

INFORMATION COMMUNICATIONS TECHNOLOGY

CURRICULUM FOR SECONDARY
EDUCATION (SHS 1 – 3)



NATIONAL COUNCIL FOR
CURRICULUM & ASSESSMENT
OF MINISTRY OF EDUCATION



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**NATIONAL COUNCIL FOR
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FOREWORD

Through the National Council for Curriculum and Assessment (NaCCA), Ghana's Ministry of Education has introduced a series of curriculum reforms to improve the quality and relevance of learning experiences in pre-tertiary schools in the country. These reforms will improve learning through the introduction of innovative pedagogies that encourage critical thinking and problem-solving. For a long time, our learners memorise facts and figures, which does not develop their analytical and practical skills. The Ministry recognises that learners need to be equipped with the right tools, knowledge, skills and competencies to deal with the fast-changing environment and the challenges facing their communities, the nation and the world.

These curriculum reforms were derived from the Education Strategic Plan (ESP 2018-2030), the National Pre-tertiary Education Curriculum Framework (NPTECF) and the National Pre-Tertiary Learning Assessment Framework (NPLAF), which were all approved by Cabinet in 2018. The new standards-based curriculum implemented in 2019 in basic schools, aims to equip learners to apply their knowledge innovatively to solve everyday problems. It also prioritises assessing learners' knowledge, skills, attitudes, and values, emphasising their achievements. The content of the basic school standards-based curriculum was therefore designed to promote a curriculum tailored to the diverse educational needs of the country's youth. It addresses the current curriculum's deficiencies in learning and assessment, especially in literacy and numeracy. These reforms have been carried out in phases. The curriculum for the basic school level – KG, Primary and Junior High School (JHS) – was developed and implemented from 2019 to 2021.

The curriculum for Senior High School (SHS), Senior High Technical School (SHTS) and Science, Technical, Engineering and Mathematics (STEM), which constitutes the next phase, is designed to ensure the continuation of learning experiences from JHS. It introduces flexible pathways for progression to facilitate the choice of subjects necessary for further study, the world of work and adult life. The new SHS, SHTS and STEM curriculum emphasises the acquisition of 21st Century skills and competencies, character development and instilling of national values. Social and Emotional Learning (SEL), Information Communications Technology, Gender Equality and Social Inclusion, have all been integrated into the curriculum. Assessment – formative and summative has been incorporated into the curriculum and aligned with the learning outcomes throughout the three-year programme.

The Ministry of Education's reform aims to ensure that graduates of our secondary schools can successfully compete in international high school competitions and, at the same time, be equipped with the necessary employable skills and work ethos to succeed in life. The Ministry of Education, therefore, sees the Senior High School (SHS) curriculum as occupying a critical place in the education system – providing improved educational opportunities and outcomes for further studies, the world of work and adult life – and is consequently prioritising its implementation.

ACKNOWLEDGEMENTS

This standards-based SHS curriculum was created using the National Pre-Tertiary Learning Assessment Framework (NPLAF), the Secondary Education Assessment Guide (SEAG), and the Teacher and Learner Resource Packs which include Professional Learning Community (PLC) Materials and Subject Manuals for teachers and learners. All the above-mentioned documents were developed by the National Council for Curriculum and Assessment (NaCCA). The Ministry of Education (MoE) provided oversight and strategic direction for the development of the curriculum with NaCCA receiving support from multiple agencies of the MoE and other relevant stakeholders. NaCCA would like to extend its sincere gratitude, on behalf of the MoE, to all its partners who participated in the professional conversations and discussions during the development of this SHS curriculum.

In particular, NaCCA would also like to extend its appreciation to the leadership of the Ghana Education Service (GES), the National School Inspectorate Authority (NaSIA), the National Teaching Council (NTC), the Commission for Technical and Vocational Education and Training (Commission for TVET), West African Examinations Council (WAEC) and other agencies of the MoE that supported the entire process. In addition, NaCCA acknowledges and values the contributions

made by personnel from various universities, colleges of education, industry players, Vice Chancellors Ghana, Vice Chancellors Technical Universities as well as educators and learners working within the Ghana education landscape.

Special appreciation is extended to consultants who contributed to development of the curriculum. The development process involved multiple engagements between national stakeholders and various groups with interests in the curriculum. These groups include the teacher unions, the Association of Ghana Industries, and heads of secondary schools.

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THE SHS CURRICULUM OVERVIEW

The vision for this curriculum is to ensure the nation has a secondary education system that enables all Ghanaian children to acquire the 21st Century skills, competencies, knowledge, values and attitudes required to be responsible citizens, ready for the world of work, further studies and adult life. The nation's core values drive the SHS curriculum, and it is intended to achieve Sustainable Development Goal 4: 'Inclusive, equitable quality education and life-long learning for all'. Above all, it is a curriculum enabling its graduates to contribute to the ongoing growth and development of the nation's economy and well-being.

The curriculum is inclusive, flexible, and robust. It was written under the auspices of the National Council for Curriculum and Assessment by a team of expert curriculum writers across Ghana. It reflects the needs of critical stakeholders, including industry, tertiary education, the West African Examination Council, SHS learners, teachers, and school leaders. It has been written based on the National Pre-Tertiary Learning and Assessment Framework and the Secondary Education Policy.

The key features of the curriculum include:

- flexible learning pathways at all levels, including for gifted and talented learners and those with deficiencies in numeracy and literacy, to ensure it can meet the needs of learners from diverse backgrounds and with different interests and abilities.
- the five core learning areas for secondary education: science and technology, language arts, humanities, technical and vocational and business; with emphasis placed on STEM and agriculture as integral to each subject.
- a structured, standards-based approach that supports the acquisition of knowledge, skills and competencies, and transition and seamless progress throughout secondary education, from JHS to SHS and through the three years of SHS.
- a focus on interactive approaches to teaching and assessment to ensure learning goes beyond recall enabling learners to acquire the ability to understand, apply, analyse and create.
- guidance on pedagogy, coupled with exemplars, demonstrating how to integrate cross-cutting themes such as 21st Century skills, core competencies,

the use of ICT, literacy and mathematics, Social Emotional Learning, Gender Equality and Social Inclusion as tools for learning and skills for life. Shared Ghanaian values are also embedded in the curriculum.

The curriculum writing process was rigorous and involved developing and using a Curriculum Writing Guide which provided systematic instructions for writers. The process was quality assured at three levels: through (a) evaluation by national experts, (b) trialling curriculum materials in schools and (c) through an external evaluation by a team of national and international experts. Evidence and insights from these activities helped hone the draft's final version. The outcome is a curriculum coherently aligned with national priorities, policies and the needs of stakeholders. A curriculum tailored to the Ghanaian context ensures that all learners benefit from their schooling and develop their full potential.

The following section highlights the details of the front matter of the draft curriculum. The vision, philosophy and goal of the curriculum are presented. This is followed by the details of the 21st Century skills and competencies, teaching and learning approaches, instructional design and assessment strategies. The template for the curriculum frame, which outlines the scope and sequence, the design that links the learning outcomes to particular 21st Century skills and competencies, as well as Gender Equality and Social Inclusion, Social and Emotional Learning and Ghanaian values are presented together with the structure of the lesson frame showing the links between the content standards, learning indicators with their corresponding pedagogical exemplars and assessment strategies.

INTRODUCTION

Effective implementation of this Senior High School (SHS) curriculum is the key to creating a well-educated and well-balanced workforce that is ready to contribute to Ghana's progress by harnessing the potential of the growing youth population, considering the demographic transition the country is currently experiencing (Educational Strategic Plan [ESP] 2018-2030). SHS curriculum aims to expand equitable, inclusive access to relevant education for all young people, including those in disadvantaged and underserved communities, those with special educational needs and those who are gifted and talented. Senior High School allows young people to develop further skills and competencies and progress in learning achievement, building from the foundation laid in Junior High School. This curriculum intends to meet the learning needs of all high school learners by acquiring 21st Century skills and competencies to prepare them for further studies, the world of work and adult life. Changing global economic, social and technological context requires life-long learning, unlearning, and continuous processes of reflection, anticipation and action.

Philosophy of Senior High School Curriculum

The philosophy underpinning the SHS curriculum is that every learner can develop their potential to the fullest if the right environment is created and skilled teachers effectively support them to benefit from the subjects offered at SHS. Every learner needs to be equipped with skills and competencies of interest to further their education, live a responsible adult life or proceed to the world of work.

Vision of Senior High School Curriculum

The vision of the curriculum is to prepare SHS graduates equipped with relevant skills and competencies to progress and succeed in further studies, the world of work and adult life. It aims to equip all learners with the 21st Century skills and competencies required to be responsible citizens and lifelong learners. When young people are prepared to become effective, engaging, and responsible citizens, they will contribute to the ongoing growth and development of the nation's economy and well-being.

