National School Curriculum

INFORMATION & COMMUNICATION TECHNOLOGY (ICT) CURRICULUM FRAMEWORK

Classes PP-XII

Department of Curriculum and Professional Development
Ministry of Education
Royal Government of Bhutan

“Your parents, relatives, and friends would be very proud of what you have achieved. At your age, to have completed your studies is your personal accomplishment. Your knowledge and capabilities are a great asset to the nation. I congratulate you on your achievements.

Finally, your capabilities and predisposition towards hard work will invariably shape the future of Bhutan. You must work with integrity, you must keep learning, keep working hard, and you must have the audacity to dream big.”

- His Majesty Jigme Khesar Namgyel Wangchuck

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Foreword

In the modern world of technology, children and youth are surrounded by multiple digital devices and digital media on a daily basis. The advent of technology benefited the people and the world in many fields including education. Students and teachers have access to multiple teaching and learning resources from the Internet and instantly get connected with professionals and experts across the world. Information and Communication Technology (ICT) provides a wide range of platforms for students to develop 21st century skills and become global citizens. With such potential to transform education and enhance students' competencies, we need to take the opportunity to harness the power of modern technology to promote ICT education in Bhutan, and it is timely that DCPD revised the ICT curriculum framework.

The ICT curriculum intends to equip classes PP-XII students with relevant ICT knowledge, skills and attitude towards becoming productive and responsible citizens of the country and beyond. The curriculum, besides the technical and coding components, also focuses on values to be cultivated through safe, ethical and responsible use of technology for a positive and harmonious digital experience. Two-thirds of the curriculum focuses on coding components while one-third is on ICT literacy components. The curriculum would be best delivered through a student-centred approach and cross-curricular activities accentuating the development of key ICT competencies.

The successful implementation of the ICT curriculum, however, depends on the support schools receive in terms of adequate computers and reliable Internet connectivity. Besides, ICT teachers need to be trained on the pedagogy, content and assessment of the ICT curriculum and children be given opportunities to participate in national and international level hackathons and ICT boot camps. For this, relevant agencies such as MoE, BCSEA and DCPD are engaged to provide support to teachers and schools regularly.

With this ICT curriculum framework in place, I look forward to an engaging and meaningful learning experiences for our students in making them competent, responsible, and productive citizens in the digital age.

Tashi Delek

(Tashi Namgyal)
Director, DCPD
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Table of Contents

1 INTRODUCTION

ICT education in Bhutanese schools started modestly in the late 1980s with Gateway computers received under the Overseas Development Agency (ODA) funding. An attempt was then made to expose students to basic mouse, keyboarding and word processing skills to the extent allowed by the limited hardware capability of Intel 286/386 computers.

In the nineties, powerful computers with better graphics capability facilitated the use of graphical-based software for various purposes. People started using computers at work as well as at home. Some schools also started offering Computer Science, based on India's ICSE and ISC syllabi, as optional subjects at classes IX to XII. The optional subject had a very strong emphasis on programming.

A disparity was observed between the ICT skills taught in schools and skills required outside of schools. The demand within the country then was for ICT skills in office productivity applications than programming. To address this gap, a new ICT curriculum was developed and implemented in 2002 to equip students with skills relevant to the world of work. This was a shift from an earlier programming-centric curriculum to office productivity applications.

Over the years, there has been exponential development and innovation in ICT. With the advent of the Fourth Industrial Revolution (or Industry 4.0), defined by cutting-edge technological breakthroughs such as artificial intelligence, cognitive computing, internet of things (IoT), blockchain technology, and a host of others, the way we work, learn and interact in the 21st century is evolving. This requires literacy with ICT in addition to conventional literacy of reading, writing and numeracy. ICT competencies including coding skills will allow the learners to adapt and respond intelligently to evolving ideas, changing attitudes and emerging technologies in the knowledge economy. This curriculum framework is expected to address some of these critical needs by focusing on knowledge, skills and competencies essential to function in the knowledge society.

The ICT curriculum framework is also aligned with the National Education Policy and the Education ICT Master Plan (2019-2023), iSherig-2. The National Education Policy mandates equipping students with ICT skills and use them extensively to enhance teaching and learning. The iSherig-2 recommends equipping students with "functional" and "foundational" ICT knowledge and skills to perform productively and responsibly in the knowledge society. Living in a knowledge society requires one to

be a critical consumer of knowledge. Equally important, however, is being able to create knowledge, content and tools through problem-solving using logic, patterns and algorithms. It is one reason why coding is given prominence in this curriculum.

ICT is part of the children's world today and it is relevant in developing different types of skills children need in their lives. In a move towards preparing our children to be adaptable, productive and responsible in the knowledge society, the curriculum framework is conceived with the view of what they can do at the end of each class and key stage. While the theoretical foundation will always be an integral part of understanding the concepts and acquiring the skills, there is a strong emphasis on student competencies - being able to perform and apply ICT knowledge and skills to new situations and contexts.

This curriculum framework is premised on competencies for each class and competency-based standards for each key stage that students must master. The competencies are geared towards achieving the goals of ICT education through four connecting themes or strands. The four strands are technology operations, communication and collaboration, safety and ethics, and coding. These four strands run across all classes from PP to XII in varying extent and depth of coverage. The overall design and development of the framework are guided and shaped by eight overarching principles, some impacting directly and others implicitly.

2 GOALS

As the tool for learning in the 21st century, ICT is not only the future of our children's education, it is the present, and we need to invest in ICT now (Lockhart, 2013). This investment in the ICT curriculum and the contents therein is aimed at achieving the following three goals.

- Students possess functional ICT knowledge and skills to perform productively and responsibly in a knowledge society.
- Students possess foundational knowledge and skills to pursue potential postsecondary educational and work opportunities in the field of ICT.
- Students engage in coding to develop logical reasoning and algorithmic thinking.

3 KEY COMPETENCIES

In the fast-changing world of technology, children should receive adequate opportunities to acquire ICT skills and knowledge towards becoming responsible and productive citizens with the confidence to harness the power of technology. Therefore, it is critical in school education to equip children with digital competencies required to access, evaluate, create and transfer knowledge effectively in a digital world.

Of the seven key competencies identified in the draft National School Curriculum Framework (NSCF), the ICT curriculum aligns predominantly towards “digital competence” due to the nature of the subject. However, other key competencies are taken care of through topical integration and strategies used in the content.

The ICT curriculum framework identifies five key ICT competencies for students to develop and demonstrate at the end of school ICT education. These competencies align with the recent curriculum standards and frameworks from Programme for International Student Assessment (PISA), Australian Curriculum, Assessment and Reporting Authority (ACARA) and International Society for Technology in Education (ISTE).

a) Accessing, evaluating and managing information

Students have the ability to access resources and identify desired information from various sources using ICT. They evaluate the information by using currency, relevance and accuracy techniques, and store the information and various digital resources in an organised manner for easy retrieval or reuse in the future.

b) Collaborating and communicating information

Students have the ability to use relevant ICT tools to collaborate with peers and others to complete common projects efficiently. They use ICT to exchange information, share knowledge, discuss issues, and customize media text for a specific audience or context for effective communication.

c) Creating information and digital content

Students have the ability to use ICT tools to adapt, modify and expand on the existing ICT-based data, information and digital content to enhance the message or produce a new understanding and knowledge. They use ICT based graphics and multimedia elements to simplify and enhance the communication of information for a specific audience.

d) Coding and computational thinking

Students have the ability to use coding knowledge and skills to identify problems, break them down into manageable steps, work out the sequence or patterns, and formulate an appropriate solution. They follow good programming practices to create animations, games and applications, and in the process, enhance their computational thinking.

e) Responsible use of ICT

Students have the ability to use ICT appropriately and responsibly across multiple contexts and platforms for learning, exploring and creating digital content. They consider both offline and online safety, security and ethical issues by using strong passwords, protecting personal information, installing antivirus, fighting to cyberbully, identifying fake news, using copyrighted materials, etc. They practice and advocate the importance of ethical and responsible use of ICT for positive and progressive digital citizens.

4 GUIDING PRINCIPLES

The ICT curriculum should provide sound knowledge, skills, values and attitudes for our students to excel in the digital world. The following guiding principles provide overall direction to the framework throughout its operation to align with the national ICT goals and global trends in ICT. They also inform teachers of the bigger picture of the subject and the philosophical ideas of delivering the ICT education.

a) Gross National Happiness (GNH) values

With the global trend of growing interest in happiness, positive psychosocial and wellbeing, the four pillars and nine domains of Gross National Happiness (GNH) present areas that can help either in the selection of contents or development of learning experiences to facilitate awareness of GNH.

GNH as a guiding principle is useful to determine skills, values and attitudes relevant to living harmoniously and using technology responsibly in the digital society.

Technology is becoming an integral part of people's life, influencing the ways of working and thinking. Students should be sensitized to how technology impacts the psycho-social wellbeing of people personally and globally. Some topics and outcomes relevant under this principle are to create awareness on cyber wellness, legal and ethical issues related to technology and e-waste.

b) 21st century skills

21st century skills such as personal and social responsibility, critical thinking, digital competence, collaboration and communication abilities, and problem-solving are seen as valuable for people to contribute economically and socially, as leaders or as active participants, and as entrepreneurs in society. Equipping students with 21st century skills are aimed at preparing competent and productive citizens that will be the key stakeholders in a society that seeks innovation and creativity. This demands digital competence which includes knowledge, understanding and creative use of ICT devices and tools.

21st century learning recognizes the importance of technology to access, research, organize, evaluate, create and communicate information successfully in a knowledge economy with a strong understanding of ethical and legal issues.

c) Effective pedagogy

In the 21st century classroom, students need to engage actively in the complex and interconnected world to make meaning of what they learn. Teachers facilitate student learning and create productive classroom environments, in which students can develop the skills they might need at present or in future.

This demands the curriculum to focus on competency-based learning outcomes which would further necessitate emphasizing hands-on, authentic and self-directed learning activities.

d) Rationale for ICT in education

Rationales for ICT in education form an important basis to determine the purpose of the intended ICT curriculum. Hawkridge (as cited in UNESCO, 2012) provided the following six rationales which are still relevant today.

i. Social rationale: need to teach basic ICT skills to prepare students for a place in society.
ii. Vocational rationale: role of ICT in giving students appropriate skills for future jobs.
iii. Pedagogical rationale: enhancement of teaching and learning with the help of ICT.
iv. Catalytic rationale: using ICT to realize educational change or innovation.
v. Industry rationale: promotion of ICT industry in education.
vi. Cost-effective rationale: roles that ICT play in reducing costs for education.

e) Child development

Human development research indicates that there are universal, predictable sequences of growth and cognitive development of children and adolescents. These predictable changes occur in all domains of development – physical, emotional, social and cognitive.

Piaget identified four cognitive development stages: sensorimotor (birth-2 years), preoperational (2-7 years), concrete operational (7-11 years), and formal operational (adolescence - adulthood). In each stage, children demonstrate new intellectual abilities and an increasingly complex understanding of the world. Learning in young children is the result of interaction between the child's thoughts and experiences with materials, ideas, and people. Piaget asserts that "these experiences should match the child's developing abilities, while also challenging the child's interest and understanding."

ICT in education is useful for the rich context it provides for the activity of children and resulting cognitive development. This requires careful consideration of the level and complexity of the curriculum to align with the development stages.

f) Learning styles

Theory of Multiple Intelligences (Herdon, 2018) states that each person has different ways of learning and different bits of intelligence. Some learn by engaging in reading and writing, some learn through mathematical logic and others learn by working with hands. Each person possesses a certain degree of these bits of intelligence, but there is always a primary, or more dominant, intelligence.

To the extent possible depending on the nature of the topic, the curriculum should provide opportunities for students to learn in a variety of ways. This allows each student to learn with his or her strengths, but also to work to improve weaknesses to realize his or her full potential.

g) Lifelong learning

Lifelong learning is based on the principle that learning is a continuous process that occurs throughout one's life. It is a voluntary and self-motivated pursuit of knowledge for either personal or professional reasons. It can take place in formal education, non-formal and informal education and beyond.

