

MINISTRY OF EDUCATION



REPUBLIC OF GHANA

COMPUTING CURRICULUM FRAMEWORK
(KG1 TO BASIC 6)

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COMPUTING CURRICULUM FOR PRIMARY SCHOOLS

COMPUTING CURRICULUM

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Ministry of Education
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FOREWORD

This curriculum is **Standards-Based**. It sets out the Computing Standards for Basic one (1) to Basic six (6) in Ghanaian schools. The key learning outcomes in this curriculum (knowledge, skill and attitude/values) are referred to as **Standards**. Standards are long-term key learning outcomes that a learner attains by the end of a particular level of education (e.g. by the end of Basic 1) or of a phase (e.g. by the end of Basic 1-3). The previous curriculum was an 'objectives-based curriculum because, the key learning outcomes were measured in terms of objectives that the learners were expected to attain by the end of each lesson or unit. The standards-based curriculum supports the provision of an inclusive educational system, where individual strengths and potentials are valued and maximized, regardless of ability, ethnicity, religion, gender, or computing location. It promotes quality education for all through the use of creative approaches to teaching and a robust accountability system.

In this standards-based computing curriculum, a pre-determined body of knowledge has been designated as a **Strand**. The topics under each strand are the **Sub-Strands**. The sub-strands are the sub topics', 'content,' or '*essential learnings*' for which content standards are formulated.

Standards, which are actually learning outcome statements, describe the specific knowledge, skills, and attitudes learners are expected to demonstrate as a result of their cumulative learning experiences in the sub-strand.

Standards are used to set performance benchmarks that indicate the minimal levels of competency required to be successful in successive basic-school levels. The benchmarks allow key stakeholders (district officials, head teachers, teachers and parents) to determine whether learners at a given basic-school level are progressing in computing as expected.

The **learning indicators** of the standards are clear outcomes or milestones that learners have to exhibit in each year to meet the content standard expectation. They are also referred to as *achievement indicators*. They illustrate what the learners must demonstrate to show they have achieved the standard. The standards and their achievement indicators are statements that identify what learners are expected to **know and be able to do** by the end of a particular class level in a sub-strand of the curriculum. Indicators represent the minimum expected standards in a year.

Each indicator is supported by **Exemplars**. Exemplars are suggested teaching and learning activities. It provides support and guidance which clearly explains the expected outcomes of an indicator. In computing, the exemplars reflect computing content and computing specific pedagogy.

The standards in this curriculum are expected to promote quality basic education that is accessible to all. The curriculum is based on the belief that all learners can and should be proficient in all curriculum areas with special emphasis on the **Reading, wRiting, aRithmetic and cReativity** (4Rs). All learners should be supported to demonstrate the knowledge of computing concepts, skills and relationships with understanding. It is a requirement of this curriculum that all learners must be presented with opportunities to learn. It also means that the content standards set forth in this curriculum should offer learners at the Basic one (1) to Basic six (6) level with the competencies and proficiencies that are comparable with the best educational systems in the world.

I approve this curriculum as the official computing curriculum to be used in basic schools throughout Ghana.

.....
Dr. Matthew Opoku-Prempeh
Hon.Minister of Education
January,2019

RATIONALE FOR PRIMARY COMPUTING

Computing is one of the essential school subjects that permeates and can be applied to all areas of learning. This is because it provides students with access to important computing ideas, knowledge and skills that they can draw on in their personal and work lives, as well as their learning of other school subjects. Computing learning provides the opportunity for students to develop essential skills and competencies, and motivates learners to become flexible problem solvers and life-long learners. In an increasingly technological age the possession of problem solving and decision-making skills is an essential pre-requisite and these are acquired in the learning of computing.

PHILOSOPHY

TEACHING PHILOSOPHY

The teaching is focused around a supportive and inclusive learning environment by positively engaging teacher-student relationships. Teachers have the responsibility to create a cooperative learning environment where students feel safe and secure. In addition, appropriate improvisation techniques would be used to represent the actual devices when they are not available.

Relevance, engagement and problem solving best describe the computing teaching philosophy. In other words, teaching of computing adopts the hands-on approach that is, the tactile/kinaesthetic approach. Students learn computing subject best when they are actively involved in the learning process, and that an engaging classroom best facilitates this. Students should be engaged in computing by using diverse teaching methods, encouraging the use of a variety of their cognitive skills. The more students process data, the more likely they would be to apply, analyse, synthesise, and evaluate the information.

Teaching of computing should enable learners know how data can be used to understand themselves, explain situations they find themselves in, describe the why and how some things happened or predict what might happen in the future.

LEARNING PHILOSOPHY

Computing education develops a wide range of skills including problem solving, design construction, communication, critical thinking, analysis, synthesis and evaluation. The skills learnt can then be applied to other fields of endeavour. Learners should have freedom of expression and creativity. Learners should be able to experiment and to realize their strengths and weaknesses in the computing subject. Each learner's learning style should be tie into the learning of computing so as to enable learners grow and learn on their own. Learners should be giving the chance to pose their own questions and try to answer them independently. Learners should be encouraged to find information in a variety of ways. Learners should also be encouraged to work on projects in groups to foster collaborative learning.

SUBJECT AIMS

The computing curriculum is designed to help learners to:

1. acquire basic ICT literacy
2. communicate effectively using ICT tools
3. develop interest and acquire skills in the use of the internet
4. develop basic ethics in using ICT tools
5. acquire basic programming and database skills

INSTRUCTIONAL EXPECTATIONS

1. Guide and facilitate learning by generating discourse among learners and challenging them to accept and share responsibility for their own learning, based on their unique individual differences.
2. Select computing content, adapt and plan lessons to meet the interests, knowledge, understanding, abilities, and experiences of learners.
3. Work together as colleagues within and across disciplines and grade levels to develop communities of computing learners who exhibit the skills of computing inquiry and the attitudes and social values conducive to computing learning.
4. Use multiple methods and systematically gather data about learner understanding and ability to guide computing teaching and learning, with arrangements to provide feedback to both learners and parents.
5. Design and manage learning environments that provide learners with the time, space, and resources needed for learning computing

CORE COMPETENCES

The core competences for computing studies describe a body of skills that teachers in computing at all levels should seek to develop in their learners. They are ways in which teachers and learners in computing engage with the subject matter as they learn the subject. The competences presented here describe a connected body of core skills that are acquired throughout the processes of teaching and learning. These include:

CRITICAL THINKING AND PROBLEM SOLVING

This skill develops learners' cognitive and reasoning abilities to enable them analyse and solve problems. Critical thinking and problem solving skill enables learners to draw on their own experiences to analyse situations and choose the most appropriate out of a number of possible solutions. It requires that learners embrace the problem at hand, persevere and take responsibility for their own learning.

CREATIVITY AND INNOVATION

Creativity and Innovation promotes entrepreneurial in learners skills through their ability to think of new ways of solving problems and developing technologies for addressing the problem at hand. It requires ingenuity of ideas, arts, technology and enterprise. Learners having this skill are also able to think independently and creatively.

COMMUNICATION AND COLLABORATION

This competence promotes in learners the skills to make use of languages, symbols and texts to exchange information about themselves and their life experiences. Learners actively participate in sharing their ideas. They engage in dialogue with others by listening to and learning from them. They also respect and value the views of others.

CULTURAL IDENTITY AND GLOBAL CITIZENSHIP

This competence involves developing learners to put country and service foremost through an understanding of what it means to be active citizens. This is done by inculcating in learners a strong sense of social and economic awareness. Learners make use of the knowledge, skills, competences and attitudes acquired to contribute effectively towards the socioeconomic development of the country and on the global stage. Learners build skills to critically identify and analyse cultural and global trends that enable them to contribute to the global community.

PERSONAL DEVELOPMENT AND LEADERSHIP

This competence involves improving self-awareness and building self-esteem. It also entails identifying and developing talents, fulfilling dreams and aspirations. Learners are able to learn from mistakes and failures of the past. They acquire skills to develop other people to meet their needs. It involves recognising the importance of values such as honesty and empathy and seeking the well-being of others. Personal development and leadership enables learners to distinguish between right and wrong. The skill helps them to foster perseverance, resilience and self-confidence. PL helps them acquire the skill of leadership, self-regulation and responsibility necessary for lifelong learning.

DIGITAL LITERACY

Digital Literacy involves developing learners to discover, acquire, and communicate through ICT to support their learning. It also makes them use digital media responsibly.