Goal of Senior High School Curriculum

The goal of the curriculum is to achieve relevant and quality SHS through the integration of 21st Century skills and competencies as set out in the Secondary Education Policy. The key features to integrate into the curriculum are:

- Foundational Knowledge: literacy, numeracy, scientific literacy, information, communication and digital literacies, financial literacy and entrepreneurship, cultural identity, civic literacy and global citizenship
- Competencies: critical thinking and problem-solving, innovation and creativity, collaboration, and communication
- Character Qualities: discipline, integrity, self-directed learning, self-confidence, adaptability and resourcefulness, leadership, and responsible citizenship.

The JHS curriculum has been designed to ensure that learners are adequately equipped to transition seamlessly into SHS, where they will be equipped with the relevant knowledge, skills and competencies. The SHS curriculum emphasises character building, acquisition of 21st Century skills and competencies and nurturing core values within an environment of quality education to ensure the transition to further study, the world of work and adult life. This requires the delivery of robust secondary education that meets the varied learning needs of the youth in Ghana. The SHS curriculum, therefore, seeks to develop learners to become technology-inclined, scientifically literate, good problem-solvers who can think critically and creatively and are equipped to communicate with fluency, and possess the confidence and competence to participate fully in Ghanaian society as responsible local and global citizens – (referred to as 'Glocal citizens').

The SHS curriculum is driven by the nation's core values of truth, integrity, diversity, equity, discipline, self-directed learning, self-confidence, adaptability and resourcefulness, leadership, and responsible citizenship, and with the intent of achieving the Sustainable Development Goal 4: 'Inclusive, equitable quality education and life-long learning for all'. The following sections elaborate on the critical competencies required of every SHS learner:

Gender Equality and Social Inclusion (GESI)

- Appreciate their uniqueness about others.
- Pay attention to the uniqueness and unique needs of others.
- Value the perspective, experience, and opinion of others.
- Respect individuals of different beliefs, political views/ leanings, cultures, and religions.
- Embrace diversity and practise inclusion.
- Value and work in favour of a democratic and inclusive society.
- Be conscious of the existence of minority and disadvantaged groups in society and work to support them.
- Gain clarity about misconceptions/myths about gender, disability, ethnicity, age, religion, and all other excluded groups in society
- Interrogate and dispel their stereotypes and biases about gender and other disadvantaged and excluded groups in society.
- Appreciate the influence of socialisation in shaping social norms, roles, responsibilities, and mindsets.
- Identify injustice and advocate for change.
- Feel empowered to speak up for themselves and be a voice for other disadvantaged groups.

21st Century Skills and Competencies

In today's fast-changing world, high school graduates must be prepared for the 21st Century world of work. The study of Mathematics, Science, and Language Arts alone is no longer enough. High school graduates need a variety of skills and competencies to adapt to the global economy. Critical thinking, creativity, collaboration, communication, information literacy, media literacy, technology literacy, flexibility, leadership, initiative, productivity, and social skills are needed. These skills help learners to keep up with today's fast-paced job market. Employers want workers with more than academic knowledge. The 21st Century skills and competencies help graduates navigate the complex and changing workplace. Also, these help them become active citizens who improve their communities. Acquisition of 21st Century skills in high school requires a change in pedagogy from the approach that has been prevalent in Ghana in recent years. Teachers should discourage and abandon rote memorisation and passive learning. Instead, they should encourage active learning, collaboration, and problem-solving, project-

based, inquiry-based, and other learner-centred pedagogy should be used. As well as aligning with global best practices, these approaches also seek to reconnect formal education in Ghana with values-based indigenous education and discovery-based learning which existed in Ghana in pre-colonial times. This is aligned with the 'glocal' nature of this curriculum, connecting with Ghana's past to create confident citizens who can engage effectively in a global world. Digitalisation, automation, technological advances and the changing nature of work globally mean that young people need a new set of skills, knowledge and competencies to succeed in this dynamic and globalised labour market.

Critical Thinking and Problem-Solving Competency

- Ability to question norms, practices, and opinions, to reflect on one's values, perceptions, and actions.
- Ability to use reasoning skills to come to a logical conclusion.
- Being able to consider different perspectives and points of view
- Respecting evidence and reasoning
- Not being stuck in one position
- Ability to take a position in a discourse
- The overarching ability to apply different problem-solving frameworks to complex problems and develop viable, inclusive, and equitable solution options that integrate the above-mentioned competencies, promote sustainable development,

Creativity

- Ability to identify and solve complex problems through creative thinking.
- Ability to generate new ideas and innovative solutions to old problems.
- Ability to demonstrate originality and flexibility in approaching tasks and challenges.
- Collaborating with others to develop and refine creative ideas
- Ability to incorporate feedback and criticism into the creative process
- Utilising technology and other resources to enhance creativity
- Demonstrating a willingness to take risks and experiment with new approaches
- Adapting to changing circumstances and further information to maintain creativity

- Integrating multiple perspectives and disciplines to foster creativity
- Ability to communicate creative ideas effectively to a variety of audiences

Collaboration

- Abilities to learn from others; to understand and respect the needs, perspectives, and actions of others (empathy)
- Ability to understand, relate to and be sensitive to others (empathic leadership)
- Ability to deal with conflicts in a group
- Ability to facilitate collaborative and participatory problem-solving
- Ability to work with others to achieve a common goal.
- Ability to engage in effective communication, active listening, and the ability to compromise.
- Ability to work in groups on projects and assignments.

Communication

- Know the specific literacy and language of the subjects studied
- Use language for academic purposes
- Communicate effectively and meaningfully in a Ghanaian Language and English Language
- Communicate confidently, ethically, and effectively in different social contexts.
- Communicate confidently and effectively to different participants in different contexts
- Ability to communicate effectively verbally, non-verbally and through writing.
- Demonstrate requisite personal and social skills that are consistent with changes in society
- Ability to express ideas clearly and persuasively, listen actively, and respond appropriately
- Ability to develop digital communication skills such as email etiquette and online collaboration.
- Ability to engage in public speaking, debate, and written communication.

Learning for Life

- Understand subject content and apply it in different contexts
- Apply mathematical and scientific concepts in daily life

- Demonstrate mastery of skills in literacy, numeracy, and digital literacy.
- Develop an inquiry-based approach to continual learning.
- Be able to understand higher-order concepts and corresponding underlying principles.
- Participate in the creative use of the expressive arts and engage in aesthetic appreciation.
- Use and apply a variety of digital technologies
- Be digitally literate with a strong understanding of ICT and be confident in its application.
- Be equipped with the necessary qualifications to gain access to further and higher education and the world of work and adult life
- Ability to apply knowledge practically in the workplace so that they are able to utilise theory by translating it into practice.
- Develop their abilities, gifts and talents to be able to play a meaningful role in the development of the country
- Be able to think critically and creatively, anticipate consequences, recognise opportunities and be risk-takers
- Ability to pursue self-directed learning with the desire to chart a path to become effective lifelong learners.
- Independent thinkers and doers who show initiative and take action.
- Ability to innovate and think creatively, building on their knowledge base so that they take risks to achieve new goals
- Ability to think critically and solve problems so that they become positive change agents at work, in further study and in their personal lives.
- Be motivated to adapt to the changing needs of society through self-evaluation and ongoing training
- Be able to establish and maintain innovative enterprises both individually and in collaboration with others.
- Be able to ethically prioritise economic values to ensure stability and autonomy
- Show flexibility and preparedness to deal with job mobility
- Be committed towards the improvement of their quality of life and that of others
- Feel empowered in decision-making processes at various levels e.g., personal, group, class, school, etc.

- Be able to seek and respond to assistance, guidance and/or support when needed.
- Ability to make and adhere to commitments.
- Adopt a healthy and active lifestyle and appreciate how to use leisure time well.
- Be enthusiastic, with the knowledge, understanding and skill that enable them to progress to tertiary level, the world of work and adult life.
- Ability to transition from school to the world of work or further study by applying knowledge, skills and attitudes in new situations.
- Be independent, have academic and communication skills such as clarity of expression (written and spoken), and the ability to support their arguments.
- Be innovative and understand the 21st Century skills and competencies and apply them to everyday life.

Global and Local (Glocal) Citizenship

- Appreciate and respect the Ghanaian identity, culture, and heritage
- Be conscious of current global issues and relate well with people from different cultures
- Act in favour of the common good, social cohesion and social justice
- Have the requisite personal and social skills to handle changes in society
- Appreciate the impact of globalisation on the society.
- Ability to be an honest global citizen displaying leadership skills and moral fortitude with an understanding of the wider world and how to enhance Ghana's standing.