With the rapid development in the field of ICTs such as Web 3.0 and virtual world technologies, rich resources of educational study materials are now at our fingertips. Students can now complement and supplement their learning through online resources, office-goers and hobbyists can enhance their knowledge and skills or learn new skills to become more productive in their work-life or their areas of interest.

ICT can provide a rich context for communication, collaboration and positive learning experiences to help students fully develop their natural abilities, open mind and create curiosity for new learning, adapt to change, increase wisdom and make the world a better place.

h) ICT across the curricula

Globally, educational systems are integrating ICT in the teaching and learning process to improve subject learning. Kainth and Kaur (as cited in Essays, 2018) describe ICT integration "as the usage of technology seamlessly for educational processes like transacting curricular content and students working on technology to do authentic tasks".

ICT, as an interdisciplinary domain, is transforming the curriculum and the learning activities that promote higher-order thinking skills, which require the use of digital tools and online resources. This transformation in student learning and their learning environment requires ICT competence which is best developed by providing students with meaningful learning experiences, embedded in purposeful subject-related contexts.

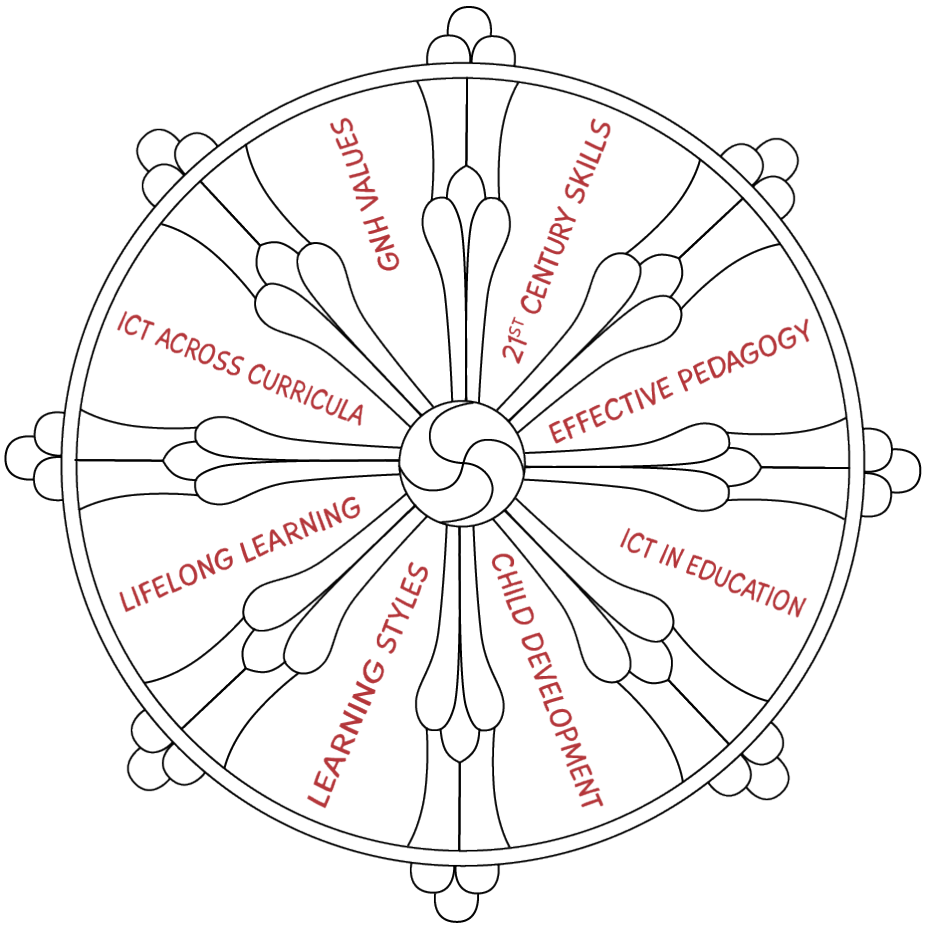

Figure 1: Eight Guiding Principles

5 CURRICULUM STRUCTURE AND ORGANIZATION

ICT curriculum is organised into strands, key stage-wise competency-based standards, class-wise competencies and objectives to provide a clear outline of what learning standards, competencies, and core concepts are expected of students to achieve at the end of each key stage and class level. These standards and competencies in all classes are grouped into broad thematic areas called strands.

5.1 STRANDS

The learning standards and competencies in this framework are organised by broad themes termed as strands. The term 'strands' is used to indicate "domains that group the related general and specific learning outcomes or achievement aims and objectives within a particular learning area or discipline" (UNESCO, 2016). Strands show a logical flow of learning, starting from the technology operations and concepts to computational thinking.

Four connecting strands run across all classes from PP to XII in varying extent and depth of coverage as follows:

Strand A: Technology Operations

Strand B: Communication and Collaboration

Strand C: Safety and Ethics

Strand D: Coding

A. Technology operations

The Technology Operations strand broadens the students' understanding of computers as a system and the basic principles on which computers work. Students become familiar with the concepts and elements of modern computers, devices and networks. They recognize common, similar features and functions in digital environments and independently apply those to new technology experiences. With this strand, students are also exposed to efficient operations of technology and management of their products.

B. Communication and collaboration

The Communication and Collaboration strand prepares students to work together to create innovative solutions to real-world problems and communicate their solutions with others. As they

carry out their investigations and projects, they must access, analyse, and use the information they need to complete the learning tasks. While working through the task, students build important life and career skills by learning to manage their time, to become self-directed learners and to collaborate effectively with others. Using appropriate technology tools to complete their task, students discover the most effective and efficient ways to access and manage the world of digital information that is available.

C. Safety and ethics

The Safety and Ethics strand encourages students to become responsible digital citizens. Digital citizenship relates to the responsible, ethical and safe use of ICT by students as a member of connected global 21st century society (Manitoba, 2012). This strand prepares the students to evaluate the various positive and negative impacts of computers on society and demonstrate the understanding of ethical, cultural and societal issues related to technology. They practice responsible use of technology systems and information; and develop positive attitudes towards technology uses that support lifelong learning (International Society for Technology in Education, 2016).

D. Coding

The coding strand relates to the development of computational thinking skills. Computational thinking is an approach to solving problems in a way that can be implemented with the computer. Computational thinking enables students to better conceptualize, analyse, and solve complex problems by selecting and applying appropriate strategies and tools, both virtually and in the real world (Barr and Stephenson, 2011). They use a set of concepts, such as abstraction, recursion, and iteration, to process and analyse data, and to create real and virtual artefacts. Students with sound coding skills become not merely tool users but tools builders, where they demonstrate critical and logical thinking skills to research, plan and develop innovative products.

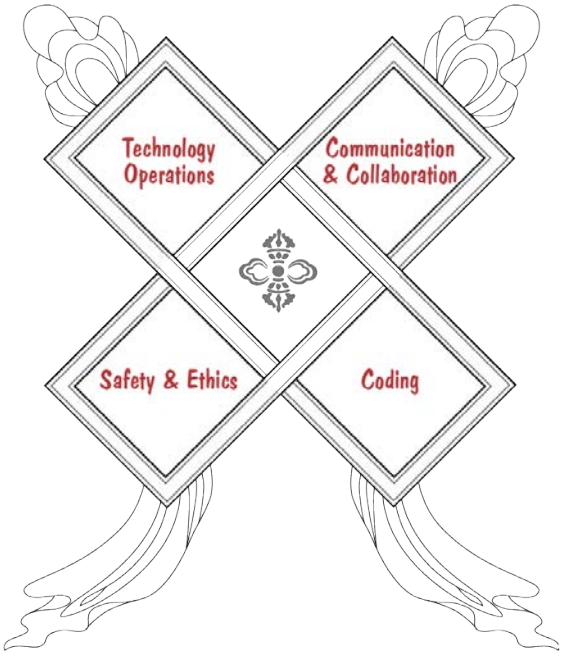

Figure 2: Four Strands

5.2 KEY STAGES

The learning standards and competencies for all class levels are categorised into five key stages to represent cohorts of learners as informed by their generic developmental stages. Each key stage outlines competencies, standards and core concepts that are aligned to the four strands, and are expected to be achieved by learners at the end of the key stage. The five key stages for different classes are as follows:

Key Stage	Class Range
I	PP to III
II	IV to VI
III	VII to VIII
IV	IX to X
V	XI to XII

5.3 KEY STAGE-WISE COMPETENCY-BASED STANDARDS

Key Stage	Competency-based Standards
I	1. Operate a computer and its peripheral devices by using Windows Operating System to perform a task. 2. Manage files and folders by following folder management techniques for proper organisation of files and applications. 3. Draw creative arts using a drawing tool to express ideas and explain concepts learned in other subjects. 4. Produce documents both in English and Dzongkha using a word processor to enhance typing skill and convert individual works into digital format. 5. Search materials related to the concepts learned in other subjects by using the Internet to facilitate self-exploration and learning. 6. Play online educational games based on the curricular need to expand the understanding of the concepts and assist in learning ICT skills as they play. 7. Exhibit healthy behaviour while using computers by following correct body posture and reducing screen time to prevent body strain and injury. 8. Identify the source of creative works such as drawings, books, and images to acknowledge the ownership and appreciate creativity. 9. Care for computers by practising proper handling of computers and its devices to reduce maintenance of computers and devices. 10. Use strong passwords by following a set of criteria to keep personal data safe and secure. 11. Solve problems by applying computational skills such as pattern recognition, logical and sequential thinking that enhance confidence and attitude to work with coding problems. 12. Solve problems by using block programming language to enhance coding skills and build a positive attitude towards coding.
II	1. Distinguish between hardware and software based on its features and utility to understand the working of a computer system. 2. Produce formatted documents such as reports, assignments, posters, and flowcharts using word processors to demonstrate efficient use of ICT tools. 3. Create a theme-based digital poster using an image editing tool to communicate messages effectively. 4. Gather information by using the Internet on how the Internet services have positively changed the way people live and work in the digital age.

	5. Use features such as bookmark and history in a browser for quick access of information and trace the digital footprint of a user. 6. Use emails to communicate and share resources with others for collaboration and timely dissemination of information. 7. Participate in online coding communities to exchange ideas, showcase projects and enhance coding skills. 8. Demonstrate correct behaviours while using different computer devices by following proper body posture and reducing screen time for safety, health and productivity. 9. Practice data backup and malware prevention strategies for data security in times of unplanned data loss and disruptions. 10. Exhibit good practices of validating online resources by following evaluation criteria to avoid false information and irrelevant materials. 11. Solve problems by using block and script programming language to enhance coding skills and build a positive attitude towards coding.
III	1. Create engaging presentations by using relevant features of presentation tools to communicate ideas effectively. 2. Use an audio editing tool to record, edit and create audio materials that can be shared to effectively communicate information and ideas. 3. Create theme-based videos using video editing software to communicate messages creatively and experience the process of filmmaking. 4. Gather relevant information from the Internet by using different search techniques and keywords. 5. Demonstrate good use of social media by ensuring safe, ethical and positive online behaviours to foster effective communication and collaboration. 6. Use online Government to Citizen (G2C) services by accessing the G2C portal to avail the services and appreciate the government's initiative to foster effective public service delivery. 7. Maintain a personal blog using an online blogging platform to reach messages and ideas to a wider audience. 8. Demonstrate acceptable online behaviours including the good practices of protecting personal data for safe and enriching online experience. 9. Maintain a positive digital identity and digital footprint while using social media to exhibit responsible and ethical use of online communication platforms. 10. Solve problems by using algorithms and programming language to enhance computational thinking and build a positive attitude towards coding.