LEARNING DOMAINS (EXPECTED LEARNING BEHAVIOURS)

A central aspect of this curriculum is the concept of three integral learning domains that should be the basis for instruction and assessment. These are

- Knowledge, Understanding and Application
- Process Skills
- Attitudes and Values

KNOWLEDGE, UNDERSTANDING AND APPLICATION

Under this domain, learners acquire knowledge through some learning experiences. They may also show understanding of concepts by comparing, summarising, re-writing etc. in their own words and constructing meaning from instruction. The learner may also apply the knowledge acquired in some new contexts. At a higher level of learning behaviour, the learner may be required to analyse an issue or a problem. At higher levels, the learner may be required to synthesize knowledge by integrating a number of ideas to formulate a plan, solve a problem, compose a story, or a piece of music. Further, the learners may be required to evaluate, estimate and interpret a concept. At the last level, which is the highest, learners may be required to create, invent, compose, design and construct. These learning behaviours “knowing”, “understanding”, “applying”, “analysing”, “synthesising”, “evaluating” and “creating” fall under the domain “Knowledge, Understanding and Application”.

In this curriculum, learning indicators are stated with action verbs to show what the learner should know and be able to do. For example, the learner will be able to describe something. Being able to “describe” something after teaching and learning has been completed means that the learner has acquired “knowledge”. Being able to explain, summarise, and give examples etc. means that the learner has understood the concept taught.

Similarly, being able to develop, defend, etc. means that the learner can “apply” the knowledge acquired in some new context. You will note that each of the indicators in the curriculum contains an “action verb” that describes the behaviour the learner will be able to demonstrate after teaching and learning has taken place. “Knowledge, Understanding and Application” is a domain that should be the prime focus of teaching and learning in schools. Teaching in most cases has tended to stress knowledge acquisition to the detriment of other higher level behaviours such as applying knowledge.

Each action verb in any indicator outlines the underlying expected outcome. Each indicator must be read carefully to know the learning domain towards which you have to teach. The focus is to move teaching and learning from the didactic acquisition of “knowledge” where there is fact memorisation, heavy reliance on formulae, remembering facts without critiquing them or relating them to real world – **surface learning** – to a new position called – **deep learning**. Learners are expected to deepen their learning by knowledge application to develop critical thinking skills, explain reasoning, and to generate creative ideas to solve real life problems in their school lives and later in their adult lives. This is the position where learning becomes beneficial to the learner.

The explanation and the key words involved in the “Knowledge, Understanding and Application” domain are as follows:

Knowing: The ability to remember, recall, identify, define, describe, list, name, match, state principles, facts and concepts. Knowledge is the ability to remember or recall material already learned and this constitutes the lowest level of learning.

Understanding: The ability to explain, summarise, translate, rewrite, paraphrase, give examples, generalise, estimate or predict consequences based upon a trend. Understanding is generally the ability to grasp the meaning of some concepts that may be verbal, pictorial, or symbolic.

Applying: This dimension is also referred to as “Use of Knowledge”. Ability to use knowledge or apply knowledge, apply rules, methods, principles, theories, etc. to situations that are new and unfamiliar. It also involves the ability to produce, solve, plan, demonstrate, discover etc.

Analysing: The ability to break down material/information into its component parts; to differentiate, compare, distinguish, outline, separate, identify significant points etc., ability to recognise unstated assumptions and logical fallacies; ability to recognise inferences from facts etc.

Synthesising: The ability to put parts or ideas together to form a new whole. It involves the ability to combine, compile, compose, devise, plan, revise, organise, create, generate new ideas and solutions.

Evaluating: The ability to appraise, compare features of different things and make comments or judgment, criticise, justify, support, discuss, conclude, make recommendations etc. Evaluation refers to the ability to judge the worth or value of some material based on some criteria.

Creating: The ability to use information or materials to plan, compose, produce, manufacture or construct other products.

From the foregoing, creating is the highest form of thinking and learning and is therefore the most important behaviour. This, unfortunately, is the area where most learners perform poorly. In order to get learners to develop critical thinking skills, beginning right from the lower primary level, it is advised that you do your best to help your learners to develop analytical skills and processes as we have said already.

SKILLS AND PROCESSES

Computing is the means by which a learner solves problems or seeks to gain information using technological tools. Learners should be exposed to situations that challenge them to raise questions and attempt to solve problems using technological tools. The more often they are faced with these challenges, the more likely they are to develop a positive attitude toward computing, and the more likely they are to develop relevant computing skills. The skills and processes that learners need to develop in computing are as follows:

Mouse skills

This is the skill of using the mouse to perform various functions.

Keyboarding skills

This is the skill of using the keyboarding to perform various functions

Comparing

This is the skill of identifying the similarities and differences between two or more objects, concepts, information or processes.

Communicating/Reporting

This is the skill of transmitting, receiving and presenting information in concise, clear and accurate forms - verbal, written, pictorial, tabular or graphical.

Analysing

This is the skill of identifying the parts of objects, information or processes, and the patterns and relationships between these parts.

Evaluating

This is the skill of assessing the reasonableness, accuracy and quality of information, processes or ideas. This is also the skill of assessing the quality and feasibility of objects or information.

Designing

This is the skill of Visualizing and drawing new objects or gargets from imagination.

Interpreting

This is the skill of evaluating data in terms of its worth: good, bad, reliable, unreliable; making inferences and predictions from written or graphical data; extrapolating and deriving conclusions. Interpretation is also referred to as “Information Handling”.

Learners therefore need to acquire positive attitudes, values and psychosocial skills that will enable them participate actively in lessons and take a stand on issues affecting them and others.

ATTITUDES

To be effective, competent and reflective citizens, who will be willing and capable of solving personal and societal problems, learners should be exposed to situations that challenge them to raise questions and attempt to solve problems. Learners therefore need to acquire positive attitudes, values and psychosocial skills that will enable them participate in debates and take a stand on issues affecting them and others. The computing curriculum thus focuses on the development of attitudes and values.

The computing curriculum aims at helping learners to acquire the following:

1. Commitment: determination to contribute to national development.
2. Tolerance: willingness to respect the views of others.
3. Patriotism: readiness to defend the nation.
4. Flexibility in ideas: willingness to change opinion in the face of more plausible evidence.
5. Respect for evidence: willingness to collect and use data on one's investigation, and also have respect for data collected by others.
6. Reflection: the habit of critically reviewing ways in which an investigation or observation has been carried out to see possible faults and other ways in which the investigation or observation can be improved upon.
7. Comportment conforming to acceptable societal norms.
8. Co-operation the ability to work effectively with others.
9. Responsibility: the ability to act independently and make decisions; morally accountable for one's action; capable of rational conduct.
10. Environmental Awareness: being conscious of one's physical and socio-economic surroundings.
11. Respect for the Rule of Law: obeying the rules and regulations of the land.

The teacher should ensure that learners cultivate the above attitudes and skills as basis for living in the nation as effective citizens.

VALUES:

At the heart of this curriculum is the belief in nurturing honest, creative and responsible citizens. As such, every part of this curriculum, including the related pedagogy, should be consistent with the following set of values.

Respect: This includes respect for the nation of Ghana, its institutions and laws and the culture and respect among its citizens and friends of Ghana.

Diversity: Ghana is a multicultural society in which every citizen enjoys fundamental rights and responsibilities. Learners must be taught to respect the views of all persons and to see national diversity as a powerful force for nation development. The curriculum promotes social cohesion.

Equity: The socio-economic development across the country is uneven. Consequently, it is necessary to ensure an equitable distribution of resources based on the unique needs of learners and schools. Ghana's learners are from diverse backgrounds which require the provision of equal opportunities to all, and that, all strive to care for each other.

Commitment to achieving excellence: Learners must be taught to appreciate the opportunities provided through the curriculum and persist in doing their best in whatever field of endeavour as global citizens. The curriculum encourages innovativeness through creative and critical thinking and the use of contemporary technology.

Teamwork/Collaboration: Learners are encouraged to be committed to team-oriented working and learning environments. This also means that learners should have an attitude of tolerance to be able to live peacefully with all persons.

Truth and Integrity: The curriculum aims to develop learners into individuals who will consistently tell the truth irrespective of the consequences, be morally upright with the attitude of doing the right thing even when no one is watching. Also, be true to themselves and be willing to live the values of honesty and compassion. Equally important is the practice of positive values as part of the ethos or culture of the work place, which includes integrity and perseverance. These values must underpin the learning processes to allow learners to apply skills and competences in the world of work.

The action verbs provided in the learning indicators in each content standard, should help you to structure your teaching and learning to achieve the desired learning outcomes. Check the learning indicators to ensure that you have given the required emphasis to each learning domain in your instruction and assessment.

ASSESSMENT

Assessment is a process of collecting and evaluating information about learners and using the information to make decisions to improve their learning.

In this curriculum, it is suggested that assessment is used to promote learning. Its purpose is to identify the strengths and weaknesses of learners to enable teachers ascertain their learner's response to instruction.

Assessment is both formative and summative. Formative assessment is viewed in terms of Assessment **as** learning and Assessment **for** learning.

Assessment as learning: Assessment as learning relates to engaging learners to reflect on the expectations of their learning. Information that learners provide the teacher forms the basis for refining teaching-learning strategies. Learners are assisted to play their roles and to take responsibility of their own learning to improve performance. Learners are assisted to set their own learning goals and monitor their own progress.