Systems Thinking Competency

- Ability to recognise and understand relationships
- Ability to analyse complex systems
- Ability to think of how systems are embedded within different domains and different scales
- Ability to deal with uncertainty

Normative Competency

- Ability to understand and reflect on the norms and values that underlie one's actions

- Ability to negotiate values, principles, goals, and targets, in a context of conflicts of interests and trade-offs, uncertain knowledge and contradictions

Anticipatory Competency

- Ability to understand and evaluate multiple futures – possible, probable, and desirable
- Ability to create one's vision for the future.
- Ability to apply the precautionary principle
- Ability to assess the consequences of actions
- Ability to deal with risks and changes

Strategic Competency

- Ability to collectively develop and implement innovative actions that further a cause at the local level and beyond.
- Ability to understand the bigger picture and the implications of smaller actions on them

Self-Awareness Competency

- The ability to reflect on one's role in the local community and (global) society
- Ability to continually evaluate and further motivate one's actions
- Ability to deal with one's feelings and desires

Social Emotional Learning (SEL): Five Core Competencies with Examples

I. Self-Awareness

Understanding one's emotions, thoughts, and values and how they influence one's behaviour in various situations. This includes the ability to recognise one's strengths and weaknesses with a sense of confidence and purpose. For instance:

- *Integrating personal and social identities;*
- *Identifying personal, cultural, and linguistic assets;*
- *Identifying one's emotions;*
- *Demonstrating honesty and integrity;*
- *Connecting feelings, values, and thoughts;*

- *Examining prejudices and biases;*
- *Experiencing self-efficacy;*
- *Having a growth mindset;*
- *Developing interests and a sense of purpose;*

2. Self-Management

The capacity to control one's emotions, thoughts, and actions in a variety of situations and to realise one's ambitions. This includes delaying obtaining one's desires, dealing with stress, and feeling motivated and accountable for achieving personal and group goals. For instance:

- *Managing one's emotions;*
- *Identifying and utilising stress-management strategies;*
- *Demonstrating self-discipline and self-motivation;*
- *Setting personal and group goals;*
- *Using planning and organisation skills;*
- *Having the courage to take the initiative;*
- *Demonstrating personal and collective agency;*

3. Social Awareness

The capacity to comprehend and care for others regardless of their backgrounds, cultures, and circumstances. This includes caring for others, understanding larger historical and social norms for behaviour in different contexts, and recognising family, school, and community resources and supports. For instance:

- *Recognising others' strengths*
- *Demonstrating empathy and compassion*
- *Caring about others' feelings*
- *Understanding and expressing gratitude*
- *Recognising situational demands and opportunities*
- *Understanding how organisations and systems influence behaviour*

4. Relationship Skills

The capacity to establish and maintain healthy, beneficial relationships and adapt to various social situations and groups. This includes speaking clearly, listening attentively, collaborating, solving problems and resolving conflicts as a group,

adapting to diverse social and cultural demands and opportunities, taking the initiative, and asking for or offering assistance when necessary. For instance:

- *Communicating effectively;*
- *Building positive relationships;*
- *Demonstrating cultural competence;*
- *Working as a team to solve problems;*
- *Constructively resolving conflicts;*
- *Withstanding negative social pressure;*
- *Taking the initiative in groups;*
- *Seeking or assisting when needed;*
- *Advocating for the rights of others.*

5. Responsible Decision-Making

The capacity to make thoughtful and constructive decisions regarding acting and interacting with others in various situations. This includes weighing the pros and cons of various personal, social, and group well-being actions. For example:

- *Demonstrating curiosity and an open mind;*
- *Solving personal and social problems;*
- *Learning to make reasonable decisions after analysing information, data, and facts;*
- *Anticipating and evaluating the effects of one's actions;*
- *Recognising that critical thinking skills are applicable both inside and outside of the classroom;*
- *Reflecting on one's role in promoting personal, family, and community well-being;*
- *Evaluating personal, interpersonal, community, and institutional impacts*

Learning and Teaching Approaches

Learning and teaching should develop learners as self-directed and lifelong learners. Learners must be helped to build up deep learning skills and competencies to develop the ability to acquire, integrate and apply knowledge and skills to solve authentic and real-life problems. Learners need to be exposed to a variety of learning experiences to enable them to collaborate with others, construct meaning, plan, manage, and make choices and decisions about their learning. This will allow them to internalise newly acquired knowledge and skills and help them

to take ownership of their education. The 21st Century skills and competencies describe the relevant global and contextualised skills that the SHS curriculum is designed to help learners acquire in addition to the 4Rs (Reading, wRiting, aRithmetic and cReativity). These skills and competencies, as tools for learning and teaching and skills for life, will allow learners to become critical thinkers, problem-solvers, creators, innovators, good communicators, collaborators, digitally literate, and culturally and globally sensitive citizens who are life-long learners with a keen interest in their personal development and contributing to national development.

Given the diverse needs of learners, teachers need to have a thorough grasp of the different pedagogies as they design and enact meaningful learning experiences to meet the needs of different learners in the classroom. The teaching-learning techniques and strategies should include practical activities, discussion, investigation, role play, problem-based, context-based, and project-based learning. Active learning strategies have become increasingly popular in education as they provide learners with meaningful opportunities to engage with the material. These strategies emphasise the use of creative and inclusive pedagogies and learner-centred approaches anchored on authentic and enquiry-based learning, collaborative and cooperative learning, differentiated teaching and learning, holistic learning, and cross-disciplinary learning. They include experiential learning, problem-based learning, project-based learning, and talk-for-learning approaches. Some of the pedagogical exemplars to guide learning and teaching of the SHS curriculum include:

- **Experiential Learning:** Experiential learning is a hands-on approach to learning that involves learners in real-world experiences. This approach focuses on the process of learning rather than the result. Learners are encouraged to reflect on their experiences and use them to develop new skills and knowledge. Experiential learning can take many forms, including internships, service learning, and field trips. One of the main benefits of experiential learning is that it allows learners to apply what they have learned in the classroom to real-world situations. This can help them develop a deeper understanding of the material and make connections between different concepts. Additionally, experiential learning can help learners develop important skills such as critical thinking, problem-solving and communication.
- **Problem-Based Learning:** Problem-based learning is an approach that involves learners in solving real-world problems. Learners are presented with

a problem or scenario and are asked to work together to find a solution. This approach encourages learners to take an active role in their learning and helps them develop important skills such as critical thinking and problem-solving. One of the main benefits of problem-based learning is that it encourages learners to take ownership of their learning. By working together to solve problems, learners can develop important skills such as collaboration and communication. Additionally, problem-based learning can help learners develop a deeper understanding of the material as they apply it to real-world situations.

- **Project-Based Learning:** Project-based learning is a hands-on approach to learning that involves learners in creating a project or product. This approach allows learners to take an active role in their learning and encourages them to develop important skills such as critical thinking, problem-solving, collaboration, and communication. One of the main benefits of project-based learning is that it allows learners to apply what they have learned in the classroom to real-world situations. Additionally, project-based learning can help learners develop important skills from each other and develop a deeper understanding of the material.
- **Talk for Learning Approaches:** Talk for learning approaches (TfL) are a range of techniques and strategies that are used to encourage learners to talk by involving them in discussions and debates about the material they are learning. This approach encourages learners to take an active role in their learning and helps them develop important skills such as critical thinking, collaboration and communication and also makes them develop confidence. One of the main benefits of TfL is that it encourages learners to think deeply about the material they are learning. By engaging in discussions and debates, learners can develop a deeper understanding of the material and make connections between different concepts.
- **Initiating Talk for Learning:** Initiating talk for learning requires the use of strategies that would encourage learners to talk in class. It helps learners to talk and participate meaningfully and actively in the teaching and learning process. Apart from developing skills such as communication and critical thinking, it also helps learners to develop confidence. Some strategies for initiating talk among learners are Activity Ball; Think-Pair-Share; Always, Sometimes, Never True; Matching and Ordering of Cards.
- **Building on What Others Say:** Building on what others say is an approach that involves learners in listening to and responding to their classmates'

ideas. This approach encourages learners to take an active role in their learning and helps them develop important skills such as critical thinking and communication. One of the main benefits of building on what others say is that it encourages learners to think deeply about the material they are learning. By listening to their classmates' ideas, learners can develop a deeper understanding of the material and make connections between different concepts. Additionally, building on what others say can help learners develop important skills such as collaboration and reflection. Some of the strategies to encourage learners to build on what others say are brainstorming, concept cartoons, pyramid discussion, and 5 Whys, amongst others.