IV	1. Perform data analysis of datasets through creating charts in a Spreadsheet for identification of patterns, trends and outliers in datasets. 2. Troubleshoot common networking problems by following appropriate strategies explored on the Internet to develop the habit of fixing problems independently. 3. Upgrade knowledge and skill by enrolling in relevant online courses to foster independent learning. 4. Perform tasks collaboratively by using cloud services such as Google Workspace to increase flexibility and efficiency. 5. Become a responsible online user by advocating on cyberbullying, fake news, online crimes and acknowledging the ownership to create a harmonious online experience. 6. Evaluate different types of media messages by using the media deconstruction tools to make an informed judgement. 7. Analyse problems by using algorithms and flowcharts to enhance the flow, clarity and correctness of solutions to problems. 8. Create images and patterns using GUI modules to enhance coding knowledge and skills. 9. Develop applications using different coding concepts in a programming language to get hands-on experience of planning, creating and testing an application. 10. Carry out a coding project by documenting all the processes involved in application development to demonstrate the acquisition of good programming practices.
V	1. Create a well-designed publication using desktop publishing software to exhibit creative works. 2. Evaluate the impact of technology based on its benefits and limitations to appreciate positive development that technology brings to individuals and society at large. 3. Develop applications using object-oriented concepts and relevant modules to simulate real-world applications. 4. Develop applications with frontend, backend and database management systems by using relevant modules of a programming language to build dynamic applications. 5. Present a visual representation of a dataset by applying data analysis modules in a programming language to communicate a message. 6. Maintain documentation for an application development project to provide information about its creation, deployment and use for everyone involved.

5.4 CLASS-WISE COMPETENCIES

Class	Competencies
PP	Students will be able to: 1. Operate computers by following the correct procedures for safety and proper care of the machine. 2. Draw images and basic shapes by handling the mouse in a drawing tool to acquire mouse balance and techniques. 3. Type alphabets and words by following the correct hand position on a keyboard to develop keyboarding skills. 4. Search images in a search engine by using basic words as a keyword to enhance the understanding of the words. 5. Play online education games based on the curricular need to expand the understanding of the concepts and assist in learning ICT skills as they play. 6. Demonstrate proper behaviour while using computers in the laboratory for safe and conducive learning. 7. Solve problems by applying computational skills such as pattern recognition, logical and sequential thinking that builds confidence in tackling more difficult tasks.
I	Students will be able to: 1. Navigate in Windows Operating System by accessing the files, folders and applications to use them effectively. 2. Create simple digital arts using features in a drawing tool to improve drawing and mouse handling skills. 3. Produce a simple document using a word processor to enhance design and layout including text typing skills. 4. Manage files and folders by following proper naming conventions and structure for easy identification and access. 5. Search videos related to the concepts learned in other subjects by using the Internet to facilitate self-exploration and learning. 6. Play online educational games based on the curricular need to expand the understanding of the concepts and assist in learning ICT skills as they play. 7. Identify the source of creative works such as drawings, books, and images to acknowledge the ownership and appreciate creativity.

	8. Solve problems by applying computational skills such as pattern recognition, logical and sequential thinking that enhance confidence and attitude to work with coding problems.
II	Students will be able to: 1. Manage folders on the desktop interface by creating relevant folders within a folder for organisation of files and applications. 2. Draw 3D arts using drawing software to express creativity and enhance mouse handling skills. 3. Produce a document using word processors to enhance typing skills and convert individual works into digital format. 4. Search materials related to the concepts learned in other subjects by using the Internet to facilitate self-exploration and learning. 5. Play online educational games based on the curricular need to expand the understanding of the concepts and assist in learning ICT skills as they play. 6. Exhibit healthy behaviour while using computers by following correct body posture and reducing screen time to prevent body strain and injury. 7. Care for computers by practising proper handling of computers and its devices to reduce maintenance of computers and devices. 8. Solve problems by applying computational skills such as pattern recognition, logical and sequential thinking that enhance confidence and attitude to work with coding problems. 9. Solve problems by using block programming language to improve coding skills and build a positive attitude towards coding.
III	Students will be able to: 1. Classify computer devices based on input, output and storage to understand the functioning of a computer system in performing a task. 2. Draw creative arts using a drawing tool to express ideas and explain concepts learned in other subjects. 3. Create a simple Dzongkha document using a word processor to promote Dzongkha language. 4. Search materials related to the concepts learned in other subjects by using the Internet to facilitate self-exploration and learning. 5. Play online educational games based on the curricular need to expand the understanding of the concepts and assist in learning ICT skills as they play.

	6. Use strong passwords by following a set of criteria to keep personal data safe and secure. 7. Solve problems by using block programming language to enhance coding skills and build a positive attitude towards coding.
IV	Students will be able to: 1. Identify key components of the internal hardware based on their functions to understand and appreciate the working of a computer. 2. Produce a well-formatted document as a project work by using a word processor to improve design and layout skills. 3. Gather information by using the Internet on how the Internet services have positively changed the way people live and work in the digital age. 4. Demonstrate correct behaviours while using different computer devices by following proper body posture and reducing screen time for safety, health and productivity. 5. Solve problems by using block and script programming language to enhance coding skills and build a positive attitude towards coding.
V	Students will be able to: 1. Distinguish between hardware and software by identifying its features and utility to understand that a computer system requires both hardware and software to function efficiently. 2. Produce a Word document report by adding images, tables, shapes, and graphs to enhance the design and communicate the information clearly. 3. Use features such as bookmark and history in a browser for quick access of information and trace the digital footprint of a user. 4. Practice data backup and malware prevention strategies for data security in times of unplanned data loss and disruptions. 5. Solve problems by using block and script programming language to enhance coding skills and build a positive attitude towards coding.
VI	Students will be able to: 1. Produce formatted documents such as reports, assignments, posters, and flowcharts using word processors to demonstrate efficient use of ICT tools. 2. Create a theme-based digital poster using an image editing tool to communicate messages effectively. 3. Use emails to communicate and share resources with others for collaboration and timely dissemination of information.

	4. Participate in online coding communities to exchange ideas, showcase projects and enhance coding skills. 5. Exhibit good practices of validating online resources by following evaluation criteria to avoid false information and irrelevant materials. 6. Solve problems by using block and script programming language to enhance coding skills and build a positive attitude towards coding.
VII	Students will be able to: 1. Create a presentation on a relevant topic by using presentation tools to share ideas and communicate information effectively. 2. Use an audio editing tool to record, edit and create audio materials that can be shared to effectively communicate information and ideas. 3. Gather relevant information from the Internet by using different search techniques and keywords. 4. Demonstrate good use of social media by ensuring safe, ethical and positive online behaviours to foster effective communication and collaboration. 5. Demonstrate acceptable online behaviours including the good practices of protecting personal data for safe and enriching online experience. 6. Solve problems by using both algorithms and programming language to enhance coding skills and build a positive attitude towards coding.
VIII	Students will be able to: 1. Create engaging presentations by adding multimedia and animations to communicate ideas effectively. 2. Create theme-based videos using video editing software to communicate messages creatively and experience the process of filmmaking. 3. Use online Government to Citizen (G2C) services by accessing the G2C portal to avail the services and appreciate the government's initiative to foster effective public service delivery. 4. Maintain a personal blog using an online blogging platform to reach messages and ideas to a wider audience. 5. Maintain a positive digital identity and digital footprint while using social media to exhibit responsible and ethical use of online communication platforms. 6. Solve multiple problems by using algorithms and programming language to enhance computational thinking and build a positive attitude towards coding.

IX	Students will be able to: 1. Perform fundamental data analysis by applying functions and formulas in spreadsheets to generate insights from a dataset. 2. Troubleshoot common networking problems by following appropriate strategies explored on the Internet to develop the habit of fixing problems independently. 3. Upgrade knowledge and skill by enrolling in relevant online courses to foster independent learning. 4. Become a responsible online user by advocating on cyberbullying, fake news, online crimes and other negative online behaviours to create a harmonious online experience. 5. evaluate different types of media messages by using the media deconstruction tools to make an informed judgement. 6. Analyse problems by using algorithms and flowcharts to enhance the flow, clarity and correctness of solutions to problems. 7. Create images and patterns using GUI modules to enhance coding knowledge and skills. 8. Develop a text-based application using different coding concepts in a programming language to get hands-on experience of planning, creating and testing an application.
X	Students will be able to: 1. Use spreadsheets to analyse and visualise datasets through creating charts for easier identification of patterns, trends and outliers in datasets. 2. Perform tasks collaboratively by using cloud services such as Google Workspace to increase flexibility and efficiency. 3. Cite sources of online materials by using standard citation rules to acknowledge the ownership and avoid plagiarism, piracy and copyright infringement. 4. Develop applications using different coding concepts in a programming language to get hands-on experience of planning, creating and testing an application. 5. Carry out a coding project by documenting all the processes involved in application development to demonstrate the acquisition of good programming practices.
XI	Students will be able to: 1. Create a well-designed publication using desktop publishing software to exhibit creative works. 2. Evaluate the impact of technology based on its benefits and limitations to appreciate positive development that technology brings to individuals and society at large.

	3. Develop applications using object-oriented concepts in a programming language to break the program into bit-sized problems for code efficiency and easy maintenance. 4. Develop applications with both frontend (GUI) and backend by using relevant modules of a programming language to recognise the role of coding in solving real-life problems.
XII	Students will be able to: 1. Develop applications including games by using relevant modules and coding concepts to simulate a real-world application. 2. Use a database management system in an application for easy access, and secure data storage and management. 3. Present a visual representation of a dataset by applying data analysis modules in a programming language to communicate a message. 4. Maintain documentation for an application development project to provide information about its creation, deployment and use for everyone involved.

5.5 LEARNING OBJECTIVES

CLASS PP		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Explain computers in their own words. • Identify basic computer components. • List different types of computers such as laptop, mobile, desktop and tablet.	**Introduction to Computers** • Definition of computer • Computer components o Mouse, Monitor, o Keyboard, CPU • Examples of computer	Observing, identifying, and comprehending
• Follow the correct steps to start and shut down computers. • Explain the benefits of proper shut down and start up to save energy and care for the system.	**Operating a computer** • Turning on a computer • Shutting down a computer • Advantage of following proper procedure	Operating and analysing
• Use different mouse actions to play mouse balancing games. • State the purpose of left click, right click, double click, and drag and drop.	**Computer Mouse** • Definition of mouse • Different parts of the mouse • Mouse actions - Right and left click, Scroll, double click, drag and drop	Operating, analysing and identifying

• Follow instructions to use the mouse properly on a drawing tool. • Draw shapes and objects in drawing software such as MS Paint. • Explain the drawings or arts created using a drawing software in their own words.	**Introduction to MS Paint** • Steps to open MS Paint • MS Paint window • Basic drawing tools o Paint bucket, brush, eraser, pencil o Drawing shapes and adding colours.	Exploring, designing, and creating
• Identify different alphabets, numbers and special characters on the keyboard. • Type alphabets and numbers to form words and numbers. • Use a typing tutor to start typing with the keyboard.	**Computer Keyboard** ● Definition of keyboard ● Keyboard layout o Alphabets, Numbers o Shift, Spacebar o Enter, Delete ● Typing tutor for kids ● Typing numbers ● Typing alphabets	Operating, comprehending, and practising
• Open and close an Internet browser to begin searching on the Internet. • Search images on the Internet using basic words as keywords. • Navigate the web browser to search for images with the support from teachers.	**Internet Search** • Open and close browser • Use address bar • Use search bar • Type words • Searching images • Searching words	Accessing, searching and exploring
• Identify relevant online educational games for learning. • Play online educational games to enhance learning. • Explain some of the learnings and skills acquired from playing the games.	**Online Educational Games** ● Games on alphabets, words, numbers. Shapes, etc. (Teacher guided) ● Sharing the experience of playing online games. ● Improving keyboard and navigation skills.	Accessing, exploring, problem solving and comprehending
• Follow the basic laboratory rules to care for the computer. • Contribute in framing the computer laboratory rules. • Explain the importance of computer laboratory rules.	**Computer Laboratory Rules** ● Framing rules o Maintain cleanliness o Do not fiddle cables o Keep away from power sockets o Avoid food and drink, etc. ● Benefits of following rules.	Creating, framing, comprehending and evaluating