Assessment for learning: It is an approach used to monitor learner's progress and achievement. This occurs throughout the learning process. The teacher employs assessment for learning to seek and interpret evidence which serves as timely feedback to refine their teaching strategies and improve learners' performance. Learners become actively involved in the learning process and gain confidence in what they are expected to learn.

Assessment of learning: This is summative assessment. It describes the level learners have attained in the learning, what they know and can do over a period of time. The emphasis is to evaluate the learner's cumulative progress and achievement.

It must be emphasised that all forms of assessment should be based on the domains of learning. In developing assessment procedures, try to select indicators in such a way that you will be able to assess a representative sample from a given strand. Each indicator in the curriculum is considered a criterion to be achieved by the learners. When you develop assessment items or questions that are based on a representative sample of the indicators taught, the assessment is referred to as a "Criterion-Referenced Assessment". In many cases, a teacher cannot assess all the indicators taught in a term or year. The assessment procedure you use i.e. class assessments, homework, projects etc. must be developed in such a way that the various procedures complement one another to provide a representative sample of indicators taught over a period.

SUGGESTED TIME ALLOCATION

A total of four periods a week, each period consisting of thirty minutes, is allocated to the teaching of computing at the Lower Primary level. It is recommended that the teaching periods be divided as follows:

1(one) period per day (30-minutes per period)

PEDAGOGICAL APPROACHES

These are the approaches, methods, strategies, appropriate relevant teaching and learning resources for ensuring that every learner benefits from teaching and learning process. The curriculum emphasises the:

1. creation of learning-centred classrooms through the use of creative approaches to ensure learner empowerment and independent learning.
2. positioning of inclusion and equity at the centre of quality teaching and learning
3. use of differentiation and scaffolding as teaching and learning strategies for ensuring that no learner is left behind
4. use of Information Communications Technology (ICT) as a pedagogical tool
5. identification of subject specific instructional expectations needed for making learning in the subject relevant to learners
6. integration of assessment as learning, for learning and of learning into the teaching and learning processes and as an accountability strategy
7. questioning techniques that promote deep learning

LEARNING-CENTRED PEDAGOGY

The learner is at the centre of learning. At the heart of the national curriculum for change and sustainable development is the learning progression and improvement of learning outcomes for Ghana's young people with a focus on the 4Rs – Reading, wRiting, aRithmetic and cReativity. It is expected that at each curriculum phase, learners would be offered the essential learning experiences to progress seamlessly to the next phase. Where there are indications that a learner is not sufficiently ready for the next phase a compensatory provision through differentiation should be provided to ensure that such a learner is ready to progress with his/her cohort. At the primary school, the progression phases are KG1 to KG2 and B1 to B6.

The Curriculum encourages the creation of a learning centred classroom with the opportunity for learners to engage in meaningful “hands-on” activities that bring home to the learner what they are learning in school and what they know from outside of school. The learning centred classroom is a place for the learners to discuss ideas through the inspiration of the teacher. The learners then become actively engaged in looking for answers, working in groups to solve problems. They also research for information, analyse and evaluate information. The aim of the learning-centred classroom is to enable learners take ownership of their learning. It provides the opportunity for deep and profound learning to take place.

The teacher as a facilitator needs to create a learning environment that:

1. makes learners feel safe and accepted
2. helps learners to interact with varied sources of information in a variety of ways
3. helps learners to identify a problem suitable for investigation through project work
4. connects the problem with the context of the learners' world so that it presents realistic opportunities for learning
5. organises the subject matter around the problem, not the subject
6. gives learners responsibility for defining their learning experience and planning to solve the problem
7. encourages learners to collaborate in learning
8. expects all learners to demonstrate the results of their learning through a product or performance

It is more productive for learners to find answers to their own questions rather than teachers providing the answers and their opinions in a learning-centred classroom.

INCLUSION

Inclusion is ensuring access and learning for all learners, especially, those disadvantaged. All learners are entitled to a broad and balanced curriculum in every school in Ghana. The daily learning activities to which learners are exposed should ensure that the learners' right to equal access and accessibility to quality education is met. The Curriculum suggests a variety of approaches that addresses learners' diversity and their special needs in the learning process. When these approaches are effectively used in lessons, they will contribute to the full development of the learning potential of every learner. Learners have individual needs and learning experiences and different levels of motivation for learning. Planning, delivery and reflection on daily learning experiences should take these differences into consideration. The curriculum therefore promotes:

1. learning that is linked to the learner's background and to their prior experiences, interests, potential and capacities.
2. learning that is meaningful because it aligns with learners' ability (e.g. learning that is oriented towards developing general capabilities and solving the practical problems of everyday life); and
3. the active involvement of the learners in the selection and organisation of learning experiences, making them aware of their importance and also enabling them to assess their own learning outcomes.

DIFFERENTIATION AND SCAFFOLDING

Differentiation is a process by which differences (learning styles, interest and readiness to learn) between learners are accommodated so that all learners in a group have best chance of learning. Differentiation could be by content, tasks, questions, outcome, groupings and support. Differentiation as a way of ensuring each learner benefits adequately from the delivery of the curriculum can be achieved in the classroom through i) Task ii) Support from the Guidance and Counselling Unit and iii) Learning outcomes.

Differentiation by task involves teachers setting different tasks for learners of different abilities. E.g. in sketching the plan and shape of their classroom some learners could be made to sketch with free hand while others would be made to trace the outline of the plan.

Differentiation by support involves the teacher giving needed support and referring weak learners to the Guidance and Counselling Unit for academic support.

Differentiation by outcome involves the teacher allowing learners to respond at different levels. Weaker learners are allowed more time for complicated tasks.

Scaffolding in education refers to the use of variety of instructional techniques aimed at moving learners progressively towards stronger understanding and ultimately greater independence in the learning process.

It involves breaking up the learning task, experience or concepts into smaller parts and then providing learners with the support they need to learn each part. The process may require a teacher assigning an excerpt of a longer text to learners to read and engaging them to discuss the excerpt to improve

comprehension. The teacher goes ahead to guide them through the key words/vocabulary to ensure learners have developed a thorough understanding of the text before engaging them to read the full text. Common scaffolding strategies available to the teacher are:

1. give learners a simplified version of a lesson, assignment, or reading, and then gradually increases the complexity, difficulty, or sophistication over time
2. describe or illustrate a concept, problem, or process in multiple ways to ensure understanding
3. give learners an exemplar or model of an assignment they will be asked to complete
4. give learners a vocabulary lesson before they read a difficult text
5. describe the purpose of a learning activity clearly and the learning goals they are expected to achieve
6. describe explicitly how the new lesson builds on the knowledge and skills learners were taught in a previous lesson

INFORMATION COMMUNICATIONS TECHNOLOGY

Information Communications Technology (ICT) has been integrated into the computing curriculum as part of the core of education, alongside reading, writing and numeracy. Thus, the curriculum is designed to use ICT as a teaching and learning tool to enhance deep and independent learning. For instance, the teacher in certain instances is directed to use multimedia to support the teaching and learning process.

ICT has the potential to innovate, accelerate, enrich, and deepen skills. It also motivates and engages learners to relate school experiences to work practices. It provides opportunities for learners to fit into the world of work. Some of the expected outcomes that this curriculum aims to achieve are:

1. improved teaching and learning processes
2. improved consistency and quality of teaching and learning
3. increased opportunities for more learner-centered pedagogical approaches
4. improved inclusive education practices.
5. improved collaboration, creativity, higher order thinking skills
6. enhanced flexibility and differentiated approach of delivery

The use of ICT as a teaching and learning tool is to provide learners access to large quantities of information online and offline. It also provides the framework for analysing data to investigate patterns and relationships in the computing context. Once learners have made their findings, ICT can help them organize, edit and print the information in many different ways.

Learners need to be exposed to various ICT tools around them including calculators, radios, cameras, phones, television sets and computers and related software like Microsoft Office packages - Word, PowerPoint and Excel as teaching and learning tools. The exposure that learners are given at the primary school level to use ICT in exploiting learning will build their confidence and will increase their level of motivation to apply ICT use in later years, both within and outside of education. ICT use for teaching and learning is expected to enhance the quality and competence level of learners.

ORGANISATION AND STRUCTURE OF THE CURRICULUM

The curriculum is organised under key headings and annotations.

Strands are the broad areas/sections of the computing content to be studied.

Sub-strands are the topics within each strand under which the content is organised.

Content standard refers to the pre-determined level of knowledge, skill and/or attitude that a learner attains by a set stage of education.

Indicator is a clear outcome or milestone that learners have to exhibit in each year to meet the content standard expectation. The indicators represent the minimum expected standard in a year.

Exemplar – support and guidance which clearly explains the expected outcomes of an indicator and suggests what teaching and learning activities could take to support the facilitators/teachers in the delivery of the curriculum.

