 2016-2026. Retrieved from http://www.molhr.gov.bt/molhr/wp-content/uploads/2017/07/TVET-Blueprint-Inside-Page.pdf

Pineida, F. O. (2011). Competencies for the 21st Century: Integrating ICT to Life, School and Economical Development. *Procedia - Social and Behavioral Sciences, 28, 54-57.* doi:10.1016/j.sbspro.2011.11.011

Plomp, T., Anderson, R. E., Law, N., & Quale, A. (2009). *Cross-national Information and Communication Technology*: *Policies and Practices in Education.* Charlotte, N.C.: Information Age Publishing.

Policy and Planning Division, Ministry of Education. (2018). *Annual Education Statistics 2018.* Thimphu, Ministry of Education

Ritche, D. & Rodriguez, S. (1996). School administrators and educational technologies: Narrowing the divide. *Journal of Information Technology for Teacher Education. 5*(1/2), *107-114.* doi:10.1080/0962029960050111

Ronnkvist, A., Dexter, S.L & Anderson, R.E. (2000). Technology Support: Its Depth, Breadth and Impact in America's Schools. Teaching, Learning, and Computing: 1998 National Survey. Retrieved from https://www.researchgate.net/publication/255625558_Technology_Support_Its_epth_Breadth_and_Impact_in_America%27s_Schools

Royal Government of Bhutan. (2016). Economic Development Policy. Thimphu. Retrieved from https://www.moea.gov.bt/wp-content/uploads/2017/07/Economic-Development-Policy-2016.pdf

Savvidis, P. (2016). Top 6 benefits of using technology in the classroom. Retrieved from https://www.webanywhere.co.uk/blog/2016/02/top-6-benefits-technology-classroom/

Semerci, A. & Aydın, K. M. (2018). Examining high school teachers' attitudestowards ICT use in Education. *International Journal of Progressive Education, 14*(2), *93-105.* Retrieved from https://files.eric.ed.gov/fulltext/EJ1177301.pdf

Tenzin, K., Dorji, T., Gurung, M. S., Pelzom, D., Tamang, S., Pradhan, U., & Dorji, G. (2018). Prevalence of Internet Addiction and Associated Psychological Co-morbidities among College Students in Bhutan. *Journal of Nepal Medical Association, 56*(210). doi:10.31729/jnma.3447

Tinio, V. L. (2003). ICT in Education. Retrieved from http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan037270.pdf

Congress, U. S. (1995). Teachers and technology: Making the connections (GPO# 052-003-0149-2). Office of Technology Assessment. Washington, DC: US Government Printing Office.

UNESCO (2017). Asia Pacific Regional Strategy on Using ICT to Facilitate the Achievement of Education 2030. Bangkok, Thailand.

UNESCO (2018). iSherig1 Review Report: Findings and recommendations. Bangkok, Thailand.

UNESCO Institute of Statistics. (2018). Quick Guide to Education Indicators for SDG 4. Retrieved from http://uis.unesco.org/sites/default/files/documents/quick-guide-education-indicators-s g4-2018-en.pdf

UNESCO. (2015). Leveraging Information and Communication Technologies to Achieve the Post 2015 Education Goal. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000243076

UNESCO. (2018). Positioning ICT in Education to Achieve the Education 2030 Agenda in Asia and Pacific: Recommendation for a Regional Strategy. Bangkok: UNESCO.

Victoria J. Rideout, Ulla G. Foehr & Donald F. Roberts. (2010). Generation M2: Media in the Lives of 8–18 Year-Olds. Henry J. Kaiser Family Foundation.

Yildirim, S. (2007). Current utilization of ICT in Turkish basic education schools: review of teacher's ICT use and barriers to integration. *International Journal of Instructional Media, 34*(2), *171.*

Annexure: Working Groups and Committees

First Consultative Working Group

Name	Designation and Agency
1. Bumpa Tshering	Deputy Chief Dzongkhag Education Officer, Haa
2. Gomchen Tenzin	Principal, Khangkhu MSS, Paro
3. Jangchu Tenzin	ICT Officer, IMD, REC
4. Karma Kuenphen	Education Monitoring Officer, EMD, DSE, MoE
5. Karma K. Wangdi	Deputy Chief Programme Officer, Bhutan NatCom, MoE
6. Kinley	Teacher, Taba LSS, Thimphu Thromde
7. Lemo	Chief Dzongkhag Education Officer, Punakha
8. Pema Chhogyel	Deputy Chief Programme Officer, ECCD&SEN, DSE, MoE
9. Pema Wangchuk	Deputy Chief Programme Officer, SPCD, DSE, MoE
10. Sherab Tenzin	Education Monitoring Officer, EMD, DSE, MoE
11. Sonam Tshering	Deputy Chief Programme Officer, IMD, REC
12. Sonam Zangmo	Cluster Lead Teacher, Samtse HSS, Samtse
13. Tenzin Rabgyel	Deputy Chief Programme Officer, NFCED, DAHE, MoE
14. Tshering Yangzom	Assistant ICT Officer, ICTD, DoS, MoE
15. Udhim Subba	Vice Principal, Pakshikha CS, Chhukha