• Complete challenges or activities to enhance logical thinking without using a computer. • Identify patterns and sequence in problems to get solutions. • Explain the functions of different block codes used in a coding challenge. • Complete challenges related to sequences, loops and conditions in a block coding platform. • Recognise the importance of block coding to become better at coding and confident in the use of computers.	**Unplugged Activities** ● Use grids, cards, worksheets, cups, etc for activities ● Focus on activities related to pattern recognition, sequencing and logical thinking without the use of computers. **CodeMonkey Courses** • Introduce CodeMonkey platform • CodeMonkey Jr Course - Sequencing and Loops • CodeMonkey Jr Course - Advanced Sequencing and Loops • CodeMonkey Jr Course - Conditional Loops	Logical thinking, pattern recognition, debugging, and Problem-solving
CLASS I		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Explain functions of basic computer peripheral devices. • Identify the different computer peripheral devices available in the computer laboratory.	**Common Computer Peripherals** ● Basic computer peripherals - Mouse, monitor, keyboard, printer, projector. ● Functions of computer peripherals.	Observing, identifying, and comprehending
• Perform basic operations on a Window such as closing, minimising, resizing, etc. • Navigate from one window to another to access files, folders and applications. • Open files and applications available in different locations of the computer.	**Basic Window Operation** ● Close, minimise, maximise, resize, forward, backward ● File explorer o Navigate to Desktop o Navigate to Downloads o Navigate to Documents o Open an application	Operating, exploring, and identifying
• Open a drawing software available in the computer system. • Draw basic shapes using a drawing software.	**Drawing in MS Paint** ● Drawing arts o 2D shapes, sceneries o Cartoon characters, animals o Buildings, toys.	Exploring, designing, identifying and creating

• Create an art that has shapes, colours and objects using a drawing software. • Modify individual artworks by adding appropriate colours, shapes and characters.	• Adding colours, shapes and characters. • Writing names and symbols in artworks	
• Open a MS Word document in a computer system. • Use features of MS Word to add text and apply basic formatting. • Type words to create short sentences in MS Word. • Save the word documents created to improve typing and formatting skills.	**Microsoft Word** • Opening MS Word • Microsoft Word window • Saving MS Word document. • Typing alphabets (A to Z) and numbers (0 to 30) • Typing special character o Full stop, Comma, Quotation marks • Typing short sentences given in the workbooks.	Operating, exploring, designing and creating
• Create files and folders on the desktop. • Rename the files and folders with appropriate names. • Store files such as Word documents and images in the folder they created.	**File and Folder Management** • File operation. o Create, Open, Rename, Save, Delete, etc. • Folder Management. o Create, Open, Rename	Creating, organising, and operating
• Open a web browser to begin searching for information from the Internet. • Search videos including rhymes and animated stories that are related to contents learned in other subjects. • Watch online videos to get a deeper understanding of the concepts learned in other subjects.	**Internet Search** • Internet Browser o Open and close o Address bar • Searching videos o Nursery rhymes, Phonics, Stories, Cartoons, tutorials (teacher guided)	Accessing, searching, comprehending and exploring

• Complete online educational games identified by teachers to enhance learning. • Explain some of the learnings and skills acquired from playing educational games.	**Online Educational Games** ● Mathematical games ● Logical games ● Quiz games ● Memory games ● Matching games, etc.	Accessing, exploring, analysing, problem solving and comprehending
• Identify the sources of materials such as videos referred from the Internet. • Write names or symbols in the artworks they created using drawing software. • Recognise the benefit of writing names or symbols on artworks they created.	**Ownership of Creative Works** • Types of creative work o Art, photo, video, story, rhyme, etc. • Identifying owners of creative works o Name, symbol and date • Reflecting owner's identity • Benefits of acknowledging ownership	Analysing, identifying, designing and creating
• Write simple algorithms of problems related to unplugged coding activities. • Convert the algorithm of a problem or challenge into block codes to solve the problem. • Use different block codes to complete coding challenges and problems.	**Unplugged Activities** ● Use grids, cards, worksheets, cups, etc. ● Recognizing patterns to solve a problem. **CodeMonkey Courses** ● Complete Beaver Achiever Courses for Sequencing and Loops	Logical thinking, pattern recognition, analysing, debugging, and Problem-solving
CLASS II		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Customise the desktop interface by changing background and icons. • Manage files and folders on the desktop by creating folders and arranging files in them.	**Files and Folder Management** • Computer Desktop o Icons, taskbar, background, date and time. • Managing folders o Create, rename, delete, sub-folders, move files and folders.	Operating and comprehending
• Draw different shapes and objects using drawing software such as MS Paint.	**Drawing in Microsoft Paint** • Drawing arts o 3D shapes, scenery, cartoon characters, etc. • File extension	Exploring, designing, exporting and creating

• Create simple artwork using MS Paint. • Save artworks as images by using appropriate file extension. • Create 3D arts using a 3D drawing tool such as Paint 3D.	o export to jpg, png, etc **Drawing in Paint 3D** • User Interface o 3D Shapes o 3D Text	
• Type sentences and paragraphs in a word processor. • Format the word document to improve the layout and design. • Create a Word document on topics or concepts learned in other subjects.	**Document in MS Word** • Typing sentences • Typing paragraphs o Keyboard keys (enter, spacebar, shift, caps lock) • Character formatting o Font o Bold, o Italic, o Underline, etc.	Exploring, typing, formatting, designing and creating
• Identify commonly used web browsers such as Chrome, Safari, and Internet Explorer. • Use basic features of a browser to navigate the Internet. • Search information related to contents learned in other subjects from the Internet.	**Internet Search** ● Web browser - Examples ● Basic features o open, close, minimize, maximize, tabs, forward, backward, etc. ● Searching information o Examples: countries, famous people, places, animals, vegetations, wonders of the world, flags, music, etc.	Accessing, searching, and exploring
• Play online educational games identified for enhancing learning of concepts learned in other subjects. • List the educational games that are relevant to improve learning. • Explain the additional learning derived from playing the online educational games.	**Online Educational Games** ● Mathematical games ● Logical games ● Quiz games ● Memory games ● Matching games, etc.	Accessing, exploring, logical thinking and comprehending
• Explain the benefits of maintaining a balanced screen time.	**Balanced Screen Time** ● Definition of screen time ● Benefits of balanced screen time ● Ways to manage balanced screen time	Evaluating, reflecting, analysing and applying

• Share some of the ways they will adopt to maintain a balanced screen time.		
• List some of the correct body postures while using computers. • Adopt correct body postures while using computers for safety and health.	**Correct Body Posture** ● Definition of body posture ● Examples of correct body posture ● Benefits of following correct body posture ● Arrangement of furniture and devices to support correct body posture	Observing, comprehending and adopting
• List different ways to handle the computers and digital devices properly. • Follow ways to take care of personal computers. • Explain the benefits of taking care of computers both at home and school.	**Computer Care** ● Ways to take care of computers at school and home ● Benefits of computer care o Data protection, life span, hygiene, repair expenses, etc.	Observing, identifying, comprehending, and practising
• Recognise patterns and sequences in a problem to solve it. • Participate in unplugged activities to understand coding concepts. • Work in pairs or groups to solve logical and sequential problems without the use of computers.	**Unplugged Activities** ● Activities that involve sequence, pattern recognition, algorithm, loops, decision making, debugging, decomposition. ● Individual, pair or group participation in solving unplugged activities.	Logical thinking, problem-solving and analysing
• Write simple algorithms for the problems and challenges given on a coding platform. • Convert the algorithms of problems or challenges into block codes. • Use different block codes to complete the problem or challenges given on a coding platform. • Explain different coding concepts learned through completing the challenges on a coding platform.	**CodeMonkey Courses** ● Complete Beaver Achiever Course for Conditional Loops o Purpose of loops o Variables o While loop structure o Repeat loops ● Complete Beaver Achiever Course for if/else conditions o If statement o If-else statement o Usage of “or” operator	Logical thinking, debugging and creating

CLASS III		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Explain the functions of the input, output and storage devices. • Distinguish between input, output and storage devices with examples. • Categorise computer peripheral devices available in the school or home based on functions.	**Input, Output and Storage Devices** ● Definition of input, output and storage devices ● Functions of input, output and storage devices ● Grouping devices into input, output and storage	Observing, identifying, and comprehending
• Create drawings or arts by combining multiple shapes and objects. • Apply creative design and colours to express an idea or improve the look of the drawings. • Draw arts related to concepts learned in other subjects.	**Drawing in MS Paint** ● Drawing creative arts ● Drawing arts related to concepts and topics learned in other subjects	Exploring, designing and creating
• Type in Dzongkha using a word processor. • Recognize the importance of typing in Dzongkha in relation to promoting the Dzongkha language. • Produce a document in Dzongkha on a relevant topic.	**Typing in Dzongkha** ● Dzongkha fonts, keyboard layout & language setting ● Practice in Dzongkha typing tutor ● Typing Dzongkha words and sentences	Operating, typing, designing and practising
• Identify the keywords to search information on a topic or concepts learned in other subjects. • Use keywords to search relevant information from the Internet. • Save relevant information taken from the internet in their system.	**Internet Search** ● Basic search techniques (keywords) ● Search information from the Internet on relevant topics. ● Saving webpages and images to the system.	Accessing, searching, analysing and exploring
• Share links to useful online educational games with friends.	**Online Educational Games** ● Searching online educational games	Accessing, exploring, comprehending and problem solving

• Demonstrate how to go about with the useful online educational games. • Help peers who find difficulties playing online educational games. • List knowledge and skills learned from playing online educational games.	● Playing interactive educational games ● Sharing links of educational games with friends	
• Distinguish between a strong and a weak password. • Explain the passwords they have are strong or weak with reasons. • Create strong passwords by applying the features of a strong password for their email and other accounts. • Explain the importance of having a strong password for safety and security.	**Strong Password** ● Definition of password ● Function of password ● Features of a strong password ● Setting passwords for personal account	Comprehending, analysing and applying
• Explain the purpose of functions, loops, operators and methods through unplugged activities. • Use methods, functions, and loops to complete logical challenges on a coding platform. • Solve problems on distance, angles, and multiplications using loops, functions and operators. • Recognize the importance of loops and function in solving problems.	**CodeMonkey Courses** ● Dodo Does Maths course for Distance o Purpose of function o Purpose of scale o Functions (step, turn, left, right, turnTo, pickUp() ● Dodo Does Maths course for Angle o Purpose of protector o Angle in degree o Function (step, turn, pickUp) ● Dodo Does Maths course for Multiplication o Loop (times) ● Dodo Does Maths Mini Course	Logical and sequential thinking, debugging, problem-solving and creating

CLASS IV		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Explain the difference between internal and external hardware. • Describe the functions of hardware components.	**Internal Hardware** ● Definition of hardware. ● Internal Hardware and its functions o Motherboard, RAM o Processor, Hard drive o Network Interface Card o Power supply unit ● Differentiate between internal and external hardware.	Observing, identifying and comprehending
• Demonstrate the working process (IPO) of a computer system with examples and diagrams. • Recognise the importance of different hardware for the working of a computer system.	**Working of a Computer** ● Introduction to IPO cycle o Input devices o Output devices o CPU ● Examples of IPO process	Observing, identifying and comprehending
• Apply different character and paragraph formatting features to improve the looks of texts. • Create a word document on a relevant topic learned in other subjects including Dzongkha.	**Formatting a Document** ● Character formatting o font size, font colour, font type, font effects ● Paragraph formatting o paragraph alignment o line and paragraph spacing o indentation ● Typing in Dzongkha	Exploring, formatting, designing and creating
• Explain the benefits of using the Internet to search for information. • Identify how the Internet has been used by different agencies to enhance their productivity and communication. • Search for relevant information from the Internet to get a deeper understanding of the concepts learned in other subjects.	**Benefits of Internet** ● Definition of Internet ● Examples of ISP ● Benefits of Internet o Business, banking, entertainment o education, medicine, etc. ● Search information on the Internet	Accessing, exploring, analysing and evaluating