- **Managing Talk for Learning:** Managing talk for learning requires the use of various strategies to effectively coordinate what learners say in class. Effective communication is a crucial aspect of learning in the classroom. Teachers must manage talk to ensure that learners are engaged, learning, and on-task in meaningful and purposeful ways. Some strategies for managing learners' contributions are debates, think-pair-share, sage in the circle etc.
- **Structuring Talk for Learning:** One effective way to shape learners' contributions is to structure classroom discussions. Structured discussions provide a framework for learners to engage in meaningful dialogue and develop critical thinking skills. Teachers can structure discussions by providing clear guidelines, such as speaking one at a time, listening actively, and building on each other's ideas. One popular structured discussion technique is the "think-pair-share" method. In this method, learners think about a question or prompt individually, and then pair up with a partner to discuss their ideas. Finally, the pairs share their ideas with the whole class. This method encourages all learners to participate and ensures that everyone has a chance to share their thoughts. Another effective way to structure talk for learning is to use open-ended questions. Open-ended questions encourage learners to think deeply and critically about a topic. They also promote discussion and collaboration among learners. Teachers can use open-ended questions to guide classroom discussions and encourage learners to share their ideas and perspectives. Other strategies that can be used are Concept/Mind Mapping, "Know," "Want to Know," "Learned" (KWL); Participatory Feedback; and the 5 Whys.
- **Diamond Nine:** The Diamond Nine activity is a useful tool for managing talk for learning in the classroom. This activity involves ranking items or ideas in order of importance or relevance. Learners work in groups to arrange cards

or sticky notes with different ideas or concepts into a diamond shape, with the most important idea at the top and the least important at the bottom. The Diamond Nine activity encourages learners to think critically about a topic and prioritise their ideas. It also promotes collaboration and discussion among group members. Teachers can use this activity to introduce a new topic, review material, or assess student understanding.

- **Group Work/Collaborative Learning:** Group work or collaborative learning are effective strategies for managing talk for learning in the classroom. These strategies encourage learners to work together to solve problems, share ideas, and learn from each other. Group work and collaborative learning also promote communication and collaborative skills that are essential for success in the workplace and in life. To implement group work effectively, teachers must provide clear guidelines and expectations for group members. They should also monitor group work to ensure that all learners are participating and on-task. Teachers can also use group work as an opportunity to assess individual student understanding and participation.
- **Inquiry-Based Learning:** Learners explore and discover new information by asking questions and investigating.
- **Problem-Based Learning:** Learners are given real-world problems to solve and must use critical thinking and problem-solving skills.
- **Project-Based Learning:** Learners work on long-term projects that relate to real-world scenarios.
- **Flipped Classroom:** Learners watch lectures or instructional videos at home and complete assignments and activities in class.
- **Mastery-Based Learning:** Learners learn at their own pace and only move on to new material once they have mastered the current material.
- **Gamification:** Learning is turned into a game-like experience with points, rewards, and competition.

These strategies provide learners with opportunities to engage with the material in meaningful ways and develop important skills such as critical thinking, problem-solving, collaboration, and communication. By incorporating these strategies into their teaching, teachers can help learners develop a deeper understanding of the material and prepare them for success in the real world. Effective communication is essential for learning in the classroom. Teachers must manage talk to ensure that learners are engaged in learning and on-task. Strategies such as structuring

talk for learning, using Diamond Nine activities, and implementing group work/ collaborative learning can help teachers manage talk effectively and promote student learning and engagement. By implementing these strategies, teachers can create a positive and productive learning environment where all learners can succeed.

Universal Design for Learning (UDL) in the SHS Curriculum

The design of the curriculum uses UDL to ensure the creation of flexible learning environments that can accommodate a wide range of learner abilities, needs, and preferences. The curriculum is designed to provide multiple means of engagement, representation, and action and expression, so teachers can create a more inclusive and effective learning experience for all learners. UDL is beneficial for all learners, but it is particularly beneficial for learners needing special support and learners who may struggle with traditional teaching approaches. The integration of UDL in the pedagogy is aimed at making learning accessible to everyone and helping all learners reach their full potential. For instance, teachers need to:

- incorporate multiple means of representation into their pedagogy, such as using different types of media and materials to present information.
- provide learners with multiple means of action and expression, such as giving them options for how they can demonstrate their learning.
- consider incorporating multiple means of engagement into their choice of pedagogy, such as incorporating games or interactive activities to make learning more fun and engaging.

By doing these, teachers can help ensure that the curriculum is accessible and effective for all learners, regardless of their individual needs and abilities.

Curriculum and Assessment Design: Revised Bloom's Taxonomy and Webb's Depth of Knowledge

The design of this curriculum uses the revised Bloom's Taxonomy and Webb's Depth of Knowledge (DoK) as frameworks to design what to teach and assess.

The Revised Bloom's Taxonomy provides a framework for designing effective learning experiences. Understanding the different levels of learning, informed the creation of activities and assessments that challenge learners at the appropriate level and help them progress to higher levels of thinking. Additionally, the framework emphasises the importance of higher-order thinking skills, such

as analysis, evaluation, and creation, which are essential for success in today's complex and rapidly changing world. This framework is a valuable tool for educators who want to design effective learning experiences that challenge students at the appropriate level and help them develop higher-order thinking skills. By understanding the six levels of learning and incorporating them into their teaching, educators can help prepare students for success in the 21st century. The six hierarchical levels of the revised Bloom's Taxonomy are:

1. **Remember** – At the foundation is learners' ability to remember. That is retrieving knowledge from long-term memory. This level requires learners to recall concepts—identify, recall, and retrieve information. Remembering is comprised of identifying, listing, and describing. Retrieving relevant knowledge from long-term memory includes, recognising, and recalling is critical for this level.
2. **Understand** – At understanding, learners are required to construct meaning that can be shown through clarification, paraphrasing, representing, comparing, contrasting and the ability to predict. This level requires interpretation, demonstration, and classification. Learners explain and interpret concepts at this level.
3. **Apply** – This level requires learners' ability to carry out procedures at the right time in a given situation. This level requires the application of knowledge to novel situations as well as executing, implementing, and solving problems. To apply, learners must solve multi-step problems.
4. **Analyse** – The ability to break things down into their parts and determine relationships between those parts and being able to tell the difference between what is relevant and irrelevant. At this level, information is deconstructed, and its relationships are understood. Comparing and contrasting information and organising it is key. Breaking material into its constituent parts and detecting how the parts relate to one another and an overall structure or purpose is required. The analysis also includes differentiating, organising and attributing.
5. **Evaluate** – The ability to make judgments based on criteria. To check whether there are fallacies and inconsistencies. This level involves information evaluation, critique, examination, and formulation of hypotheses.
6. **Create** – The ability to design a project or an experiment. To create, entails learners bringing something new. This level requires generating information—planning, designing, and constructing.

Webb's Depth of Knowledge (DoK) is a framework that helps educators and learners understand the level of cognitive engagement required for different types of learning tasks. The framework includes four levels. By understanding the four DoK levels, educators can design learning activities that challenge students to engage in deeper thinking and problem-solving. DoK is an essential tool for designing effective instruction and assessments. By understanding the different levels of DoK, teachers can design instruction and assessments that align with what they intend to achieve. DoK is a useful tool for differentiating instruction and providing appropriate challenges for all learners. Teachers can use DOK to identify students who need additional support or those who are ready for more advanced tasks. The four levels of Webb's' DoK assessment framework are:

- **Level 1: Recall and Reproduction** – Assessment at this level is on recall of facts, concepts, information, and procedures—this involves basic knowledge acquisition. Learners are asked specific questions to launch activities, exercises, and assessments. The assessment is focused on recollection and reproduction.
- **Level 2: Skills of Conceptual Understanding** – Assessment at this level goes beyond simple recall to include making connections between pieces of information. The learner's application of skills and concepts is assessed. The assessment task is focused more on the use of information to solve multi-step problems. A learner is required to make decisions about how to apply facts and details provided to them.
- **Level 3: Strategic Reasoning** – At this level, the learner's strategic thinking and reasoning which is abstract and complex is assessed. The assessment task requires learners to analyse and evaluate composite real-world problems with predictable outcomes. A learner must apply logic, employ problem-solving strategies, and use skills from multiple subject areas to generate solutions. Multitasking is expected of learners at this level.
- **Level 4: Extended Critical Thinking and Reasoning** – At this level of assessment, the learner's extended thinking to solve complex and authentic problems with unpredictable outcomes is the goal. The learner must be able to strategically analyse, investigate, and reflect while working to solve a problem, or changing their approach to accommodate new information. The assessment requires sophisticated and creative thinking. As part of this assessment, the learner must know how to evaluate their progress and determine whether they are on track to a feasible solution for themselves.

The main distinction between these two conceptual frameworks is what is measured. The revised Bloom's Taxonomy assesses the cognitive level that learners must demonstrate as evidence that a learning experience occurred. The DoK, on the other hand, is focused on the context—the scenario, setting, or situation—in which learners should express their learning. In this curriculum, the revised Bloom's taxonomy guided the design, and the DoK is used to guide the assessment of learning. The taxonomy provides the instructional framework, and the DoK analyses the assignment specifics. It is important to note that Bloom's Taxonomy requires learners to master the lower levels before progressing to the next. So, suppose the goal is to apply a mathematical formula. In that case, they must first be able to identify that formula and its primary purpose (remember and understand). The cognitive rigour is therefore presented in incremental steps to demonstrate the learning progression. When measuring assessments in DoK, learners move fluidly through all levels. In the same example, while solving a problem with a formula, learners recall the formula (DoK 1) to solve the problem (DoK 2 and DoK 3). Depending on the difficulty of the problem to be solved, the learner may progress to DoK 4.