Class	Strand	Sub Strand	Content Standard	Learning Indicators
Strand 1: NUMBER				
Sub-strands: 1- Counting, Representation & Number Sense				
KG1	KG2	B1	B2	
KG1.1.1.1	KG2.1.1.1	B1.1.1.1	B2.1.1.1	
Describe numbers and the relationship between numbers 1 to 5.	Describe numbers and the relationship between numbers 0 to 20.	Describe numbers and the relationship between numbers 0 to 50	Count and estimate quantities from 0 to 100.	
KG1.1.1.1.1	KG2.1.1.1.1	B1.1.1.1.1	B2.1.1.1.1	
Use number names, counting sequences and how to count to find out "how many?" up to 5.	Use number names, counting sequences and how to count to find out "how many?" up to 20.	Use number names, counting sequences and how to count to find out "how many?" up to 50.	Use number names, counting sequences and how to count to find out "how many?" up to 100.	

ANNOTATION

A unique annotation is used to label the class, strands, sub-strands, content standards and learning indicators in the curriculum for the purpose of easy referencing. The annotation is defined in figure 1:

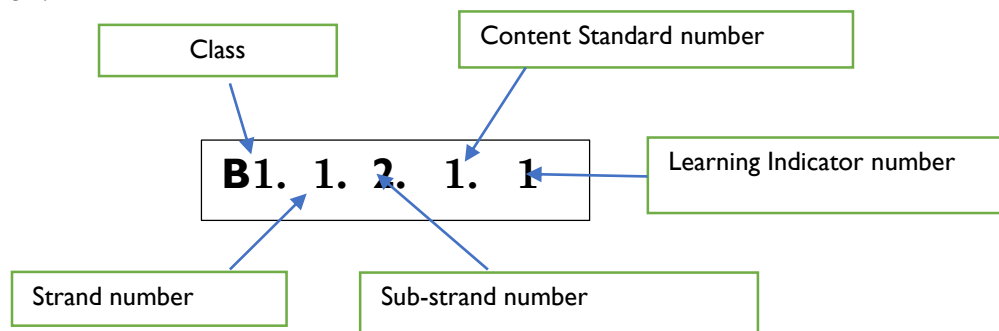


Figure 1: Curriculum Reference Numbers

ORGANIZATION OF THE STANDARDS (KGI – B6)

The content standards in this document are organized by grade level. Within each grade level, the contents are grouped first by strands. Each strand is further subdivided into sub-strands of related indicators.

- **Indicators** are learning outcomes that define what learners should know and be able to do.
- **Content Standards** are groups of related indicators. Note that indicators from different standards may sometimes be closely related, because computing is a connected subject.
- **Sub-strands** are larger groups of related indicators (or computing topics to be studied). Indicators from different sub-strands may sometimes be closely related.
- **Strands** are the main branches of the computing content to be studied.

The Standards are organized at the KGI – B6 phase under seven strands:

1. Introduction to computing
2. Presentation
3. Word processing
4. Desktop Publishing
5. Programming and databases
6. Internet and social media
7. Health and safety in using ICT tools

The table below shows the scope and sequence of the strands addressed at the KGI – B6 phase. The remaining part of the document presents the details of the standards and indicators for each grade level,

SCOPE AND SEQUENCE

Sn	Strand	Sub-strands	KG1	KG2	B1	B2	B3	B4	B5	B6
1	Introduction to computing	Generation of computers and parts of a computer and other gadgets								
		Introduction to MS-Windows Interface (Desktop Background and locations of the computer.)								
		Data, sources and usage								
		Technology in the community (communication)								
2	Presentation	Introduction to MS-PowerPoint (Tabs and ribbons of MS-PowerPoint)								
3	Word processing	Introduction to Word Processing (Tabs and ribbons of word processing)								
4	Desktop Publishing	Introduction to MS-Publisher								
5	Programming and databases	Introduction to databases, algorithm and programming.								
		Introduction to programming languages (e.g. MS- Excel, Scratch, VB dot Net etc.)								
		Introduction to Electronic Spreadsheet								
		Tabs and ribbons manipulation								

Sn	Strand	Sub-strands	KG1	KG2	B1	B2	B3	B4	B5	B6
6	Internet and social media	Network Overview								
		Web browsers and Web Pages								
		Surfing the world wide web								
		Favourite places and Search engine								
		Using Online Forms								
		Customising your browser								
		Electronic Email								
		Internet of things (IoT)								
		Digital Literacy								
		Network Etiquette								
7	Health and safety in using ICT tools	Health and safety in using ICT tools								

STANDARDS FRAMEWORK KGI to B3

Strand I: Introduction to computing				
Sub-strand I: Generation of computers and Parts of a Computer and Technology Tools				
KG1	KG2	B1	B2	B3
KG1.1.1.1: Demonstrate an understanding of the parts of a computer and technology tools (moving the mouse up and down)	KG2.1.1.1: Demonstrate an understanding of the how parts of a computer and technology tools	B1.1.1.1: Demonstrate an understanding of the parts of a computer and technology tools	B2.1.1.1: Demonstrate an understanding of the parts of a computer and technology tools)	B3.1.1.1: Demonstrate an understanding of the parts of a computer and technology tools
KG1.1.1.1.1. Recognise the mouse and play with it by clicking the left and right mouse button using the correct fingers.	KG2.1.1.1.1. Recognize the mouse and play with it by clicking the right and left mouse button and moving it up and down, left and right and in circular motion as well as double clicking	B1.1.1.1.1. Identify and discuss parts of a computer and how they connect to each other (i.e. the connection of mouse, keyboard, monitor, system unit)	B2.1.1.1.1. Recognise other peripherals that can be connected to the computer e.g. Scanners, speakers, printers, web camera etc.	B3.1.1.1.1. Recognise the hard disk, processor, power supply unit and memory.
KG1.1.1.1.2. Identify the keyboard and play with it by typing /pressing the keys on the keyboard. E.g. using keyboard tutorials	KG2.1.1.1.2. Identify the keyboard and play with it by typing alphabets separately and numerals separately on the keyboard using the spacebar.	B1.1.1.1.2. Identify and discuss and the Home keys and Enter buttons.	B2.1.1.1.2. Identify the top row key, Backspace and Delete buttons	B3.1.1.1.2. Identify the bottom row key, Caps Lock and Tab keys.
KG1.1.1.1.3. Identify the monitor and the system unit.	KG2.1.1.1.3. Identify the identification of the monitor and system unit and put them on and off.	B1.1.1.1.3. Identify the features of the monitor. e.g. Power buttons, contrast Button	B2.1.1.1.3. Identify the features of the system unit.eg. USB port, CD drive, power button, mouse port, etc.	B3.1.1.1.4. Type four letter words and simple sentences on the key pad with proper positioning of fingers on the keyboard.
KG1.1.1.1.4. Demonstrate basic use of keyboard e.g. press/type alphabets a, b, c....j and numbers 1, 2, 3...10 on a phone, computer, etc.	KG2.1.1.1.4. Press/type alphabets a, b, c....t and 1, 2, 3....20 and numbers two letter words on the key pad.	B1.1.1.1.4. Press alphabets a, b, c.... z and numbers 1, 2, 3....20 and three letter words on the key pad.	B2.1.1.1.4. Type four letter words on the key pad.	

Strand 1: Introduction to computing				
Sub-Strand 3: Data, Sources and Usage				
KG1	KG2	B1	B2	B3
		<p>B1.1.3.1: Show an understanding of data types and sources of data</p> <p>B1.1.3.1.1. Identify data. (Data as in values allocated to a collection of items with similar properties) e.g. Number of tables, chairs etc.</p> <p>B1.1.3.1.2. Identify sources of information (2 sources)</p> <p>B1.1.3.1.3. Demonstrate sending & sharing information (e.g. Tin-can telephone)</p>	<p>B2.1.3.1: Show an understanding of data types and sources of data</p> <p>B2.1.3.1.1. Identify types of data (primary data and information).</p> <p>B2.1.1.3.2. Identify more sources of information (3 sources)</p> <p>B2.1.3.3. Demonstrate sending & sharing information (using gestures and sign language to communicate)</p>	<p>B3.1.3.1: Show an understanding of data types and sources of data</p> <p>B3. 1.3.1.1. Identify data in conversation and newspapers</p> <p>B3.1.1.3.2. Identify more sources of information (5 sources)</p> <p>B3.1.3.3. Demonstrate sending & sharing information. (letter writing or text messaging)</p>