• Explain computer ergonomics with examples. • Recognise the benefits of practising computer ergonomics. • Follow correct body postures when using different computer devices. • Make a presentation on how to prevent health issues related to the use of computer devices.	**Computer Ergonomics** ● Definition of computer ergonomics ● Benefits of ergonomics ● Correct body postures for different devices ● Ways to prevent health issues o brightness settings, screen time, break, short exercises, etc. ● Examples of proper workplace setting **Safety measures in using different devices** • Correct body postures for different devices (mobile, laptop, tablets, computers, etc.) • Ways to prevent health issues: o brightness settings, screen time, break, short exercises, etc. • Examples of proper workplace setting.	Evaluating, identifying, demonstrating and exhibiting
• Use algorithms and flowcharts to solve coding challenges or problems. • Apply coding concepts such as functions, conditional statements, and loops to complete logical challenges on a coding platform. • Recognize the importance of coding to enhance computational thinking and problem-solving skills.	**CodeMonkey Courses** ● Complete Coding Adventure Part I course in Story Mode o Meaning of Indentation o Variable o Assignment operator (=) o Arithmetic operator (+,-) o Arrays, Index o Membership operator “in”, For loop o Dot operator, Object ● Explore Coding Adventure Part I in Skill Mode	Logical, sequential, creative thinking, problem-solving, and creating
CLASS V		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Differentiate between hardware and software with examples. • List some of the common hardware and software used by the students for education and entertainment.	**Computer Hardware and Software** ● Definition of hardware and software ● Difference between hardware and software ● Examples of hardware and software	Identifying, analysing and comprehending

• Recognise the importance of both hardware and software for the functioning of a computer system.		
• Add relevant images, tables, and objects to enhance a word document. • Edit images, tables, and objects inserted in word documents. • Produce word documents such as report, essay, journals, etc. on topics learned in other subjects including Dzongkha.	**Adding Images & Objects in MS Word** ● Adding images and objects in word document ● Formatting images and objects in a word document o Edit, crop, picture effects and styles **Designing a report** ● Insert table and images ● Insert graph/chart ● Formatting a report. ● Report in Dzongkha	Exploring, designing, and creating
• Explain the function of URL and search engine to search for online information. • Search information on topics discussed in other subjects by using popular search engines such as Google. • Create bookmarks on different topics to store relevant web pages. • Recognise the importance of using bookmarks and history.	**Internet Search** • Definition of Uniform Resource Locator • Features of the browser o address bar, history • Creating bookmarks • Definition and examples of search engines • Search information using different search engines • Creating bookmarks and checking history on a browser.	Accessing, analysing and exploring
• Explain different types of malwares with examples. • List different measures to prevent computers and mobile devices from malware infection • Back up personal data in different locations such as thumb drive, cloud, CD and hard disk for safety. • Make a present on the risk of malicious software and the benefit of data back.	**Malicious Software** • Definition of malware • Different types of malwares o Virus, worms, trojan horse, ransomware • Signs of malware infected system o slow computer o blue screen of death o lack of storage space, Pop-ups, websites, toolbars, and other unwanted programs **Data Backup** • Definition of data backup • Advantages of data backup • Best practices for data backup	Identifying, evaluating, comprehending and problem solving

• Use algorithms and flowcharts to solve coding challenges or problems. • Apply coding concepts such as functions, conditional statements, and loops to complete logical challenges on a coding platform. • Recognize the importance of using coding concepts to solve problems and enhance computational thinking.	**CodeMonkey Courses** ● Complete Coding Adventure Part II course in Story Mode o For loop o If condition o If-else condition o Membership operator "in" o Logical operator "and" and "or" ● Explore Coding Adventure Part II in Skill Mode.	Logical, sequential, and creative thinking, problem-solving and creating
CLASS VI		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Add tables and objects in a word document to make data and information presentable. • Apply text, paragraph and page formatting in a word document to improve the document's looks and flow. • Create word documents such as reports, posters, flowcharts, etc. on topics learned in other subjects including Dzongkha.	**Page and Table Formatting** ● Adding a table ● Table formatting o Adding, deleting row or column o text alignment, wrapping o row height and width o cell and table border, design ● Page formatting o setting header and footer o setting page margins o page size, numbers, orientation	Exploring, designing and creating
• Identify different image editing tools (free & paid) on computer and mobile devices. • Use free image editing tools such as Paint.Net to enhance images. • Use different features in an image editing tool to modify images. • Create theme based digital posters using an image editing tool to communicate a message.	**Image Editing in Paint.NET** ● Definition of multimedia ● Types of multimedia o Text, graphics, audio, video, etc. ● Taking pictures and transferring them to computer ● Paint.NET window o features, advanced tools o applying adjustments and effects ● Project on image editing	Exploring, identifying, designing and creating

• Explain the benefits of using email with examples. • List different email services provided online to understand their similarities and differences. • Create a personal email account with a strong password for communicating with others. • Send email to friends and teachers to communicate and collaborate on learning activities. • Share files and materials as an email attachment with peers, teachers and others.	**Email** ● Definition of e-mail ● Overview of working of email ● Types of email o Client base email o webmail ● Advantages of email ● Different email service providers (Gmail, Yahoo, etc.) ● Creating and managing email ● Creating email account ● Compose, send, forward, reply, subject, cc, signature ● Email attachment, etiquettes ● Project - email attachment.	Accessing, evaluating, identifying and communicating
• Share personal coding projects in online coding communities such as CodeMonkey or Scratch. • Participate in online discussion on coding concepts and projects to foster deeper learning in coding. • Recognise the importance of online coding communities to enhance coding projects and skills.	**CodeMonkey and Scratch Online Community** ● Definition of online community ● Creating an account for the Scratch/CodeMonkey community ● Uploading personal projects in *Discovery* ● Participate in online discussion o Comments, questions, suggestions, seek advice	Accessing, communicating, problem solving and collaborating
• Define information literacy with examples. • Identify online news sources such as BBC, CNN, Kuenselonline, etc. that share reliable information on a daily basis. • Use relevant criteria such as source, accuracy, currency, etc. to evaluate online information. • Recognise the benefits of information literacy skills in the digital world.	**Information Literacy** • Definition of information literacy • Checking the sources of various news channels/websites. • Evaluation criteria for online information o Author, date, accuracy, objectivity, fairness • Identifying and tackling fake news	Identifying, analysing, evaluating and comprehending

• Use algorithms and flowcharts to solve coding challenges or problems. • Apply coding concepts such as functions, conditional statements, and loops to complete logical challenges on a coding platform. • Recognize the importance of using coding concepts to solve problems and enhance computational thinking.	**CodeMonkey Courses** • Complete Coding Adventure Part III course in Story Mode o If condition o Bitwise operator "not" o Control Statement (until etc.) o Return statement o For loop o Array, Index o Object, Dot operator • Explore Coding Adventure Part III in Skill Mode • Explore Block Jumper Mini Course • Explore Space Adventure Mini Course o While loop	Logical, sequential, and creative thinking, problem-solving, and creating
CLASS VII		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Design effective presentations by using relevant features. • Apply design principles such as 10-20-30 rules in the presentation slides for effective communication. • Deliver a presentation using a PowerPoint/ Google slide to share information or ideas learned in other subjects including Dzongkha.	**PowerPoint Presentation** ● Creating a PowerPoint presentation ● Slides, templates, texts, objects, images, tables, etc. ● Design Principles o PechaKucha 20X20 o 10-20-30 rules ● Animation, transition, hyperlinks, etc ● Presentation in Google Slide	Exploring, analysing, designing, and creating
• Select effective audio tools to record audio for editing purposes. • Record/import the sound for expressing their ideas. • Edit recorded sounds to create audio materials on topics learned in other subjects including Dzongkha. • Express the ideas through audio format files by sharing on relevant platforms.	**Audio Editing** • Definition of audio • Different audio editing tools (Audacity, Adobe Audition, Garageband, etc.) • Recording audio. o recording devices and steps. o Audio recording and editing o Recording or importing audio. o Editing Audio and mixing o Applying Audio Effects. o Saving • Audio sharing • Project on audio editing.	Exploring, designing, analysing, organising and creating

• List different Boolean search operators with examples. • Search information using keywords and Boolean operators. • Recognise the value of using search techniques for efficient online search.	**Online Search Techniques** ● Keywords ● Boolean operators o AND, OR, NOT ● Wildcard searches (*,?,$) ● Exact phrase search (using quoted phrase) ● Searching information from the Internet.	Accessing, analysing, searching, and exploring
• Define social media and its features with examples. • List different social media platforms used by people at different age levels. • Identify the appropriate social media platform for effective communication. • Use social media for learning after understanding the pros and cons of social media. • Follow the safety tips and measures while engaging in social media.	**Collaborating in Social Media** ● Definition of social media and its features. ● Examples of social media o Facebook, Twitter, YouTube, SoundCloud, Wechat, Messenger, etc. ● Pros and cons of social media ● Using social media for communication, collaboration and learning (groups, pages, etc.) ● Safety tips for students on the use of social media	Analysing, comprehending, communicating and collaborating
• Explain the consequences of unprotected online data. • Protect personal data on social media and online messaging apps by following online data protection measures. • Follow acceptable behaviour while using the Internet in reference to the social media policy of the country. • Recognise the importance of protecting personal online data for safety and security.	**Online Data Protection** ● Definition of personal data ● Ways to protect online personal data ● Risks of unprotected data o identity theft, cyberbullying, defamation, etc. ● Social Media Policy of Bhutan ● Acceptable Use Policy (AUP) of online services ● Following acceptable behaviour on the Internet ● Avoiding aggressive and unpleasant sites, respecting bandwidth consumption, refraining from sharing copyrighted materials, etc.	Identifying, comprehending and exhibiting

• Use for loops to iterate through lists with the help of range() function. • Assign to a variable using an assignment operator. • Use if statements to choose which objects to perform an action with during iteration. • Use if-else statements to choose what action to perform with an object during iteration. • Write functions to solve multiple similar problems without duplicating code.	**CodeMonkey Courses:** Banana tales and Game Builders: Completing the challenges on the following coding concepts: ● Sequencing ● index ● Lists ● Range ● Variable ● If statement ● If-else statement ● While loops ● For Loops ● Boolean operators ● Object ● Functions	Logical, sequential, and creative thinking, problem-solving and creating
CLASS VIII		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Prepare engaging presentations by adding relevant images, videos and audio on topics learned in other subjects including Dzongkha. • Communicate ideas effectively by creating interactive PowerPoint presentations. • Recognise the importance of using PowerPoint or Google Slide to share ideas or messages.	**PowerPoint Presentation** ● Adding multimedia o Image, video, audio ● Adding visual effects o transition, animation effects ● Adding hyperlinks ● Creating a Google Slides presentation. ● Project - Creating an interactive presentation on topics learned in other subjects including Dzongkha.	Exploring, designing, collaborating, and creating
• Use appropriate video recording tools to record varieties of materials of learning. • Edit the recorded videos to tell a story on themes or concepts learned in other subjects. • Share the final video materials on an appropriate learning platform such as YouTube.	**Video Making** ● Recording videos using different equipment -Digital camera, webcam, mobile, etc. ● Transferring of recordings to computer - Cable, wireless, memory card, etc. ● Video editing - Import, effects, trim, captions, audio, publish, file formats, etc. ● Sharing videos online	Recording, uploading, modifying exploring, designing and creating