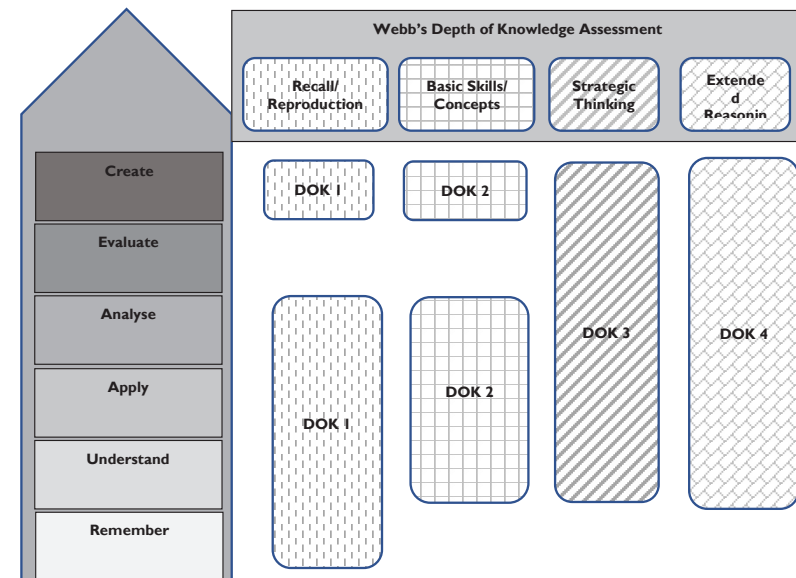


Figure 1: Revised Bloom Taxonomy combined with Webb's Depth of Knowledge for Teaching and Assessment

The structure of teaching and the assessment should align with the six levels of Bloom’s knowledge hierarchy and DoK shown in Figure 1. Each level of DoK

should be used to assess specific domains of Bloom’s Taxonomy as illustrated in the table below:

Depth of Knowledge (DoK) Assessment	Bloom’s Taxonomy applied to DoK
• Level 1: Recall and Reproduction	• Remembering, Understanding, Application, Analysis and Creation
• Level 2: Basic Skills and Concepts	• Understanding, Application, Analysis and Creation
• Level 3: Strategic Thinking	• Understanding, Application, Analysis, Evaluation and Creation
• Level 4: Extended Reasoning	• Understanding, Application, Analysis, Evaluation and Creation

In line with the National Pre-Tertiary Learning and Assessment Framework, the Secondary Education Assessment Guide (SEAG) requires that classroom assessments should cover **Assessment as learning (AaL), Assessment of learning (AoL) and Assessment for learning (AfL)**. Therefore, teachers should align the Revised Bloom’s Taxonomy with the DoK framework of assessment. Formative assessments should include classroom discussions, project-based assignments, and self-reflection exercises, while summative assessments should include standardised tests and rubric-based evaluations of learners’ work. It is important to seek feedback from learners themselves, as they may have unique insights into how well they are developing these skills in the classroom.

To assess 21st Century skills and competencies in the classroom, teachers will have to use a combination of both formative and summative assessments to evaluate learners’ acquisition of these skills and competencies. For instance:

- Identify the specific 21st Century skills and competencies to be assessed. For instance, you might want to assess *critical thinking, problem-solving, or creativity*.
- Align the skills and competencies with the DoK levels. For example, lower DoK levels might be more appropriate for assessing basic knowledge and

comprehension, whereas higher DoK levels might be more appropriate for assessing more complex skills such as *analysis, synthesis, and evaluation*.

- Develop assessment items that align with the DoK levels and the skills and competencies you want to assess. These items should be designed to elicit evidence of learning across the different levels of the DoK framework.
- Administer the assessment and collect data. Analyse the data to gain insights into student learning and identify areas where learners may need additional support or instruction.

The DoK framework is a powerful tool for assessing the acquisition of 21st Century skills and competencies in the classroom, helping teachers to better understand how learners are learning and identify areas for improvement.

Educational success is no longer about producing content knowledge, but rather about extrapolating from what we know and applying the knowledge creatively in new situations.

The overall assessment of learning at SHS should be aligned with the National Pre-Tertiary Learning and Assessment Framework and the Secondary Education Assessment Guide. Formative and summative assessment strategies must be used.

Definition of Key Terms and Concepts in the Curriculum

- **Learning Outcomes:** It is a statement that defines the knowledge, skills, and abilities that learners should possess and be able to demonstrate after completing a learning experience. They are specific, measurable, attainable, and aligned with the content standards of the curriculum. It helps the teachers to determine what to teach, how to teach, and how to assess learning. Also, it communicates expectations to learners and helps them to better master the subject.
- **Learning Indicators:** They are measures that allow teachers to observe progress in the development of capacities and skills. They provide a simple and reliable means to evaluate the quality and efficacy of teaching practices, content delivery, and attainment of learning outcomes.
- **Content Standards:** It is a statement that defines the knowledge, skills, and understanding that learners are expected to learn in a particular subject area or grade level. They provide a clear target for learners and teachers and help focus resources on learner achievement.
- **Pedagogical Exemplars:** They are teaching examples used to convey values and standards to learners. Pedagogical Exemplars are usually demonstrated through teacher behaviour.
- **Assessment:** It is the systematic collection and analysis of data about learners' learning to improve the learning process or make a judgement on learner achievement levels. Assessment is aimed at developing a deep understanding of what learners know, understand, and can do with their knowledge because of their educational experiences. Assessment involves the use of empirical data on learners' learning to improve learning. Assessment is an essential aspect of the teaching and learning process in education, which enables teachers to assess the effectiveness of their teaching by linking learner performance to specific learning outcomes.
- **Teaching and Learning Resources:** Teaching and learning resources are essential tools for teachers to provide high-quality education to their learners. These resources can take various forms, including textbooks, audiovisual materials, online resources, and educational software. It is also important to avoid stereotypes and use inclusive language in teaching and learning resources. This means avoiding language that reinforces negative stereotypes and using language that is respectful and inclusive of all individuals regardless of their background. Using a consistent tone, style, and design is very important.

PHILOSOPHY, VISION AND GOAL OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Philosophy

The next generation of ethical digital literates can be empowered through observation, curiosity, and exposure to related computing concepts and tools that leverage practical activities in a learner-centred environment leading to global and local relevance.

Vision

To prepare learners with 21st Century Skills and Competencies to ethically use and apply computing systems to solve real-world problems for economic development.

Goal

The goal of the computing curriculum is to provide learners with the knowledge, skills and tools that will allow them to apply and use computing tools in a creative way to meet the needs of individuals, society, and the economy.

Contextual Issues

The integration of Information and Communication Technology (ICT) into teaching and learning is very low in many Ghanaian schools in all sorts of ways, from televisions and projectors to computer laboratories and learners' laptops. Due to that Ghanaian schools can be classified as low technology-rich learning environments, particularly in the public schools.

The SHS Information and Communications Technology Curriculum would prepare learners with technology integration strategies in the learning space, as well as the world of work with learner-centred approaches, using the appropriate technological resources to cater for all learners. In particular, learners must be motivated about computing and technology as it has become an integral part of many careers today and in the future. These learners would make use of ICT skills to contribute effectively to the economic, scientific, and social development of Ghana and the world at large in an ethical manner.

The areas in the ICT curriculum relate to computing infrastructure, competence development, digital literacy resources, and computational thinking. The ICT curriculum will achieve the following:

- Access to high-quality ICT infrastructure and services.
- The use of ICT as an integrated tool for innovation and quality development in SHS education in Ghana.

Rationale

Today's world is changing. Jobs that are available today did not exist some years ago. Through teaching ICT, we equip our learners to participate in a rapidly changing world where work and leisure activities are increasingly transformed by existing technology and will continue to be transformed by technologies yet to be developed. We enable learners to find, explore, analyse, exchange and present information. We also focus on developing the skills necessary for learners to be able to use information in a responsible, discriminating, and effective way. ICT skills are a major factor in enabling learners to be confident, creative, and independent learners.