Strand 1: Introduction to computing				
Sub-strand 2: Introduction to Windows Interface				
KG1	KG2	B1	B2	B3
				<p>B3.1.2.2: Show an understand the concept of the Desktop Background, as well as their purposes (Image, Icons, Start Menu, and Taskbar)</p> <p>B3.1.2.2.1. Identify the features of Desktop Background (e.g. image, icons and Taskbar)</p> <p>B3.1.2.2.2 Use of the Background Area of the desktop (Changing Wallpaper with different pictures and themes)</p> <p>B3.1.2.2.3. Explain the basic use of the Taskbar and its features (Start button, Pinned Programmes and Notification Area)</p> <p>B3.1.2.2.4 Show how to Personalise the Desktop Background; this includes the proficient use of Change Colours, Set Lock Screen, and Change Themes of the Desktop.</p>

Strand 1: Introduction to computing				
Sub-Strand 3: Data, sources and usage				
KG1	KG2	B1	B2	B3
		<p>B1.1.3.2: Demonstrate an understanding of data collection tools and usage</p> <p>B1.1.3.2.1. Demonstrate data collection methods (e.g. listening to teacher and identifying data.)</p> <p>B1.1.3.2.2. Identify tools for collecting data (e.g. observation)</p>	<p>B2.1.3.2: Demonstrate an understanding of data collection tools and usage</p> <p>B2.4.1.4.1. Demonstrate more data collection methods (e.g. listening to radio or watch special video to collect data)</p> <p>B2.4.1.4.2. Identify more tools for collecting data (e.g. interview)</p>	<p>B3.1.3.2: Demonstrate an understanding of data collection tools and usage</p> <p>B3.4.1.4.1. Demonstrate more data collection methods (e.g. Pencil and paper used to collect data through interviews)</p> <p>B3.4.1.4.2. Identify more tools for collecting data (e.g. questionnaires)</p> <p>B3.4.1.4.3. Categorize and store data on the computer.</p>

Strand 1: Introduction to computing				
Sub-Strand 4: Technology in the Community				
KG1	KG2	B1	B2	B3
<p>KG1.1.4.1 Show an understanding of Technology in the community (communication)</p> <p>KG1.1.4.1.1. Demonstrate what communication is at their level (i.e. not detailed e.g. conversation between two or more learners and teachers).</p>	<p>KG2.1.4.1. Show an understanding of Technology in the community (communication)</p> <p>KG2.1.4.1.1. Demonstrate an understanding of what communication is at their level (e.g. passing information to one another by whispering).</p>	<p>B1.1.4.1. Show an understanding of Technology in the community (communication)</p> <p>B1.1.4.1.1 Illustrate what is communication. (e.g. using sign language to communicate)</p>	<p>B2.1.4.1. Show an understanding of Technology in the community (communication)</p> <p>B2.1.4.1.1. Show what is communication. (e.g. communication through colours)</p>	<p>B3.1.4.1 Show an understanding of Technology in the community (communication)</p> <p>B3.1.4.1.1. Discuss with examples what is communication. (e.g. communication through types of dresses)</p>
<p>KG1.1.4.1.2. Identify one technological tool for communication in the community.</p>	<p>KG2. 1.4.1.2. Identify and discuss two technological tools for communication in the community.</p>	<p>B1. 1.4.1.2 Identify five technological tools for communication in the community.</p>	<p>B2. 1.4.1.2. Identify five technological tools for communication in the community how they are used.</p>	<p>B3. 1.4.1.2. Identify seven technological tools for communication in the community how they are used.</p>
<p>KG1.1.4.1.3. Mention an importance of technology in communication.</p>	<p>KG2. 1.4.1.3. Discuss the importance of technology in communication.</p>	<p>B1. 1.4.1.3. Identify three importance of technology in communication.</p>	<p>B2. 1.4.1.3. Identify five importance of technology in communication</p>	<p>B3. 1.4.1.3. Identify seven importance of technology in communication</p>

Strand 2: Presentation				
Sub-Strand I: Introduction to Presentation Software				
KG1	KG2	BI	B2	B3
		.		<p>B3.2.1.1: Show a basic understanding of MS-PowerPoint.</p> <p>B3.2.1.1.1. Explore the types of presentation software e.g. MS-PowerPoint, Google Slides, Apple Keynote</p> <p>B3.2.1.1.2. Discuss the importance of MS-PowerPoint</p> <p>B3.2.1.1.3. Access and launch MS-PowerPoint on any computer or gadget.</p>

Strand 3: Word Processor				
Sub-Strand I: Introduction to Word Processing Software				
KG1	KG2	B1	B2	B3
				<p>B3.3.1.1: Show a basic understanding of MS-Word.</p> <p>B3.3.1.1.1. Explore the types of word processing software e.g. MS-Word, Google Doc, Open Office writer etc.</p> <p>B3.3.1.1.2. Discuss the importance of MS-Word.</p> <p>B3.3.1.1.3. Access and launch MS-Word on any computer or gadget.</p>

**STANDARDS
FRAMEWORK
B4 TO B6**

Strand I: Introduction to computing		
Sub-strand I: Identify Parts of a Computer and Technology Tools		
B4	B5	B6
B4.1.1.1. Identify parts of a computer and technology tools	B5.1.1.1. Identify parts of a computer and technology tools	B6.1.1.1. Identify parts of a computer and technology tools
B4.1.1.1.1. Recognise and use input devices (keyboard etc.)	B5.1.1.1.1. Recognise and use output devices (e.g. speakers etc.)	B6.1.1.1.1. Recognise the types, capacity and use of storage devices
B4.1.1.1.2. Describe the types of input devices and their use.	B5.1.1.1.2. Describe the types of output device and their use. Trouble-shooting the system unit.	B6.1.1.1.2 Explore by assembling basic components of the system unit.
B4.1.1.1.3. Differentiate between ram and rom.	B5.1.1.1.3. Identify the difference and similarities between analogue and digital devices	B6.1.1.1.3. Identify types of networking devices and describe how they work. (Personal area network, Peer-To-Peer, LAN, WAN, WI-FI, etc.)
B4.1.1.1.4. Demonstrate typing of short phrases	B5.1.1.1.4. Demonstrate typing a paragraph.	B6.1.1.1.4. Demonstrate typing out essays.
B4.1.1.1.5. Summarize the first generation of computers	B5.1.1.1.5. Recognize and differentiate between the second and third generation of computers	B6.1.1.1.5. Describe the fourth and fifth generation of computers as well as software and operating systems such as Android, Windows OS, LINUX and Mac OS.

Strand 1: Introduction to computing		
Sub Strand 2: Identify Parts of a computer and Technology Tools		
B4	B5	B6
<p>B4.1.2.1: Demonstrate the use of the Desktop Background as well as working with folders.</p> <p>B4.1.2.1.1. Describe the desktop background and explain its features (e.g. image, icons and Taskbar of the background)</p> <p>B4.1.2.1.2. Demonstrate how to personalise the desktop background using advance tools and settings; this includes customising the Start Menu.</p> <p>B4.1.2.1.3. Use the three sections of the Taskbar; Start Menu (Location and Launching only), Pinned Applications (Launched/Minimised programmes) and Notification Area (Date & Time, and Volume).</p> <p>B4.1.2.1.4. Add and remove icons from the desktop.</p> <p>B6.1.2.1.5. Move, select and hide multiple icons on the desktop</p> <p>B4.1.2.1.6. Create, name and rename a folder.</p>	<p>B5.1.2.1. Demonstrate the use of the Desktop Background as well as working with folders.</p> <p>B5.1.2.1.1. Personalise the desktop background and edit its images (e.g. image, icons and Taskbar of the background)</p> <p>B5.1.2.1.2. Demonstrate how to customise the desktop background using change background, start menu and pin to task bar or start menu.</p> <p>B5.1.2.1.3. Describe how to personalise the desktop background using advance tools and settings; this includes customising the Start Menu, the Taskbar and Notification Area. [Encourage learners to customize the Start Menu and the Notification Area].</p> <p>B5.1.2.1.4. Create short cut, add or remove common icons on the desktop</p> <p>B5.1.2.1.5 Move, copy and paste a file or icon into and from a folder on the desktop</p> <p>B5.1.2.1.6. Use the File Explorer window and locations of the computer through the file explorer</p>	<p>B6.1.2.1. Demonstrate the use of the Desktop Background as well as working with folders.</p> <p>B6.1.2.1.1. Explore the use of the desktop Background, changing the themes colours and User account. (e.g. classic, icons and Taskbar of the background)</p> <p>B6.1.2.1.2. Demonstrate the use of the Recycle Bin/Trash Can [Guide learners to use the recycle bin by deleting and viewing deleted files.</p> <p>B6.1.1.1.3 Perform permanent delete/Empty Trash can and restoring files or icons in the recycle bin. [Support learners to liken the Recycle bin and its use to the real-world office trash can].</p> <p>B6.1.2.1.4. Explore the use of Copy, Paste, Delete tools, the moving of folders by using the Desktop Pop-Up menu.</p> <p>B6.1.2.1.5. Illustrate the use of File Explorer window and locations of the computer through the file explorer</p> <p>B6.1.2.1.6. Locate the hard drives, and other removable storage icons in the File explorer</p>