• Create videos in pairs or groups on themes or concepts learned in other subjects including Dzongkha.	• Project on video editing (Music video, social issues, study tips, etc.)	
• Use the G2C services for availing online services. • List the different services available on the G2C platform. • Identify the benefits of using the G2C services for efficiency and productivity. • Create an awareness program to their parents and community to share the benefits of G2C services.	**Online Government Services** • Definition of Government to Citizen services • G2C services in Bhutan o Security clearance, RSTA, Druk Trace o Citizenship, Doctor appointment o Security clearance, Land tax, Passport • Benefits of G2C services to society • Project - using G2C service o Supporting parents to use online services o awareness on online services	Accessing, evaluating, analysing and advocating
• Explore popular blogs maintained by both Bhutanese and foreigners. • List some of the favourite blogs and bloggers with reasons on why they were chosen. • Create personal blogs to share thoughts and ideas using relevant blog features. • Recognise the benefits of using blogs to express oneself and create a digital identity.	**Blogs** • Definition of a blog and blogger • Examples of popular local and foreign blogs. • Features of a blog (post, multimedia, share, comments) **Creating a Blog** • Creating and maintaining a personal blog (Blogger, WordPress, etc.) • Video blog (vlog) - examples • Practices of a good blogger • Project - Maintaining a personal blog	Accessing, communicating and collaborating
• Define positive online identity with examples. • State the benefits of maintaining a positive online identity. • Take a stock of online activities and personal digital accounts to find out their digital identity. • Adopt ways to maintain a positive online identity.	**Positive Online Identity** • Definition of positive online identity • Benefits of maintaining a positive online identity • Ways to maintain positive online identity. o posts, share links, comments, language, online friends, avoid sharing fake news or rumours, etc. • Project - Evaluating your online identity	Evaluating, analysing and exhibiting

• Explain the benefits of regularly checking on individual digital footprint. • Identify the impact of digital footprint on online digital identity of individuals or organisation.	**Managing Digital Footprint** ● Definition of digital footprint ● Impacts of digital footprint o relationships and career prospects ● Ways to reduce negative digital footprints ● Project - Checking your digital footprint	Evaluating, analysing and exhibiting
• Define Python classes to create on screen objects with specific behaviour. • Write programs that take different code paths based on user input. • Compare and contrast tuples and lists. • Solve complex challenges involving making sets contain specific numbers of items. • Refer to and modify specific elements in a 2D list by using their coordinates. • Assign the same value to multiple variables in a single statement. • involving multiple rows and columns. • Swap the value of two variables. • Apply the swap procedure multiple times to put a list in order. • Write a function to put two list elements in order by swapping them if necessary.	**CodeMonkey Courses** Banana Tales II and Coding Chatbot - Complete the challenges on the following coding concepts: • Classes (Definition, Method, Attribute) • Instantiate - Object • Variable scope • Input - input() function o Data types (strings, Integers, Dictionary, Set, Tuple) • Type cast • Operator Overloading o Meaning of operator overloading o + operator with string and integer • Algorithm o Iteration over string o Iterate over list • Dictionary o Key: value pair, Add key/value o Find the value for given key o Methods, Iterate • List - Iterate over single row or column, Tuples & Set • Bubble sort - algorithm to order elements of a list from least to greatest or greatest to least	Logical, sequential, and creative thinking, debugging, problem-solving and creating

CLASS IX		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Arrange different types of data as per certain conditions. • Apply cell referencing conditions to reflect accurate data entry. • Perform basic data analysis using mathematical functions. • Use Google Sheets to collaborate online on data analysis projects. • Recognise the importance of Excel or Google Sheet to analyse data sets to make informed decisions.	**Introduction to MS Excel** • Excel Overview o Workbook, Sheet, Cell name, Formula bar • Basic cell and data formatting o Data types in Excel o Changing cell colour o Text alignment o Inserting and deleting rows and columns o Merging and splitting cells o Applying borders • Cell referencing within a sheet and between sheets - absolute, relative, mixed referencing • Paste Special – Transpose, Values **Data Analysis in MS Excel & Sheet** • Data analysis - Data collection, cleaning, analysing • Syntax to Enter formulas and functions • Basic mathematical functions - Sum( ), Average( ), Count( ), Counta( ) , Max( ), Min( ) • Basic logical functions - if(), and(), or(), countifs()	Exploring, organising, analysing, problem solving, decision making and creating
• Explain the working of computer networks and devices. • Search online for solutions to computer network issues they encountered. • Apply different strategies to resolve computer network problems. • Recognise the importance of solving common network issues for efficiency and developing problem solving skills.	**Computer networks** • Definition of computer network and its classification. • Networking devices and its purpose. • Setting up network connection in computer – Wireless, Ethernet • Packets, Protocols - Function of TCP, Function of IP • Basics DOS commands for networking o Ping, IPconfig(release and renew) o NSLoopUp, tracert **Solving Network Issues** • Searching online solutions to network problems. • Strategies to Resolve Network Problems	Identifying, analysing, applying and problem solving

	○ Checking physical cable connection ○ Checking the connectivity of the router using DOS command ○ Verifying IP address ○ Checking the connection using the ping command ○ Checking the device drivers for the network adapter using DOS command ○ Checking virus infections	
• Explain the benefits of online courses to students. • Explore different courses related to concepts learned in other subjects on various MOOC platforms. • Identify a relevant online course and complete the course to enhance their skill and knowledge. • Recognise the advantages of taking online courses for deeper and independent learning.	**Online Courses** • Definition of online courses • Massive Open Online Courses (MOOC) • Examples of different online courses platforms - Khan academy, Coursera, Udemy, edX. Etc. • Benefits and limitations of online courses **Taking an online course** • Enrol in a free course • Selecting an online course and completing it.	Accessing, recording, identifying and exploring
• Explain the characteristics of cyberbullying with examples of real-life situations. • Explain the negative effects of cyberbullying on both the victim and bully. • Identify the list of measures to cope with cyberbullying. • Recognise the role of upstander rather than bystander in a cyberbullying situation. • Create awareness on cyberbullying through posters, videos and blogs.	**Cyberbullying:** ● Definition of cyberbullying ○ Examples of cyberbullying ● Measures to cope with cyberbullying. ● Roles of bystanders and upstanders in cyberbullying ● Effects of cyberbullying ● Providing support to victims of cyberbullying ● Project - Awareness of cyberbullying.	Comprehending, evaluating, identifying and exhibiting
• Identify different negative online experiences such as fake news, scams, impersonation, defamation and online crimes with examples.	**Dealing with Negative Online Experiences** ● Definition of fake news ● Verifying fake news	Comprehending, exhibiting, designing and creating

• Explain ways to deal with negative online experiences with examples to create awareness.	• Online scams, defamation, and crimes. • Ways to fight against fake or negative online information • Project on dealing with negative online experiences.	
• Explain the importance of media literacy in the era of media overload. • Identify different types of media for construction or deconstruction of its content. • Evaluate different media content using the five key questions for making informed decisions about the media content.	**Media Literacy** • Definition of media literacy • Importance of media literacy • Types of media (print, broadcast, online, etc.) • Deconstruction of media • Five key questions (authorship, format, audience, content, purpose). • Project on construction or deconstruction of a media text.	Accessing, identifying and evaluating
• Recognise the importance of creating algorithms and flowcharts to execute a program. • Differentiate between algorithm and flowchart in terms of their role in executing a program. • Design an algorithm and flowchart for a given program/situation.	**Algorithm and Flowchart** • Purpose of algorithm and flowchart • Sample algorithm and flowchart. **Algorithm** • Definition of algorithm • Characteristics of an algorithm • Examples of algorithm • Design algorithm of simple problems **Flowchart** • Definition of flowchart • Symbols used and its purpose • Examples of flowcharts • convert algorithm to flowchart • Design flowchart of simple problems	Logical and sequential thinking, designing and problem solving
• Import turtle module in a python program. • Draw different shapes and patterns using Turtle. • Apply different Turtle functions and methods to create a project.	**Introduction to Turtle Graphics** • Turtle module • Importing the Turtle module • Drawing with Turtle • Turtle motion • Move and draw - Pen control • Drawing state, Color control • Filling • Drawing control - Text, window control, variable, input, loops	Logical, sequential, and creative thinking, and creating

• Explain why Python is preferred to other programming languages to learn coding. • Explain the purpose of basic elements and functions used in python such as print, comment, and data type. • Design algorithms and flowchart for given problem statements. • List the functions of different operators in python programming. • Apply for and while loops in python to solve a programming problem. • Combine loops and conditionals statements to solve problems. • Apply good programming practices such as debugging, commenting, and code optimization in executing a program.	**Introduction to Python** • Features of python • Examples of python applications in real-life situations. • I/O functions in python o Input, Print - output • Keywords in python • Variables o Concepts of variables o Naming conventions • Comments **Data Types in Python** o String (str), Integer (int), float, Boolean (bool) • Type casting **Operators in Python** o Arithmetic, Assignment, Comparison, Logical o Membership, identity **Good programming practices** o Debugging o Commenting o Code optimization • Purpose of indentation **Conditional statements in Python** • if statement • if……else statement • if……elif……else statement • Nested Statement • Project on using conditional statements with algorithms and flowcharts. **Loops in Python** o Importance of loops o For and while loops o Range() function in loops **Control Statement** o Purpose, break, pass, Continue o Use of control statements in loops and conditions • Project on text-based application development. o Problem statement o Algorithm, Flowchart, Comments o Codes	Logical, sequential, and creative thinking, creating, debugging, identifying problems and formulating solutions.

CLASS X		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Apply data formatting and sorting to represent a set of data in MS Excel/Google Sheet • Apply data cleaning features such as conditional formatting and filter to identify unwanted data. • Represent data in graphical format using charts in MS Excel or Google Sheet. • Collaborate with peers on Google Sheet to work on data analysis and representation activities.	**Data Analysis** • Data analysis process o Data collection, data cleaning o Analysing using Charts and statistical tools o Interpret the charts and Statistics. **Data Cleaning** • Conditional formatting • Sort and filter, validation • Logical functions **Analysing using Functions** • Statistical functions [Measures of central tendency] o Mean, Median, Mode **Data visualisation using Charts** • Visualisation o Purpose of visualisation o Types and elements of charts o Types of Data Visualisation in MS Excel. o MS Excel as a tool for data visualisation • Data representation in charts • Project on data analysis in Excel or Google Sheets	Exploring, organising, analysing, collaborating, designing and creating
• Explain cloud services with examples of services they use regularly. • Identify the advantages and challenges of using cloud services. • List the different collaborative tools on Google Workspace where students can work together. • Use one of the Google Workspace tools (Doc, Sheet, slide, etc.) to collaborate and complete a group project.	**Cloud Services** • Definition and examples of cloud services • Features of cloud services • Advantages and disadvantages of cloud services **Collaboration on Google Workplace** • Google Workspace for education and it benefit • Google Docs, Sheet, Forms, etc. for collaboration • Project on Google Docs, sheet, slide, etc.	Accessing, analysing, collaborating, and exploring

• Identify the sources of online resources such as author, organisation, date, etc.
• Recognise the importance of acknowledging online resources that they have used.
• Distinguish between copyrights and creative commons of online resources.
• Cite the sources of online resources using proper format to ensure fair and responsible use of the resources.
	Acknowledging Ownership
	• Identifying the source or owners of online resources
	• Importance of fair and responsible use of online resources.
	• citation rule of online materials (text, video, image, website)
	• Types of citation style – APA, MLA, IEEE
	• Types of APA citation
	  o in text citation
	  o end text citation
	  o Referencing Style
	Copyright and Creative Commons
	• Understanding copyright and creative commons
	• Ways of ensuring fair use based on copyright and creative commons.
		Evaluating, analysing and exhibiting

• Explain the purpose and benefits of using loops, functions, and collections.
• Create algorithms and flow charts on loops, functions and collections in a program.
• Differentiate between different types of collections (list, tuple, set, dictionary) to use them appropriately in a program.
• Recognise the importance of using list, tuple, set, and dictionary in a python program.
• Create functions and collections in Python programs to solve problems.
	Loops in Python
	• Loops in Turtle
	• For and while loops- break and continue, pass
	• Project on loops with algorithm and flowcharts
	Functions in Python
	• Purpose of functions
	• Types of functions
	  o Built in
	  o User defined
	• Defining a function
	• Calling a function
	• Scope in Python
	• parameters of a function
	  o Positional, Keyword, Default
	• return statement in a function
	• Functions in Turtle
	• Recursive function
	• Project on function with algorithm and flowcharts
	Data Structures in Python
	• List, Tuple, Set, Dictionary
	  o Basic methods and functions
	• Projects on data structure with algorithm and flowcharts
		Logical, sequential, and creative thinking, creating, identifying problems and formulating solutions.