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SCOPE AND SEQUENCE

Information and Communications Technology Summary

S/N	STRAND	SUB-STRAND	YEAR 1			YEAR 2			YEAR 3		
			CS	LO	LI	CS	LO	LI	CS	LO	LI
1.	ICTs In the Society	Organising, Managing and Presenting Information Using Essential Productivity Tools	1	1	5	1	1	5	1	1	4
		Emerging Technologies and Applications	1	1	3	1	1	2	1	1	2
		Connecting And Communicating Online	1	1	2	1	1	2	1	1	2
2.	Network Systems for Transmitting Information	Guided And Unguided Network Systems	1	1	2	1	1	2	1	1	1
		Data And Information Security	1	1	3	1	1	2	1	1	2
Total			5	5	15	5	5	13	5	5	11

Overall Totals (SHS 1 – 3)

Content Standards	15
Learning Outcomes	15
Learning Indicators	39

YEAR ONE

Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **I. ICTs IN THE SOCIETY**
Sub-Strand **I. ORGANISING, MANAGING AND PRESENTING INFORMATION USING ESSENTIAL PRODUCTIVITY TOOLS**

Learning Outcomes	21 st Century Skills and Competencies	GESI ¹ , SEL ² and Shared National Values
<p>I.I.I.LO.1</p> <p>Create multimedia documents using appropriate computing tools</p>	<p>Collaboration: Learners will work in mixed-ability/gender-sensitive groups (the teacher identifies abilities and organises their seating), share their ideas with peers and accept constructive feedback.</p> <p>Communication:</p> <ul style="list-style-type: none"> • All learners will be allowed to provide oral and/or written descriptions of the steps involved in creating a Word document. • All learners will create a teaching Timetable for discussions. <p>Creativity: Learners will be allowed to introduce their ideas in designing the documents leading to innovation and creativity.</p> <p>Personal development: Through individual work based on interest and ability (this requires the identification of learners' interests/abilities and supporting their learning that is linked to what interests them).</p>	<p>GESI: Providing the opportunity for diverse learners to actively participate in all lessons inclusively and using GESI responsive language as pedagogy ensures;</p> <ul style="list-style-type: none"> • Awareness of personal biases and stereotypes around using appropriate multimedia tools • Respect and tolerance for individual uniqueness and peculiarities • Sensitivity to the interrelatedness with regards to integrating appropriate multimedia documents. <p>SEL: Encourage the processes through which all learners acquire and apply knowledge, skills, and attitudes to:</p> <ul style="list-style-type: none"> • Manage emotions • Achieve personal and collective goals • Feel and show empathy for others

¹ Gender Equality and Social Inclusion

² Socio-Emotional Learning

	<p>Critical thinking and problem solving: Through the application of the concept of word processing, giving equal opportunities to both males and females.</p>	<ul style="list-style-type: none"> • Establish and maintain supportive relationships • Have confidence in using apps • Make responsible and caring decisions <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity in presentations, and learners writing on the sequence of their activities.</p> <p>National core values: patriotism, faithfulness, honesty, loyalty, discipline, respect, humility, assertiveness, and good citizenship.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI	Assessment
<p>I.I.I.CS.I</p> <p>Demonstrate knowledge and understanding of the use of various computing tools to responsibly create multimedia documents containing text, images etc. e.g., birthday cards/Flyers for a specified purpose</p>	<p>I.I.I.LI.I</p> <p>Describe software, hardware, and other computing features needed to create a document.</p> <p>Brainstorm and discuss: Using mixed-ability/gender-sensitive groups, discuss computer hardware and software components required for creating multimedia documents, addressing inclusivity and equity. For example, input devices that meet learners with different abilities should be chosen, thus people with visual impairment, dyslexia, dysgraphia.</p> <p>SEL: When teaching students about creating multimedia documents using computer tools, you can incorporate Social Emotional Learning (SEL) principles to enhance their learning experience and support their emotional well-being. Here are some SEL features you can integrate into this specific topic:</p> <p>Self-awareness:</p> <ol style="list-style-type: none"> 1. Provide opportunities for self-assessment of their skills and progress in using computer tools for multimedia projects. 2. Help students identify their emotions and reactions during the creative process, guiding them to recognise their preferences and areas for improvement. <p>Self-management:</p> <ol style="list-style-type: none"> 1. Teach time management skills and strategies for planning and organising multimedia projects. 2. Guide students in setting realistic goals for their multimedia documents and teach them how to break larger tasks into smaller manageable steps. <p>Social awareness:</p> <ol style="list-style-type: none"> 1. Encourage students to consider the audience and purpose of their multimedia 	<p>I.I.I.AS.I</p> <p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>

	<p>documents, promoting an understanding of the impact and potential reactions from others.</p> <ol style="list-style-type: none"> Discuss the importance of respecting intellectual property rights when using multimedia content from various sources. Foster empathy by exploring how different design choices and multimedia elements can influence viewers' emotions and perspectives. <p>Relationship skills:</p> <ol style="list-style-type: none"> Encourage collaborative learning by assigning group projects where students can work together to create multimedia documents. Teach effective communication skills, such as active listening, giving and receiving constructive feedback, and providing clear instructions to team members. <p>Responsible decision-making:</p> <ol style="list-style-type: none"> Discuss ethical considerations when selecting and incorporating multimedia elements, emphasising the importance of respecting copyrights, permissions, and fair use. Encourage critical thinking and reflection on the potential impact of their multimedia documents, both on themselves and their intended audience. 	
	I.I.I.LI.2	I.I.I.AS.2
	<p>Create, Edit and Format text and paragraphs (Cut, Copy, Bold, Italic, Tables, Find and Replace, Format Painter, Spelling & Grammar check, Styles) using desktop/online computing tools (word processing software e.g., MS Word, Google Docs) keyboard, mouse etc.</p> <p>Discuss the reasons for creating, editing and formatting a document.</p> <p>Project- and Problem-Based Learning and Practical sessions: Engage in project-based learning and practical sessions to create, edit, and format educational artefacts using word processing software (e.g., MS Word, Google Docs), using features such as cut, copy, bold, italic, tables, find and replace, format</p>	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>

	painter, spelling and grammar check, and styles. Ensure inclusivity and equity in using ICT tools.	
	I.I.I.LI.3	I.I.I.AS.3
	<p>Enhance lists by sorting, renumbering, and customising list styles using desktop/online computing tools (word processing software e.g., MS Word, Google Docs) keyboard, mouse etc.</p> <p>Participate in discussions and practical sessions to explore and apply formatting tools (e.g., bullets, numbering, sorting, alignment) in word processing to enhance lists. Address inclusivity and equity in ICT usage.</p>	<p>Level 1 Recall</p> <p>Level 2 Skills of conceptual understanding</p> <p>Level 3 Strategic reasoning</p> <p>Level 4 Extended critical thinking and reasoning</p>
	I.I.I.LI.4	I.I.I.AS.4
	<p>Format the overall appearance of a page through colours, watermarks, headers and footers, page layout, paragraph and line, change capitalisation, bordering and shading, perform bullets and numbering, do page column, tables, graphics) using desktop/online computing tools (word processing software e.g., MS Word, Google Docs) keyboard, mouse etc.</p> <p>Discuss, present, and demonstrate the use of various formatting features (e.g., colours, watermarks, headers and footers, page layout, paragraph and line formatting, capitalisation, borders and shading, bullets and numbering, page columns, tables, graphics) in word processing software to format the overall appearance of a page.</p>	<p>Level 1 Recall</p> <p>Level 2 Skills of conceptual understanding</p> <p>Level 3 Strategic reasoning</p> <p>Level 4 Extended critical thinking and reasoning</p>
	I.I.I.LI.5	I.I.I.AS.5
	<p>Save and print documents (Save, Save As, Print)</p> <p>Use laptops or PCs to demonstrate and practice saving and printing documents, showcasing the steps involved.</p>	<p>Level 1 Recall</p> <p>Level 2 Skills of conceptual understanding</p> <p>Level 3 Strategic reasoning</p> <p>Level 4 Extended critical thinking and reasoning</p>

Teaching and Learning Materials	<ul style="list-style-type: none"> • Notepad or exercise book • Pen • Smartphones • Laptops 	<ul style="list-style-type: none"> • Desktop computers • Tablets • TV and Radio 	<ul style="list-style-type: none"> • Productivity tools • Open Educational Resources (Including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) • The iBox (CENDLOS) 	<ul style="list-style-type: none"> • Subject-based application software • Instructional Laboratories (with multimedia equipment and smartboards) • Maintenance and repair workshops
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Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **1. ICTs IN THE SOCIETY**
Sub-Strand **2. EMERGING TECHNOLOGIES AND APPLICATIONS**

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>I.1.2.LO.1</p> <p>Explain and apply digital and social media platforms</p>	<p>Collaboration: Learners will work in mixed-ability/gender-sensitive groups (teachers should identify abilities and organise their seating), share their ideas with peers and accept constructive feedback.</p> <p>Communication: All learners will be allowed to provide oral and/or written descriptions of the steps involved in applying digital and social media platforms for everyday life.</p> <p>Creativity: Learners will be allowed to introduce their ideas in designing the documents leading to innovation and creativity.</p> <p>Personal development: Through individual work based on interest and ability (this requires the identification of learners’ interests/abilities and supporting their learning that is linked to what interests them).</p>	<p>GESI: Encouraging all learners in class irrespective of the diversity in gender, ability and background, and supporting each of them to share their views ensures;</p> <ul style="list-style-type: none"> • respect for individuals of varying beliefs, religions, backgrounds and culture • knowledge of themselves and others’ peculiarities and stereotypes • embrace diversity and respect for all • uphold the basic tenets of information security, which are confidentiality, integrity and availability. • avoid cyberbullying <p>SEL: Enhancing the practice through which all learners acquire and apply knowledge, skills, and attitudes;</p> <ul style="list-style-type: none"> • Reflect on their personal experiences and interactions with the internet • Develop strategies for managing