Strand 1: Introduction to computing		
Sub strand 2: Identify parts of a computer and technology tools		
B4	B5	B6
		<p>B6.1.2.1.7. Use the File Explorer Ribbon (Home Ribbon only), that is, the use of the Clipboard and Organise tools of the Home Ribbon of the File Explorer, as well as the Open New Window and Close tools of the File Menu of the File Explorer.</p> <p>B6.1.2.1.8. Demonstrate the use of the navigation Pane of the File Explorer to access different locations of the computer from the navigation pane</p> <p>B6.1.2.1.9. Demonstrate the use of Frequent Folders Section of the File Explorer to access frequently used locations of the computer</p> <p>B6.1.2.1.10. Demonstrate the use of Recent Files Section of the File Explorer to access frequently used files of the computer</p> <p>B6.1.2.1.11. Demonstrate how to manage users of the Desktop</p>

Strand 1: Introduction to computing; Sub-Strand 3 : Demonstrate the use of data, their sources and usage		
B4	B5	B6
<p>B4.1.3.1. Demonstrate the use of data, their sources and usage</p> <p>B4.1.3.1.1. Use strategies for identifying data in conversation and news papers</p> <p>B4.1.3.1.2. Use strategies for classifying data into information</p> <p>B4.1.3.1.3. Identify primary sources of information</p> <p>B4.1.3.1.4. Demonstrate sending & sharing information.</p> <p>B4.1.3.1.5. Demonstrate basic calculations on sample data.</p>	<p>B5.1.3.1. Demonstrate the use of data, their sources and usage</p> <p>B5.1.3.1.1. Use Strategies for identifying data from results of an experiment.</p> <p>B5.1.3.1.2. Describe information by having calculations performed on a data.</p> <p>B5.1.3.1.3. Identify secondary sources of information</p> <p>B5.1.3.1.4. Demonstrate sending & sharing information.</p> <p>B5.1.3.1.5. Demonstrate basic calculations on sample data e.g. arranging data</p> <p>B5.1.3.1.6. Recognize data types (integer, double, float)</p> <p>B5.1.3.1.7. Demonstrate sending & sharing information</p>	<p>B6.1.3.1. Demonstrate the use of data, their sources and usage</p> <p>B6.1.3.1.1. Represent the collection of data by the use of automatic measurements using sensors (e.g. temperature, rainfall, pressure, etc.)</p> <p>B6.1.3.1.2. Describe information by drawing conclusions, make judgements or opinions, make predictions and decisions.</p> <p>B6.1.3.1.3. Identify more sources of information</p> <p>B6.1.3.1.4. Demonstrate sending & sharing information.</p> <p>B6.1.3.1.5. Demonstrate basic calculations on sample data.</p> <p>B6.1.3.1.6 Recognize data types (integer, double, float)</p> <p>B6.1.3.1.7. Demonstrate sending & sharing information.</p>

Strand 1: Introduction to computing		
Sub Strand 3: Demonstrate the use of data, their sources and usage		
B4	B5	B6
<p>B4.1.3.1.6. Identify the steps and issues involved in data collection</p> <p>B4.1.3.1.7. Describe various tools and techniques of data collection</p> <p>B4.1.3.1.8. Draw sketch maps of the area to be surveyed.</p>	<p>B5.1.3.1.8. Select the samples and collect data.</p> <p>B5.1.3.1.9. Make simple tables and diagrams from the collected data</p> <p>B5.1.3.1.10. Analyse tables, maps, diagrams, photographs and charts, and generalize the results and make suggestions</p>	<p>B6.1.3. 1.8. Prepare a presentation with a presentation software with collected data.</p> <p>B6.1.3. 1.9. Illustrate data presentation in different forms (e.g. chart such as line, bar and pie charts, sorting of data etc.)</p> <p>B6.1.3. 1.10. Explain further the analyse tables, maps, diagrams, photographs and charts, and generalize the results and make suggestions</p>

Strand 1: Introduction to computing		
Sub-Strand 4: Technology in the community		
B4	B5	B6
<p>B4.1.4.1. Demonstrate the use of technology in the community</p> <p>B4.1.4.1.1. Describe how digital systems are used and could be used at home, in school and the local community</p> <p>B4.1.4.1.2. Identify and list types of energy-efficient cooking.</p> <p>B4.1.4.1.3. Describe how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes in the community.</p> <p>B4.1.4.1.4. Identify technological changes in the community (e.g. Using automated irrigation for farming, eco-friendly pesticides and manure, etc.)</p>	<p>B5.1.4.1. Demonstrate the use of technology in the community</p> <p>B5.1.4.1.1. List the effect of technology on the community.</p> <p>B5.1.4.1.2. State the importance and types of compression of document.</p> <p>B5.1.4.1.3. Explain the fundamentals of digital system components (hardware, software and networks).</p> <p>B5.1.4.1.4. Identify how technology is used to save lives in community and how they are used.</p>	<p>B6.1.4.1. Demonstrate the use of technology in the community</p> <p>B6.1.4.1.1. Define simple problems using techniques such as summarising facts to deduce conclusions.</p> <p>B6.1.4.1.2. State the importance and use of collaborative document.</p> <p>B6.1.4.1.3. Display mastery of cloud computing.</p> <p>B6.1.4.1.4. Identify how technology is applied to generate energy directly or indirectly.</p>

Strand 2: Presentation		
Sub-strands I: Introduction to MS-PowerPoint		
B4	B5	B6
<p>B4.2.1.1. Demonstrate the use of MS-PowerPoint.</p> <p>B4.2.1.1.1. Demonstrate the use of clipboard, slides, fonts, paragraph and editing in the ribbons under the Home ribbons section.</p> <p>B4.2.1.1.2. Show a 3-slide presentation on presentation software using clip board, slides, fonts, paragraph and editing of the ribbons studied.</p>	<p>B5.2.1.1. Demonstrate the use of MS-PowerPoint.</p> <p>B5.2.1.1.1. Show the use of Insert, Design, Animation and Transition ribbons.</p> <p>B5.2.1.1.2. Show a 5-slide presentation on presentation software using Insert, Design, Animation and Transition ribbons studied</p>	<p>B6.2.1.1. Demonstrate the use of MS-PowerPoint.</p> <p>B6.2.1.1.1. Explain the use of Slide show, Review, View and Storyboarding ribbons.</p> <p>B6.2.1.1.2. Be able to give a 10-slide presentation on presentation software using Show, Review, View and Storyboarding ribbons studied.</p>

Strand 3: Word Processing		
Sub-strand I: Introduction to Word Processing		
B4	B5	B6
<p>B4.3.1.1. Illustrate the use of word processing</p> <p>B4.3.1.1.1. Demonstrate how to use the clip board, styles, fonts, paragraph and editing.</p> <p>B4.3.1.1.2. Illustrate the use clip board, styles, fonts, paragraph and editing.</p>	<p>B5.3.1.1. Illustrate the use of word processing</p> <p>B5.3.1.1.1. Demonstrate the use Insert, Design, and Layout</p> <p>B5.3.1.1.2. Illustrate the use Insert, Design and Layout.</p>	<p>B6.3.1. Illustrate the use of word processing</p> <p>B6.3.1.1.1. Demonstrate the use of References, Mailing, Review and View</p> <p>B6.3.1.1.2. Be able to use References, Mailing, Review and View.</p>

Strand 5: Programming and Databases		
Sub strand 1: Introduction to Databases, Algorithms and Programing		
B4	B5	B6
	<p>B5.5.1.1: Show a basic understanding and use of Databases, Algorithms and Programming.</p> <p>B5.5.1.1.1 Explore the types of databases software</p> <p>B5.5.1.1.2. Discuss the importance and use of database.</p> <p>B5.5.1.1.3. Describe the types of databases</p> <p>B5.5.1.1.4. Identify databases and data structures</p> <p>B5.5.1.1.5. Explain fundamental database concepts</p> <p>B5.5.1.1.6 Identify some programming applications and their use (e.g. vb.net, java, scratch etc.)</p>	<p>B6.5.1.1: Show a basic understanding and use of Databases, Algorithms and Programming.</p> <p>B6.5.1.1.1. Explain the basics of entity relationship (ER) model</p> <p>B6.5.1.1.2. Describe the basics of relational data model</p> <p>B6.5.1.1.3. Identify the basics of logical database design</p> <p>B6.5.1.1.4. Illustrate basics of relational algebra</p> <p>B6.5.1.1.5. Access and operate basics SQL: querying and manipulating data</p> <p>B6.5.1.1.6. Write algorithms for simple operations e.g. how to sum 2 and three numbers.</p>