• Identify a problem to be solved using python programming. • Create algorithms and flowchart to solve the problem. • Solve the identified problem/project by using python. • Recognise the benefits of using python programming to solve problems.	**Developing a Python project** • Identifying a problem statement. • Writing algorithm and creating flowchart. • Applying loops, functions and data structure in a program. • Debugging and code optimising. • Documenting and presenting the project. o Problem definition o Comments o Algorithm and flowchart o Source code and output o References	Logical, sequential, and creative thinking, creating, debugging, documenting, identifying problems and formulating solutions.
Class XI		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Create publication documents using MS Publisher. • Apply design principles in publication documents to enhance the design and looks. • Recognise the benefit of using MS Publisher compared to MS Word for design and layout works. • Publish Class newspaper or brochure to exhibit creative ideas.	**Introduction to MS Publisher** • Definition of DTP • Types of publication o Newspaper, magazines, o brochures, cards, certificates, etc • Features of MS Publisher (Master page, Header and footer, styles, Page size, margins, insert section and layout) • Designing and publishing. • Project - creating a DTP document. **Design principles in DTP** • Fonts and colours contrast • Objects, image, text and diagram alignments • Layout and white space • Balance and consistency	Exploring, analysing, designing and creating
• Identify the impacts of ICT on society with examples. • List the negative impacts of ICT on individuals to discuss solutions.	**Impact of ICT on Society** ● Positive Impacts o Entertainment, Media sharing, communication, community support o Innovation, Job market o Crowdfunding, Online learning, E-commerce ● Negative impacts o E-waste, Digital divide, Health issues o Addiction, Business fraud	Evaluating, analysing and comprehending

• List different emerging technologies with examples. • Evaluate the impacts of emerging technologies on society with examples.	**Emerging Technologies** ● Examples of emerging technologies (IoT, AI, 5G, blockchain, robotics, biometrics, 3D printing, virtual reality, drones, etc.) ● Impacts of emerging technologies - Job opportunities, education, medicine, business, environment, etc.	Evaluating, analysing and comprehending
• Adopt measures to reduce the negative impacts of ICT on individuals and society. • Design posters or videos on the impact of ICT and emerging technologies to create awareness.	**Reducing Negative ICT Impacts** ● Benefits of reducing negative impacts ● Ways to reduce negative impacts. o reduce e-waste, recycle, online support communities, etc. o Project - Awareness poster or video on the impact of ICT on society	Evaluating, analysing, designing and creating
• Handle text files to manage data in Python programming. • Use built-in or user-defined modules to break down large programs into small manageable, reusable and organised files. • Explain the features of object-Oriented Programming. • Explain the components of a class with examples. • Apply object-oriented principles to create dynamic applications.	**Python Data Structure** ● List, Tuple, Dictionary ● File handling in Python o Open, Read, Write **Module** ● Purpose of module ● User defined module - create and use modules ● Built-in module - Maths module o Random module **Object Oriented Programming** ● Encapsulation ● Classes and objects o Attribute, Behaviour (Methods) o Identity (unique name) o Constructor ● Inheritance o Single level, Multilevel, Hierarchical ● Polymorphism o Function overloading o Operator overloading ● Abstraction o Creating abstract class form ABC, abstract method, concrete method	Logical, sequential, and creative thinking, analysing, debugging, and creating.

• Explain the importance of the Tkinter module. • Create a Tkinter window and widgets. • Insert images in a window using Pillow in Tkinter. • Develop GUI application/game using object-oriented principles in Tkinter.	**GUI Programming with Tkinter** ● Import Tkinter module ● Window ● Widget and standard attributes o Label, entry, button, checkbutton, frame, etc. ● Using geometry managers to arrange the widgets ● Adding images in Tkinter o Pillow module ● Events and event handlers ● Project on Tkinter	Logical, sequential, and creative thinking, designing, debugging, and creating
CLASS XII		
Learning Objectives (KSVA)	Core Concepts (Chapters/Topics/ Themes)	Process/ Essential Skills
• Identify different Python modules for game and simulation development. • Simulate a real-world application such as timetable and password generation using Python programming. • Create games using Python and Tkinter modules for fun and creativity. • Appreciate the logic and process of game and application development through coding.	**Creating applications** • random, string, time o One Time Password (OTP) generation o Teacher's timetable **Developing games** ● Quiz gaming with a score ● Text-based adventure game ● Games in Tkinter	Logical, sequential, and creative thinking, and creating

• Explain the functions of the database system. • Create SQLite database using SQLite browser. • Insert, delete, update, and Select data from the SqLite database using SQL. • Develop a database application using SQLite module. • Develop a CRUD application using TKinter as frontend, Python as backend and SQLite for the database.	**Database Management** • Definition of database • Importance of database • Terminology in database o Database, Tuples, Attributes, Tables • CRUD operations o create, read, update, delete • SQLite database • SQL using SQLite to o Create table, drop table o read records, update record o delete records, select record o Insert record. • Connect to Database o Importing sqlite3 library o Connecting, execute SQL code o Commit, Close **Database Application** • SQLite database with Tkinter	Logical, sequential, and creative thinking, debugging, organising, and creating
• Explain the advantages of using Numpy for data analysis. • Access the element, row or column of an array using NumPy. • Perform arithmetic operations of the arrays using NumPy. • Generate insights using statistical analysis of a given dataset using NumPy.	**Data Analysis with NumPy** • Introduction to Numpy • Zero-dimensional array • One-dimensional array • Two-dimensional array • Array indexing and slicing • Addition of array • Subtraction of array • Multiplication of array • Size, shape attributes • Statistical methods and functions o mean(), median(), max(), min() o ptp(), std(), var() o quantile(data, 0) o quantile(data, 0.5) o quantile(data, 1)	Logical, sequential, and creative thinking, researching, organising and analysing.
• Import Pandas module in python programming for data analysis. • Explain the structure of a dataframe in Pandas. • Clean the dataset using the relevant methods in Pandas.	**Data Analysis with Pandas** • Introduction to Pandas • Import Pandas module • Load CSV dataset • Dataframe, Series • Methods to be covered o info(), max(), min() o describe() o head(), head(N) o tail(), tail(N) • Data cleaning methods	Logical, sequential, and creative thinking, researching, organising and analysing.

• Filter the dataset based on given conditions by using functions in Pandas. • Generate insights using statistical analysis of a given dataset using Pandas.	o Shape, dropna() o isin(), notna() o loc(), fillna(), iloc() • Statistical Methods to be covered o sum(), mean() o median(), mode(), std()	
• Explain the different types of plots available in Matplotlib. • Use relevant plot using Mathplotlib for a given dataset. • Plot graphs for a set of data using PyPlot sub library. • Interpret the chart for a given dataset using Mathplotlib.	**Data Visualisation with Matplotlib** • Introduction to Matplotlib • PyPlot • Plot types o plot() o scatter() o bar() o stem() o step() o fill_between() o pie() o hist() • Markers, line, labels, grid, subplot and annotations • Project on data analysis	Logical, sequential, and creative thinking, researching, organising, analysing and plotting.
• Maintain documentation of a coding project. • Develop a relevant project using all python knowledge and skills learned so far. • Recognise the importance of documenting the coding project for future reference and modification.	**Maintaining Documentation** • Problem definition • Plans, Flowchart, Algorithm • Process, • source codes, • output **Major Project in Python** • Demonstration of coding skill in Python • Relevant topic • Documentation (process) and application (product)	Creative thinking, researching, organising, analysing, plotting and documenting.

6 TEACHING AND LEARNING APPROACHES

Although a range of teaching and learning approaches can be employed in delivering the ICT curriculum, the following approaches are suggested because of the marked emphasis on competency-based learning in this curriculum. The use of these approaches promotes independent learning, facilitates the development of 21st century skills and enables mastery of learning competencies in students through creative and authentic problem-solving activities.

However, teachers have the flexibility to choose alternative approaches that are appropriate to the situation, the needs of the learner, and the context of learning. Teachers need to provide students opportunities to develop an inquisitive attitude, critical thinking and creative skills using ICT towards making them problem solvers and independent life-long learners.

One or more of the following teaching and learning approaches may be considered in the delivery of ICT curriculum in the classroom to make learning engaging and meaningful to students:

a) Project-based learning

Teachers identify a project that requires ICT knowledge and skills for the students to complete. The project can be done individually or in groups depending on the scale of the task. For example, students create a poster on cyberbullying using an image editing tool to create awareness of the negative impact of cyberbullying.

b) Guided discovery learning

Teachers facilitate the learners by providing multiple resources and giving different activities to help students discover and acquire ICT knowledge and skills. For example, class 7 students can be asked to maintain a journal which can later be transferred into a blog with multimedia features. This allows students to discover elements of a good blog and they will begin to enhance their blogs for a wider audience.

c) Problem-based learning

Teachers identify a problem that is relevant to the students or their family and community and ask them to use ICT to solve the problem. This can be given either in pairs or groups and they are also given the flexibility to come up with their own problem. For example, students identify the stray

dog problem in their school, and they come up with different solutions such as creating awareness videos, sending emails to veterinary doctors for support, etc.

d) Inquiry-based learning

Teachers pose a thought-provoking question related to ICT concepts or skills and encourage students to have independent thinking. Students can be further stimulated to ask their questions and investigate ideas using the Internet to enhance their problem-solving skills and have a deeper understanding of the concept. For example, children can be asked why they should learn coding in school.

e) Interdisciplinary approach

ICT is an effective tool to enhance students' knowledge and teachers must take the opportunity to integrate the teaching of ICT tools into learning of concepts in other subjects. For example, students can be introduced to the features of the Internet by making them search content on English grammar and show them how to download or bookmark for future use. In Science, students can create an animated presentation on the life cycle of butterflies to learn the features of Microsoft PowerPoint.

f) Online and blended learning

Teachers use multiple online platforms to engage students after school hours to continue learning ICT skills and concepts. Students perform independent learning using technology and report on their understanding in the class or through comments and discussions in the online forums. For example, students explore functions in Python coding and share their understanding in the class the next day or through the online class forums.

7 ASSESSMENT AND REPORTING

Assessment is an integral part of learning for it provides the ongoing feedback necessary for effective teaching and learning. It is the process of gathering evidence of learning, usually in measurable terms, concerning knowledge, skills and attitudes. Gathering evidence of learning requires the use of a variety of assessment methods to assess students' products and performances during and after the learning. The evidence of learning informs instruction by providing information about the learning to the learner, the teacher, and the parent. The goal of assessment ultimately is to develop self-directed learners who regularly monitor and assess their progress.

Assessment is divided broadly into two categories: formative and summative. Summative assessment takes place at the end of the assessment of the learning and summarizes the development of learners at a particular time. Formative assessment on the other hand is a range of formal and informal assessment methods used during the learning process, usually by teachers. It helps to influence teaching methods and priorities, and modify teaching and learning activities to monitor what students know and improve their achievements.

One of the important objectives of this ICT curriculum is to equip our learners with 21st century skills, and the formative assessment is understood to be a central feature of the learning environment of the 21st century (Harrison, 2014). 21st century learners need substantial and meaningful feedback regularly to assess their progress and influence future lessons and teaching strategies. Thus, the assessment of student learning in this curriculum lays more emphasis on formative assessment than summative assessment. The assessment in Key Stage I will focus on Continuous Formative Assessment (CFA) where there will be no term examinations and formative assessment will be undertaken throughout the year.