		<p>their time effectively when using the internet</p> <ul style="list-style-type: none"> • Manage emotions • Make responsible and caring decisions • Establish and maintain a supportive relationship <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, commitment and hard work</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI	Assessment
I.1.2.CSI	I.1.2.LI.1	I.1.2.AS.1
Demonstrate knowledge and understanding of Emerging Technologies	<p>Explain digital devices and their importance</p> <p>Project-Based Learning: Engage in individual and mixed-ability/gender-sensitive group work to brainstorm and explain the importance of digital devices (e.g., desktop computers, laptop computers, mobile phones, tablet computers, e-readers, storage devices, input devices, and output devices). Avoid stereotypes.</p> <p>SEL: When teaching students about the Emerging Technologies, usage, and function of Internet Service Providers (ISPs), you can integrate Social Emotional Learning (SEL) principles to create an engaging and supportive learning experience. Here are some SEL features you can incorporate into this specific topic:</p> <p>Self-awareness:</p> <ol style="list-style-type: none"> 1. Encourage students to reflect on their personal experiences and interactions with the internet. 2. Help students become aware of their emotions and attitudes towards the internet, considering both the benefits and potential risks. <p>Self-management:</p> <ol style="list-style-type: none"> 1. Teach students about responsible internet use, including online safety practices and digital citizenship. 2. Help students develop strategies for managing their time effectively when using the internet for various purposes. <p>Social awareness:</p> <ol style="list-style-type: none"> 1. Explore the impact of the internet on society, including its influence on communication, information access, and global connectivity. 2. Encourage discussions on digital divide issues and the importance of ensuring equitable access to the internet. 	<p>Level 1 Recall</p> <p>Level 2 Skills of conceptual understanding</p> <p>Level 3 Strategic reasoning</p> <p>Level 4 Extended critical thinking and reasoning</p>

	<p>Relationship skills:</p> <ol style="list-style-type: none"> 1. Promote collaborative learning by assigning group projects or activities that involve researching and presenting the different aspects of internet evolution and usage. 2. Encourage students to engage in discussions about responsible digital behaviour, including handling cyberbullying and fostering positive online relationships. <p>Responsible decision-making:</p> <ol style="list-style-type: none"> 1. Discuss the ethical considerations related to internet usage, such as privacy, security, and responsible sharing of digital content. 2. Help students evaluate the reliability and credibility of online sources and make informed decisions about the information they consume and share. 3. Explore the role of ISPs in ensuring reliable internet connectivity and discuss the responsibility of ISPs in promoting fair access and maintaining net neutrality. 	
	1.1.2.LI.2	1.1.2.AS.2
	<p>Differentiate between desktops, laptops, smart gadgets (tablets), and servers.</p> <p>Use videos or pictures to differentiate between desktops, laptops, smart gadgets (tablets), and servers. Encourage learners to organise their thoughts by creating a table or comparison chart.</p>	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
	1.1.2.LI.3	1.1.2.AS.3
	<p>Explore the purpose and uses of smartphones, digital cameras, wearable devices, game devices, e-book readers, portable and digital media players</p> <p>Project- and Problem-Based Learning and Practical Sessions: Engage in project-based and problem-based learning sessions (individual and group work) to explore the purpose and uses of smartphones, digital cameras, wearable devices, game devices, e-book readers, and portable digital media players.</p>	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>

Teaching and Learning Materials	<ul style="list-style-type: none"> • Notepad or exercise book • Pen • Smartphones • Laptops 	<ul style="list-style-type: none"> • Desktop computers • Tablets • TV and Radio 	<ul style="list-style-type: none"> • Productivity tools • Open Educational Resources (Including YouTube, MOOCs – Udemy /Coursera, Khan Academy, TESSA) • The iBox (CENDLOS) 	<ul style="list-style-type: none"> • Subject-based application software • Instructional Laboratories (with multimedia equipment and smartboards) • Maintenance and repair workshops
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Subject INFORMATION AND COMMUNICATIONS TECHNOLOGY

Strand 1. ICTs IN THE SOCIETY

Sub-Strand 3. CONNECTING AND COMMUNICATING ONLINE

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
I.1.3.LO.1		
Discuss and use Internet applications	<p>Communication: All learners will be allowed to provide oral and/or written descriptions of the steps involved in the use of Internet applications.</p> <p>Collaboration: Learners will work in mixed-ability groups (teachers should identify abilities and organise their sitting to ensure this), share their ideas with peers and accept constructive feedback.</p>	<p>GESI: Promoting inclusivity in the classroom by encouraging every learner to actively participate in lessons, and cross-sharing of ideas and thoughts between and among groups and individuals ensures;</p> <ul style="list-style-type: none"> • Respecting individuals of varying beliefs, religions and cultures • Being aware of personal biases and stereotypes • Embracing diversity and practising inclusion • Upholding the basic tenets of information security, which are confidentiality, integrity and availability • Avoiding cyberbullying <p>SEL: Promoting the practice through which all learners acquire and apply knowledge, skills, and attitudes;</p> <ul style="list-style-type: none"> • Reflect on their personal experiences and interactions with the internet • Develop strategies for managing their time effectively when using the internet • Manage emotions • Make responsible and caring decisions • Establish and maintain supportive

		<p>relationships</p> <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, commitment, hard work and integrity</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI			Assessment
1.1.3.CS.1	1.1.3.LI.1			1.1.3.AS.1
Demonstrate knowledge and understanding of the use of the Internet	Describe the evolution of the Internet and identify the Internet service providers and their functions. <ul style="list-style-type: none"> Engage in interactive multimedia presentations to describe the evolution of the internet. Analyse and discuss the presentations in mixed-ability groups. In group discussions, identify and explore the functions of different types of internet service providers (ISPs), including Tier 1, Tier 2, and Tier 3 ISPs. 			Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	1.1.3.LI.2 Explore how data travels on the Internet, how the IP addressing system functions and discuss surfing the Web, creating and use of e-mail and mailing lists. <ul style="list-style-type: none"> Present and demonstrate how data travels on the internet, allowing learners to explore and practice in groups. Provide a multimedia presentation and demonstration on IP addressing, explaining its types and usage. Engage in discussions on Web surfing (internet browsing) and conduct demonstrations and practice sessions (individuals or gender-sensitive groups) for creating email accounts and using mailing lists. 			Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	<ul style="list-style-type: none"> Notepad or exercise book Pen Smartphones Laptops 	<ul style="list-style-type: none"> Desktop computers Tablets TV and Radio 	<ul style="list-style-type: none"> Productivity tools Open Educational Resources (including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) The iBox (CENDLOS) 	<ul style="list-style-type: none"> Subject-based application software Instructional Laboratories (with multimedia equipment and smartboards) Maintenance and repair workshops

Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **2. NETWORK SYSTEMS FOR TRANSMITTING INFORMATION**
Sub-Strand **1. GUIDED AND UNGUIDED NETWORK SYSTEMS**

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>I.2.1.LO.1</p> <p>Connect and use wired and wireless networks</p>	<p>Collaboration: Learners will work in mixed-ability groups (teachers should identify abilities and organise their sitting to ensure mixed-ability), share their ideas with peers and accept constructive feedback.</p> <p>Communication: All learners will be allowed to provide oral and/or written descriptions of the steps involved in connecting and using wired and wireless networks.</p>	<p>GESI: Ensuring all learners in class, irrespective of the diversity in ability, socio-cultural backgrounds, and gender, contribute to the group activity will promote learners’;</p> <ul style="list-style-type: none"> • Respect for individuals of varying beliefs, religions, backgrounds and cultures • Knowledge of themselves and others’ peculiarities, strengths and weaknesses • Tolerance for diversity and respect for all • Uphold the basic tenets of information security, which are confidentiality, integrity and availability • Avoid cyber bullying <p>SEL: Promoting the development through which all learners acquire and apply knowledge, skills, and attitudes to:</p> <ul style="list-style-type: none"> • Reflect on their personal experiences and understanding of