Strand 5: Programming and Databases		
Sub strand 2: Introduction to Electronic Spreadsheets, (Tabs and Ribbons)		
B4	B5	B6
	<p>B5.5.2.1 Illustrate the use of Electronic Spreadsheet</p> <p>B5.5.2.1.1. Demonstrate the use of spreadsheet e.g. MS Excel etc.</p> <p>B5.5.2.1.2. Explore the interface of electronic spreadsheet</p> <p>B5.5.2.1.3. Discuss the importance and use of electronic spreadsheet</p> <p>B5.5.2.1.3. Access and launch MS-Excel on any computer or gadget.</p>	<p>B6.5.2.1 Illustrate the use of Electronic Spreadsheet</p> <p>B6.5.2.1.1. Demonstrate the use of some ribbons of an electronic spreadsheet. (i.e. clip board, styles, fonts, paragraph and editing).</p> <p>B6.5.2.1.2. Create basic worksheets in electronic spreadsheet.</p> <p>B6.5.2.1.3. Perform calculations in an electronic spreadsheet.</p> <p>B6.5.2.1.4. Modify a worksheet on electronic spreadsheet.</p> <p>B6.5.2.1.5. Modify the appearance of data within a worksheet of an electronic spreadsheet.</p> <p>B6.5.2.1.6. Manage electronic spreadsheet workbook.</p> <p>B6.5.2.1.7. Print the content of an electronic spreadsheet.</p>

Strand 6: Internet and Social media		
Sub strand 1: Network Overview		
B4	B5	B6
	<p>B5.6.1.1. Illustrate the use of internet</p> <p>B5.6.1.1.1. Explain what the Internet is.</p> <p>B5.6.1.1.2. Describe how the Internet works.</p> <p>B5.6.1.1.3. Explain who is in charge of the Internet.</p> <p>B5.6.1.1.4. Explain how the Internet developed.</p> <p>B5.6.1.1.5. Give examples of Internet communication.</p>	<p>B5.6.1.1. Illustrate the use of internet</p> <p>B6.6.1.1.1. Give examples of facilities the Internet offers.</p> <p>B6.6.1.1.2. Describe the types of information available on the Internet.</p> <p>B6.6.1.1.3. Identify data duplication.</p> <p>B6.6.1.1.4. Outline what one needs to connect to the Internet.</p> <p>B6.6.1.1.5. Give examples of Internet communication.</p>

Strand 6: Internet and Social media		
Sub strand 2: Web browsers and web pages		
B4	B5	B6
	<p>B5.6.2.1. Illustrate the use of Web Browsers</p> <p>B5.6.2.1.1. Identify web browsers</p> <p>B5.6.2.1.2. Display use of browsers</p> <p>B5.6.2.1.3. Recognize toolbar buttons and their uses.</p>	<p>B5.6.2.1. Illustrate the use of Web Browsers</p> <p>B6.6.2.1.1. Identify the address/links window</p> <p>B6.6.2.1.2. Recognize the status bar</p> <p>B6.6.2.1.3. Illustrate using help button</p> <p>B6.4.2.1.4. Recognize bowser speed keys</p>

Strand 6: Internet and Social media		
Sub strand 3: Web browsers and web Pages		
B4	B5	B6
	<p>B5.6.3.1 Illustrate the use of Web Browsers.</p> <p>B5.4.3.1. Recognize a page and what it is used for.</p> <p>B5.4.3.2. Identify home pages and what it is used for.</p> <p>B5.4.3.3. Use hyperlinks to link up with out other pages.</p> <p>B5.4.3.4. Illustrate the functions of the surfing buttons.</p> <p>B5.4.3.5. Illustrate the Use the stop button</p>	<p>B6.6.3.1. Illustrate the use of Web Browsers</p> <p>B6.6.3.1.1. Identify and name pages.</p> <p>B6.6.3.1.2. Identify and use the proxy server.</p> <p>B6.6.3.1.3. Illustrate use of the settings button.</p> <p>B6.6.3.1.4. Use the clear cache on the browser.</p>

Strand 6: Internet and Social media		
Sub strand 4: Surfing the World Wide Web		
B4	B5	B6
	<p>B5.6.4.1. Demonstrate and surf the World Wide Web</p> <p>B5.6.4.1.1. Recognize resource locators (URLs)</p> <p>B5.4.4.1.2. Illustrate how to jump directory to URLs</p> <p>B5.4.4.1.3. Demonstrate how to return to a URL</p> <p>B5.4.4.1.4. Show how to find items on a page</p>	<p>B6.6.4.1. Demonstrate and surf the World Wide Web</p> <p>B6.6.4.1.1 Demonstrate how to manage add-ins</p> <p>B6.6.4.1.2. Personalize your browser</p> <p>B6.6.4.1.3. Demonstrate how to update a browser.</p> <p>B6.6.4.1.4. Demonstrate how to install and use Extensions</p> <p>B6.6.4.1.5. Illustrate how to use Bookmarks</p>

Strand 6: Internet and Social media		
Sub-strand 5: Favourite places and search engine		
B4	B5	B6
	<p>B5.6.5.1. Illustrate the use of Favourite Places and the Search Engine</p> <p>B5.6.5.1.1. Show how to create a favourite link</p> <p>B5.6.5.1.2. Demonstrate deleting favourite links</p> <p>B5.6.5.1.3. Create favourite folder</p> <p>B5.6.5.1.4. Use the links toolbar</p>	<p>B6.6.5.1. Illustrate the use of Favourite Places and the Search Engine</p> <p>B6.5.5.1. Show how to create a favourite link.</p> <p>B6.5.5.2. Demonstrate deleting favourite links</p> <p>B6.5.5.3. Create favourite folder</p> <p>B6.5.5.4. Use the links toolbar</p>

Strand 6: Internet and Social media		
Sub-strand 6: Favourite places and search engines		
B4	B5	B6
	<p>B5.6.6.1. Illustrate the use of search engines on the Web</p> <p>B5.6.6.1.1. Use search engines</p> <p>B5.6.6.1.2. Show how smart search engines work.</p> <p>B5.6.6.1.3. Demonstrate how to handle search results</p>	<p>B6.6.6.1. Illustrate the use of searching for information on the Web</p> <p>B6.6.6.1. Show how to use quick reference to search syntax</p> <p>B6.6.6.2. Create detailed search</p> <p>B6.6.6.2.1. Use search engines and directories</p> <p>B6.6.6.2.2. Show use of advanced searching using field searches</p> <p>B6.6.6.1.3. Illustrate advanced queries</p> <p>B6.6.6.1.4. Create refining searches</p>

Strand 6: Internet and social media		
Sub-strand 7: Using online forms		
B4	B5	B6
	<p>B5.6.7.1. Illustrate the use of Forms in a web page</p> <p>B5.6.7.1.1. Identify and describe forms in a web page</p> <p>B5.6.7.1.2. Demonstrate working offline</p> <p>B5.6.7.1.3. Demonstrate downloading of files [e.g. pictures, audio, pdf etc.]</p> <p>B5.6.7.1.4. Identify interpreted languages used to design interactive forms</p> <p>B5.6.7.1.5. Investigate understanding of security on the Internet</p>	<p>B6.6.7.1. Illustrate the use of Forms in a web page</p> <p>B6.6.7.1. Demonstrate the types and use of form elements [check boxes, radio buttons, textboxes etc.]</p> <p>B6.6.7.2. Demonstrate the filing of forms offline</p> <p>B6.6.7.3. Demonstrate uploading of files [e.g. pictures, audio, pdf etc.]</p> <p>B6.6.7.4. Illustrate retrieving text, pictures, sounds and programs</p> <p>B6.6.7.5. Know more about security on the form submission (Antivirus, Credit card details, Personal passwords etc.)</p>

Strand 6: Internet and Social media		
Sub-strand 8: Customising your browser		
B4	B5	B6
	<p>B5.6.8.1. Demonstrate the customisation of a browser</p> <p>B5.6.8.1.1. Demonstrate how to set default search engines.</p> <p>B5.6.8.1.2. Show how to set homepages B5.4.8.3. Show how to make browser apps, add-ons, plug-ins, and extensions</p> <p>B5.6.8.1.3. Illustrate how to customise the browser toolbar</p> <p>B5.6.8.1.4. Identify cookies in web browsers</p> <p>B5.6.8.1.5. Illustrate how to set disk space/cache usage</p>	<p>B6.6.8.1. Demonstrate the customisation of a browser</p> <p>B6.6.8.1.1. Identify reasons for customising a web browser</p> <p>B6.6.8.1.2. Illustrate how to set themes.</p> <p>B6.6.8.1.3. Show how to customise the toolbar</p> <p>B6.6.8.1.4. Set bookmarks</p> <p>B6.6.8.1.5. Show how to set cookies</p> <p>B6.6.8.1.6. Set disk space/cache usage</p>