Second Consultative Working Group

Name	Designation and Agency
1. Bal Bdr Powrel	Teacher, Rinchengang PS, Wangdue
2. Gomchen Tenzin	Principal, Khangkhu MSS, Paro
3. Jangchu Tenzin	ICT Officer, IMD, REC
4. Karma K. Wangdi	Deputy Chief Programme Officer, Bhutan NatCom, MoE
5. Kinley	Teacher, Taba LSS, Thimphu Thromde
6. Lemo	Chief Dzongkhag Education Officer, Punakha
7. Pema Chhogyel	Deputy Chief Programme Officer, ECCD&SEN, DSE, MoE
8. Pema Wangchuk	Deputy Chief Programme Officer, SPCD, DSE, MoE
9. Sherab Tenzin	Education Monitoring Officer, EMD, DSE, MoE
10. Sonam Tshering	Deputy Chief Programme Officer, IMD, REC
11. Thinley Dorji	Education Monitoring Officer, EMD, DSE, MoE
12. Tshering Yangzom	Assistant ICT Officer, ICTD, DoS, MoE
13. Udhim Subba	Vice Principal, Pakshikha CS, Chhukha

Core Team

Name	Designation and Agency
1. Chenga Dorji	Lecturer, Samtse College of Education, RUB
2. Pelden	Senior Programme Officer, NFCED, DAHE, MoE
3. Phurba	Planning Officer, PPD, MoE
4. Thinley	Curriculum Developer, CDC, REC
5. Tshering Phuntsho	Deputy Chief Programme Officer, TPSD, DSE, MoE
6. Tsheyang Tshomo	Chief ICT Officer, ICTD, DoS, MoE
7. Ugyen Dorji	Chief Programme Officer, IMD, REC
8. Ugyen Wangchuk	Assistant Professor, Paro College of Education, RUB
9. Yeshey Lhendup	Deputy Chief Programme Officer, SPCD, DSE, MoE

Technical Advisors

Name	Designation and Agency
1. Jonghwi Park	ICT in Education, Section for Educational Innovation and Skills Development, UNESCO Bangkok
2. Jian Xi Teng	ICT in Education, Section for Educational Innovation and Skills Development, UNESCO Bangkok

Project Steering Committee

Designation	Designation and Agency
1. Karma Yeshey (Chair)	Secretary, Ministry of Education
2. Karma Tshering	Director General, Department of School Education, MoE
3. Jigme Thinlye Namgyal	Director General, Department of Information Technology and Telecom, MoIC
4. Kinga Dakpa	Director, Royal Education Council
5. Kinley Gyeltshen	Director, Directorate of Services, MoE
6. Chencho Tshering	Chief Planning Officer, MoF
7. Lekema Dorji	Senior Planning Officer, Gross National Happiness Commission
8. Dochu	Chief Planning Officer, Policy and Planning Division, MoE
9. Phurba (Member Secretary)	Planning Officer, Policy and Planning Division, MoE

Project Coordination and Logistics

Name	Designation and Agency
1. Wangchuk Bidha	Chief Programme Officer, Bhutan National Commission for UNESCO, MoE
2. Yeshey Lhendup	Deputy Chief Programme Officer, SPCD, DSE, MoE
3. Phurba	Planning Officer, PPD, MoE
4. Karma Yangden	Admin Assistant, Bhutan NatCom, MoE

- Education ICT Master Plan is named iSherig, which translates to ICT in education. The "i" alludes to innovation and integration that the master plan intends to promote through use of ICT in education.

- iSherig logo is represented by a three-petaled flower. Each petal represents a strategic thrust or focus area, namely iAble, iBuild and iConnect.

- The three jewels in the centre of the flower represents the government's desire to help every individual in educational institutions, government agencies in education sector and communities. iSherig is designed to impact and benefit everyone in the education sector, from children to adult learners, educators and administrators.

- The yellow and orange colours used in the logo is in deference to the two colours used in our national flag, which represents peaceful coexistence of temporal authority and spiritual tradition in the country.