The assessment of student learning in the ICT curriculum is based on the evidence of learning, which is examined through the following four ways:

1. Observation

Focused observation of learning identified in the objectives is critical to accurately describe the learning of a particular student. As in other subjects, focused observation of students engaged in learning needs to be anecdotal and done often and over time. Teachers need to regularly observe the student learning outcomes in lessons to determine the growth in student learning. Taking

descriptive notes on the student's achievement of an outcome is useful in providing the context of each learning situation such as specific successes, difficulties encountered or behaviours observed.

Achievement of a learning objective based on the assessment criteria must be seen in the context of whether the behaviour or skill observed is consistent and whether there is progress.

2. Conversation

Conversations with teachers or between students during or after the learning process allow the students to reflect and evaluate their learning. Teachers also get to identify students' strengths and weaknesses for appropriate intervention or for reporting to their parents. Conversation as an assessment strategy provides students with an opportunity to "experience their successes and failures not as reward and punishment, but as information" for reflection (Jerome Bruner).

Observations and conversations for learning in ICT are often used together to set learning goals, provide descriptive feedback and put appropriate intervention to complete a learning activity. Descriptive but specific feedback provides intrinsic motivation for students to improve their learning and enjoy their learning.

3. Digital artefacts

Digital artefacts are documents or multimedia files that are electronic evidence of students learning. They are critical to demonstrate evidence of student learning, especially in the context of performing authentic tasks. An authentic task refers to an assignment that requires applying knowledge and skills to real-world challenges such as designing a poster, creating a game, analysing data or designing a presentation.

At the core of performing authentic ICT tasks are making knowledge visible, the concept which is central in constructivist learning theory. Constructionism states that learning occurs felicitously when constructing or creating a public artefact. Teachers can observe and provide descriptive feedback on artefacts which will further necessitate students to try to solve a problem and learn because they are motivated by their construction.

4. Testing

Testing at a regular interval such as at the end of a chapter, term or year provides feedback to teachers on the progress of students' learning. Both practical and theory tests are recommended to holistically check how students are performing in terms of their understanding and application of knowledge, values and skills.

Practical testing will require computers, relevant software applications and Internet connectivity for students to explore and create digital content. Theory testing can be conducted in the form of paper-pencil tests or by ICT-enabled tests for faster, easy and reliable assessment. These tests may usually be carried out at regular intervals over the academic year.

Teachers can refer to the Key Stage-wise Assessment Matrix given in *Appendix I* for detailed assessment area, assessment mode and weighting for each key stage

8 ENABLING CONDITIONS

ICT plays a key role in preparing students to live and work successfully in a knowledge-based society. With the world moving rapidly into digital media and information, schools have realised the importance of digital competence for students. The effectiveness and success of this curriculum hinge on critical enabling conditions that must be in place or ensured as the implementation begins. The following five enabling conditions are identified as critical in the successful implementation of the ICT curriculum.

a) Adequate infrastructure

The ICT curriculum focuses on what students can do which necessitates providing hands-on learning. With the use of authentic tasks in the form of mini-projects, students require enough computer time to practise skills and complete projects. Computer laboratories equipped with adequate computers form a prerequisite for the successful implementation of the curriculum.

b) Competent teachers

Delivery of ICT curriculum intentions in schools largely depend on the competency of ICT teachers. Especially with the emphasis on coding in the curriculum, ICT teachers should be able to teach coding as well as make learning exciting. Besides, the teachers should be able to provide authentic tasks that require students to apply ICT skills and values in completing the tasks.

ICT teachers must be supported through regular professional development programmes to achieve the curriculum intentions and outcomes. The professional development programmes to enhance the competency of ICT teachers may be carried out either at Dzongkhag or national levels depending upon the degree and nature of training required.

c) Reliable Internet connectivity

Given the enormous learning opportunity the Internet provides through access to unlimited resources and information, students must have the opportunity to use the Internet for learning concepts and topics on ICT as well as other subjects. The Internet also provides a platform for students to communicate and collaborate on projects with the use of ICT tools.

For this, schools must have fast and high bandwidth Internet connectivity. It has been often mentioned that unreliable Internet connectivity can negatively affect students' experience with technology and consequently their learning.

d) Enrichment activities

ICT events such as hackathons, bootcamp, Olympiads, exhibitions and competitions provide enriching avenues for students to apply their ICT knowledge and skills learned in schools. Participating in ICT events will enrich students' experience and learning in creating innovative ICT solutions such as designing a website, developing an app or creating a game.

There is a need to initiate regular ICT events at the school and national levels to motivate students to create innovative ICT solutions and even participate in international events. Without opportunities for enrichment events, student learning will remain within the confines of classrooms, not being able to apply their ICT skills in real-world contexts.

e) Enhanced learning support

Regular maintenance of computers and networks is essential for a smooth ICT learning experience for students. ICT laboratory assistants in the schools are the key people to ensure the computers and networks are functional. Without functioning computers and networks, much of the curriculum outcomes will remain unachieved. Therefore, schools must have competent ICT laboratory assistants and some budgetary provisions to maintain the computers and networks.

9 CROSS-CURRICULAR LINKAGES

Technologies can transform the way students think and learn as they support self-exploration, group collaboration, content creation and knowledge sharing. Since technologies are fast, automated, interactive, and allow students to control how and when they learn, ICT can be used by teachers to enhance students' learning experience and improve their success in all subjects.

The ICT curriculum can be integrated smoothly into other subjects to stimulate and extend students' learning. For this, teachers need not have to teach ICT curriculum but can provide opportunities for learners to apply the ICT skills that they have already learned in the ICT subject. Accordingly, the focus of the lesson must remain firmly rooted in learning the subject's content, and teachers should not be burdened with the need to teach ICT skills separately. Subject teachers should also have a good understanding of the breadth of ICT skills and concepts that learners have been taught and know which ICT tools offer significant opportunities to enhance teaching and learning and how they can be incorporated into their subjects effectively.

For the delivery of the ICT curriculum, ICT teachers can begin by linking the ICT tools or concepts to other subjects wherever relevant and possible. This can add value, excitement and fun to the learning of ICT subjects. For example, primary students can transform a story learned in English into digital format with animations and music using Scratch coding or a digital storytelling application. In creating the digital story, students will get the opportunity to apply ICT skills. Similarly, there are many opportunities for both ICT teachers and other subject teachers to integrate ICT skills and concepts that students learn through this curriculum. Given below are some examples of how students can use skills learned in the ICT curriculum to learn other subjects.

English:

- Writing letters, journals and reports in MS Word for field trip projects.
- Creating blogs to express opinions or record daily personal experiences.
- Enrolling in online courses to learn grammar and creative writing.
- Recording audio in the recorder and playing it to improve speaking.
- Sending emails to education officials to enquire about winter programmes.
- Making a presentation using PowerPoint on a reading or writing project.
- Researching popular poets and writers using Internet search techniques.

Dzongkha:

- Typing in Dzongkha to compose an essay for competition.
- Presenting using MS PowerPoint on *Driglam Namzha* (etiquette) in school.
- Recording *Tsangmo* and *Lozay* in an audio recorder for remixing and adding music.
- Creating video on short Dzongkha drama and sharing with friends for feedback.
- Searching the Internet for images required for Dzongkha projects.

Mathematics:

- Data analysing and graph drawing in MS Excel.
- Watching videos on the Internet to learn algebra.
- Creating a calculator program using Scratch block coding.
- Playing Mathematics simulations on the Internet.
- Drawing Mathematical shapes and patterns in MS Paint.

Geography:

- Using Google Map to locate countries and places.
- Searching the Internet for geography projects.
- Creating simulation on solar system in Scratch block coding.
- Creating a poster in MS Paint on climate change.

History:

- Using the Internet to research historical figures.
- Creating video presentations on a historical site in Bhutan.
- Writing a report using MS Word on a field trip to a Dzong.
- Recording audio of an interview of a politician or local leader.

Science:

- Watching online videos on science experiments and exhibitions.
- Creating animation on water cycle using Scratch block coding.
- Exploring PhET interactive simulations on advanced science concepts.
- Designing posters on great scientists and their inventions.

10 BIBLIOGRAPHY

Australian Curriculum, Assessment and Reporting Authority.(2012). *Information and Communication Technology Capability: Learning continuum*. Retrieved from https://www.australiancurriculum.edu.au/media/1074/general-capabilities-information-and-communication-ict-capability-learning-continuum.pdf

Barr.V. & Stephenson.C.(2011). *Bringing Computational Thinking to K-12: What is Involved and What is the Role of Computer Science Education Community?* Retrieved from https://dl.acm.org/doi/pdf/10.1145/1929887.1929905

Code.org.(2015).CS Fundamentals Unplugged. Retrieved from https://code.org/ curriculum/unplugged

Common Sense Education.(2015).Our K-12 Digital Citizenship Curriculum [PDF file].Retrieved from https://www.edweek.org/media/k-12-digital-citizenship-curriculum.pdf

Computer Science Teachers Association.(2017).K-12 Computer Science Standards (revised 2017).Retrieved from https://www.doe.k12.de.us/cms/lib/DE01922744/Centricity/Domain/176/CSTA%20Computer%20Science%20Standards%20Revised%202017.pdf

Herdon, E.(2018).What Are Multiple Intelligences and How Do They Affect Learning? Retrieved from https://www.cornerstone.edu/blogs/lifelong-learning-matters/post/what-are-multiple-intelligences-and-how-do-they-affect-learning

International Bureau of Education. (2016).Curriculum Strands. Retrieved from http://www.ibe.unesco.org/en/glossary-curriculum-terminology/c/ curriculum-strands

International Society for Technology in Education (2016). ISTE Standards for Students. Retrieved from https://www.iste.org/standards/for-students

Organisation for Economic Co-operation and Development. (2019). PISA 2021 ICT Framework [PDF file]. Retrieved from https://www.oecd.org/pisa/sitedocument/PISA-2021-ICT-framework.pdf

Manitoba Education, Citizenship and Youth. (2007).Senior Years Information and Communication Technology: Manitoba Curriculum Framework of Outcomes [PDF file].Retrieved from https://www.edu.gov.mb.ca/k12/cur/ict/framework.pdf

Manitoba Education, Culture and Employment (2012).Literacy with ICT Across the Curriculum: Guide to infusion [PDF file].Retrieved from https://www.ece.gov.nt.ca/sites/ece/files/resources/lwict_infusion_guide_-_2012.pdf

Papert.S.& Harel.H.(1991). Situating Constructionism. Retrieved 2 June 2020, from http://www.papert.org/articles/SituatingConstructionism.html

UK Essays.(2017). Integrating ICT in Teaching and Learning. Retrieved from https:// www.ukessays.com/essays/education/integrating-ict-in-the-teaching-and-learning-process-education-essay.php?vref=1

UNESCO Institute of Information Technologies in Education. (2012). ICTs for Curriculum Change [PDF file]. Retrieved from http://iite.unesco.org//pics/ publications/en/files/3214717.pdf

11 APPENDIX

APPENDIX I - KEY STAGE-WISE ASSESSMENT MATRIX

Sl#	Assessment Area	Mode	Classes PP-III	Classes IV-VI	Classes VII-VIII	Classes IX-X	Classes XI-XII
			Weighting %	Weighting %	Weighting %	Weighting %	Weighting %
1	Participation and completion of classwork. (face-to-face or online) *(Formative assessment)*	Observation, Conversation	10	10	10	10	10
2	Participation and completion of homework. (face-to-face or online) *(Formative assessment)*	Observation, Conversation	10	10	10	10	10
3	Planning, research, documentation, creation and presentation of digital artefacts including coding projects. *(Formative assessment)*	Assessment of Digital Artefacts	80	60	50	40	30
4	Theory and/or Practical Test (unit, mid-term and annual exams) *(Summative assessment)*	Testing	0	20	30	40	50
Total			100	100	100	100	100