Strand 6: Internet and Social Media		
Sub-strand 9: Electronic Email		
B4	B5	B6
	<p>B5.6.9.1. Demonstrate the use of electronic mail</p> <p>B5.6.9.1.1. Use internet explorer and e-mail</p> <p>B5.6.9.1.2. Demonstrate use of internet e-mail addresses</p> <p>B5.6.9.1.3. Create free webmail account (Yahoo mail/Gmail account.)</p> <p>B5.6.9.1.4 Create messages</p> <p>B5.6.9.1.5. Illustrate viewing sent messages</p>	<p>B6.6.9.1. Demonstrate the use of electronic mail</p> <p>B6.6.9.1.1. Show how to receive e-mail messages</p> <p>B6.6.9.1.2. Illustrate how to reply to and forward received messages</p> <p>B6.6.9.1.3. Demonstrate how to delete messages</p> <p>B6.6.9.1.4. Illustrate filing of e-mail messages</p> <p>B6.6.9.1.5. Show how to sort e-mail messages</p> <p>B6.6.9.1.6. Recognise address lists</p> <p>B6.6.9.1.7. Demonstrate attaching files to e-mail messages</p> <p>B6.6.9.1.8. Show how to read an attached file</p> <p>B6.6.9.1.9. Demonstrate some e-mail tips</p>

Strand 6: Internet and Social Media		
Sub-strand 10: Internet of Things (IOT)		
B4	B5	B6
	<p>B5.6.10.1 Illustrate the use of Internet of Things (IOT)</p> <p>B5.6.10.1. Describe the purpose of Internet of Things</p> <p>B5.6.10.2. Give examples of Internet of Things with a consumer part and an industrial/business segment.</p> <p>B5.4.10.3. Identify components of Internet of Things [e.g. Hardware, Data, Software and Connectivity].</p> <p>B5.6.10.4. Identify the role of smart sensors in the Internet of Things [e.g. Sensing and data collection capability such as climatic change].</p>	<p>B6.6.10.1 Illustrate the use of Internet of Things (IOT)</p> <p>B6.6.10.1. Give history on Internet of Things</p> <p>B6.6.10.2. Give some applications of Internet of Things with a consumer part and an industrial/business segment, agriculture</p> <p>B6.6.10.3. Give the characteristics of Internet of Things. [Intelligent, Architecture, size and space consideration e.g. building knowledge on environmental degradation and proposing solutions.]</p> <p>B6.6.10.4. Identify merits and demerits Internet of Things, terms and acronyms.</p>

Strand 6: Internet and Social Media		
Sub-strand 11: Digital Literacy		
B4	B5	B6
	<p>B5.6.11.1 Illustrate the use Digital Literacy</p> <p>B5.6.11.1. Explain what is meant by being safe online.</p> <p>B5.6.11.2. Show how to stay safe when you visit a website.</p> <p>B5.6.11.3. Illustrate safe buying online.</p>	<p>B6.6.11.1 Illustrate the use Digital Literacy</p> <p>B6.4.11.1. Demonstrate how to handle private and personal information:</p> <p>B6.4.11.2. Show how to protect yourself from online identity theft.</p> <p>B6.4.11.3. Recognise spam.</p> <p>B6.4.11.4. Differentiate between internet friends and in-person friends.</p>

Strand 6: Internet and Social Media		
Sub-strand 12: Network Etiquette		
B4	B5	B6
	B5.6.12.1 Illustrate Network Etiquette B5.6.12.1.1. Illustrate how to keep some information from public when using the internet.	B6.6.12.1 Illustrate Network Etiquette B6.6.12.1.1. Explain cyberbullying and how to deal with it.

Strand 7: Health and Safety in using ICT Tools		
Sub-strand 13: Health and safety in using ICT tools		
B4	B5	B6
	B5.4.12.1: Health and Safety in using ICT Tools B5.4.12.1. Identify some major health hazards associated with specific ICT tools' use.	B5.4.12.1. Health and Safety in using ICT Tools B6.4.12.1. Identify some vision and hearing related problems because of prolonged ICT tools' use.

GLOSSARY

1. Abstraction: A simplified representation of something more complex.
2. Accessibility: The design of products, devices, services, or environments taking into consideration the ability for all users to access, including people who experience disabilities or those who are limited by older or slower technology.
3. Algorithm: A list of steps to finish a task.
4. Binary: A way of representing information using only two options.
5. Binary alphabet: The two options used in your binary code.
6. Bit: A contraction of "Binary Digit". A bit is the single unit of information in a computer, typically represented as a 0 or 1.
7. Block-based programming language: Any programming language that lets users create programs by manipulating "blocks" or graphical programming elements, rather than writing code using text. Examples include Code Studio, Scratch, Blockly, and Swift. (Sometimes called visual coding, drag and drop programming, or graphical programming blocks)
8. Blockly: The visual programming language used in Code.org's online learning system for K-5 students.
9. Bug: An error in a program that prevents the program from running as expected.
10. Byte: The most common fundamental unit of digital data e.g. Kilobyte, Megabyte, etc. A single byte is 8 bits-worth of data.
11. Call (a variable): Use a variable in a program.
12. Call (a function): This is the piece of code that you add to a program to indicate that the program should run the code inside a function at a certain time.
13. Click: Press the mouse button.
14. Code: The language that programmers create and use to tell a computer what to do.
15. Command: An instruction for the computer. Many commands put together make up algorithms and computer programs.
16. Computational thinking: Modifying a problem in such a way that it can be modelled or solved using a computer or machine. Strategies include: decomposition, pattern matching, abstraction, algorithms.
17. Computer science: Using the power of computers to solve problems.
18. Conditionals: Statements that only run under certain conditions.
19. Crowdsourcing: Getting help from a large group of people to finish something faster.
20. Cyberbullying: Doing something on the internet, usually again and again, to make another person feel angry, sad, or scared.
21. Data: Information. Often, quantities, characters, or symbols that are the inputs and outputs of computer programs.
22. Debugging: Finding and fixing problems in an algorithm or program.
23. Decompose: Break a problem down into smaller pieces.
24. Define (a function): Figure out the details of the problems that you are trying to solve.
25. Digital citizen: Someone who acts safely, responsibly, and respectfully online.
26. Digital footprint: The information about someone on the Internet.
27. DNS (domain name service): The service that translates URLs to IP addresses.

28. Double-click: Press the mouse button very quickly two times.
29. Drag: Click your mouse button and hold as you move the mouse pointer to a new location.
30. Drop: Release your mouse button to "let go" of an item that you are dragging.
31. DSL/cable: A method of sending information using telephone or television cables.
32. Event: An action that causes something to happen.
33. Event handler: A monitor for a specific event or action on a computer. When you write code for an event handler, it will be executed every time that event or action occurs. Many event-handlers respond to human actions such as mouse clicks.
34. F.A.I.L: First Attempt In Learning
35. Fiber optic cable: A connection that uses light to transmit information.
36. For loop: A loop with a predetermined beginning, end, and increment (step interval).
37. Frustrated: Feeling annoyed or angry because something is not the way you want it.
38. Function: A piece of code that you can easily call over and over again.
39. Function call: The piece of code that you add to a program to indicate that the program should run the code inside a function at a certain time.
40. Function definition: The code inside a function that instructs the program on what to do when the function is called.
41. If-statement: The common programming structure that implements "conditional statements".
42. Input: A way to give information to a computer.
43. Internet: A group of computers and servers that are connected to each other.
44. IP address: A number assigned to any item that is connected to the Internet.
45. Iteration: A repetitive action or command typically created with programming loops.
46. Loop: The action of doing something over and over again.
47. Online: Connected to the Internet.
48. Output: A way to get information out of a computer.
49. Packets: Small chunks of information that have been carefully formed from larger chunks of information.
50. Pattern matching: Finding similarities between things.
51. Parameter: An extra piece of information passed to a function to customize it for a specific need.
52. Persistence: Trying again and again, even when something is very hard.
53. Pixel: Short for "picture element", the fundamental unit of a digital image, typically a tiny square or dot that contains a single point of colour of a larger image.
54. Program: An algorithm that has been coded into something that can be run by a machine.
55. Programming: The art of creating a program.
56. Repeat: To do something again.
57. Run program: Cause the computer to execute the commands you've written in your program.
58. Search engine: A program that searches for and identifies items in a database that correspond to keywords or characters specified by the user, used especially for finding particular sites on the World Wide Web.
59. Servers: Computers that exist only to provide things to others.

60. Toolbox: The tall grey bar in the middle section of Code.org's online learning system that contains all of the commands you can use to write your program.
61. Trustworthy: Able to be relied on as honest or truthful.
62. Try: Attempt to do something
63. URL (universal resource locator): An easy-to-remember address for calling a web page (like www.google.com).
64. Username: A name you make up so that you can see or do things on a website, sometimes called a "screen name."
65. Variable: A placeholder for a piece of information that can change.
66. Website: A collection of interlinked web pages on the World Wide Web.
67. while loop: A loop that continues to repeat while a condition is true.
68. Wi-Fi: A wireless method of sending information using radio waves.
69. Workspace: The white area on the right side of Code.org's online learning system where you drag and drop commands to build your program.

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