		<p>communication systems</p> <ul style="list-style-type: none"> • Discuss ethical considerations related to communications, such as privacy, security, and responsible data handling • Develop strategies for time management when working on projects • Feel and show empathy for others • Manage emotions • Make responsible and caring decisions • Establish and maintain supportive relationships <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, commitment and hard work.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI			Assessment
I.2.1.CSI	I.2.1.LI.1			I.2.1.AS.1
Demonstrate basic knowledge and understanding of guided and unguided network systems	Classify network types and topologies <ul style="list-style-type: none"> Engage in interactive learner-centred teaching and learning to explain different network topologies, such as star, ring, bus, and mesh. Utilise multimedia presentations and video analysis, such as YouTube videos, to discuss the concepts and techniques of both wired and wireless networks. Ensure the strategies adopted do respond to inclusivity and equity, supporting diverse learners with visual impairment, dyslexia, dysgraphia, and other needs. 			Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	I.2.1.LI.2 Classify transmission media used to send and receive data in a network environment <ul style="list-style-type: none"> Engage in group work to discuss and differentiate network types (e.g., LAN, MAN, WAN, CAN). Implement project-based learning and practical sessions (individual and group work) to explore and connect transmission media, such as optical fibre, twisted pair, coaxial cable, microwave, satellite, and Bluetooth. Utilise interactive multimedia presentations and video analysis to discuss the concepts and techniques of both wired and wireless networks. Ensure the strategies adopted do respond to inclusivity and equity, supporting diverse learners with visual impairment, dyslexia, dysgraphia, and other needs. 			Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	<ul style="list-style-type: none"> Notepad or exercise book Pen Smartphones Laptops 	<ul style="list-style-type: none"> Desktop computers Tablets TV and Radio 	<ul style="list-style-type: none"> Productivity tools Open Educational Resources (Including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) 	<ul style="list-style-type: none"> Subject-based application software Instructional Laboratories (with multimedia equipment and smartboards) Maintenance and repair

			<ul style="list-style-type: none">• The iBox (CENDLOS)	workshops
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Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **2. NETWORK SYSTEMS FOR TRANSMITTING INFORMATION**
Sub-Strand **2. COMPUTER AND INFORMATION SECURITY**

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>I.2.2.LO.1</p> <p>Discuss and evaluate the physical safety hazards and their prevention in the use of computers</p>	<p>Collaboration: Learners will work in mixed-ability groups (teachers should identify abilities and organise their sitting to ensure mixed-ability), share their ideas with peers, and accept constructive feedback.</p> <p>Communication: All learners will be allowed to provide oral and/or written descriptions of the steps involved in physical safety hazards and their preventions relating to the use of computers.</p>	<p>GESI: Offering equal opportunities to all learners, irrespective of their background, and soliciting views from all learners ensures;</p> <ul style="list-style-type: none"> • Respect for individuals of varying beliefs, religions, backgrounds and cultures • Sensitivity to the inter-relatedness of the various spheres of life, groups and individuals • Awareness of personal biases, peculiarities and stereotypes • Embrace diversity • Individual activities and physical needs when interacting within a working space <p>SEL: Improving the development through which all learners acquire and apply knowledge, skills, and attitudes:</p> <ul style="list-style-type: none"> • Reflect on their personal experiences and interactions with devices • Develop strategies for maintaining

		<p>safe and healthy computer workstations</p> <ul style="list-style-type: none"> • Feel and show empathy for others • Manage emotions • Make responsible and caring decision • Establish and maintain supportive relationships. <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, commitment and hard work, honesty and truthfulness.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI	Assessment
I.2.2.CS.I	I.2.2.LI.I	I.2.2.AS.I
<p>Demonstrate knowledge and understanding of Safety and Security Issues in the use of computers</p>	<p>Discuss Physical Safety Risks (Electrocution, Fire hazard, Tripping hazard, Personal injury) in the use of computers</p> <ul style="list-style-type: none"> • Conduct presentations and engage in mixed-ability group discussions to explore and discuss physical safety risks associated with computer use, including the hazards of electrocution, fire, tripping, and personal injury. • Enhance understanding through multimedia presentations that showcase real-life occurrences of these risks. <p>SEL: When teaching students about physical hazards and their prevention in the computer environment, you can integrate Social-Emotional Learning (SEL) principles to create a safe and responsible learning environment. Here are some SEL features you can incorporate into this specific topic:</p> <p>Self-awareness:</p> <ol style="list-style-type: none"> 1. Help students recognise and understand the potential physical hazards that exist in the computer environment, such as ergonomic risks or electrical hazards. 2. Encourage students to reflect on their behaviours and habits in the computer environment, considering how they may contribute to or mitigate physical hazards. <p>Self-management:</p> <ol style="list-style-type: none"> 1. Teach students strategies for maintaining a safe and healthy computer workstation, such as proper ergonomics, adjusting chairs and monitor heights, and taking regular breaks. 2. Promote self-regulation by encouraging students to listen to their bodies and take proactive steps to address physical discomfort or hazards. 	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>

	<p>Social awareness:</p> <ol style="list-style-type: none"> 1. Discuss the importance of considering the safety and well-being of others in the computer environment, such as keeping walkways clear and reporting faulty equipment. 2. Encourage empathy by discussing how physical hazards can affect different individuals, such as those with disabilities or physical limitations. <p>Relationship skills:</p> <ol style="list-style-type: none"> 1. Promote open communication about physical hazards and safety practices in the computer environment, creating a supportive classroom culture where students feel comfortable discussing concerns. 2. Teach effective collaboration skills when working on computer-related projects, emphasising the importance of clear communication and respecting others' safety needs. 3. Encourage students to take on leadership roles in promoting safety, such as organising safety checklists or leading discussions on physical hazard prevention. <p>Responsible decision-making:</p> <ol style="list-style-type: none"> 1. Guide students in making informed decisions about equipment and furniture selection for a safe and ergonomic computer setup. 2. Encourage students to report any potential hazards or unsafe conditions they observe, fostering a culture of responsibility and proactive action. 	
	1.2.2.LI.2	1.2.2.AS.2
	<p>Discuss Causes of Physical Safety Risks of computer equipment.</p> <ul style="list-style-type: none"> • Facilitate discussions and presentations among learners, to examine the causes of physical safety risks associated with computer equipment, with a specific focus on the issue of overheating due to poor heat dissipation. • Encourage learners to analyse the factors contributing to this risk and discuss preventive measures. 	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>

	<p>I.2.2.LI.3</p> <p>Apply preventive measures on physical safety risks (Increase the number of wall sockets and do not use too many extension blocks)</p> <ul style="list-style-type: none"> Engage in Think-Pair-Share activities to brainstorm and discuss various preventive measures for physical safety risks in the use and handling of computers. Encourage discussions on preventive measures applicable in different contexts, such as our society, schools, and homes. While mentioning increasing the number of wall sockets and avoiding excessive use of extension boards, also explore other preventive measures, such as proper cable management, regular equipment maintenance, and adherence to safety guidelines. 		<p>I.2.2.AS.3</p> <p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
<p>Teaching and Learning Materials</p>	<ul style="list-style-type: none"> Notepad or exercise book Pen Smartphones Laptops Desktop computers 	<ul style="list-style-type: none"> Tablets TV and Radio Productivity tools Open Educational Resources (Including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) 	<ul style="list-style-type: none"> The iBox (CENDLOS) Subject-based application software Instructional Laboratories (with multimedia equipment and smartboards) Maintenance and repair workshops

Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **I. ICTs IN THE SOCIETY**
Sub-Strand **I. ORGANISING, MANAGING AND PRESENTING INFORMATION USING ESSENTIAL PRODUCTIVITY TOOLS**

Learning Outcomes	21 st Century Skills and Competencies	GESI ³ , SEL ⁴ and Shared National Values
<p>2.1.1.LO.1</p> <p>Utilise knowledge of Spreadsheet software to create functions for data analysis, interpret graphs and manipulate tables.</p>	<p>Collaboration: Learners will work in mixed-ability/gender-sensitive groups (teachers should identify abilities and organise their seating), share their ideas with peers and accept constructive feedback.</p> <p>Communication: All learners will be allowed to provide oral and/or written descriptions of the steps involved in creating spreadsheet documents.</p> <p>Creativity: Learners will be allowed to introduce their ideas in designing the documents leading to innovation and creativity.</p> <p>Personal development: Through individual work based on interest and ability (this requires the identification of learners’ interests/abilities and supporting their learning that is linked to what interests them).</p> <p>Critical thinking and problem solving: Through the application of the concept of using spreadsheets, giving equal opportunities to both males and females.</p>	<p>GESI: Using mixed-ability and mixed-gender pairing, special attention given to the catch-up, regular and gifted and talented learners leads to;</p> <ul style="list-style-type: none"> • Respecting individuals of varying abilities, beliefs, religions and cultures • Being sensitive to the inter-relatedness of the various spheres of life, groups and individuals • Being aware of personal biases and stereotypes • Embracing diversity and practising inclusion <p>SEL: Encouraging the process through which all learners acquire and apply knowledge, skills, and attitudes to:</p> <ul style="list-style-type: none"> • Manage emotions • Achieve personal and collective goals

³ Gender Equality and Social Inclusion

⁴ Socio-Emotional Learning

		<ul style="list-style-type: none"> • Feel and show empathy for others • Establish and maintain supportive relationships • Make responsible and caring decisions <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Integrity, tolerance, open-mindedness, patience, integrity and hard work</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI	Assessment
2.1.1.CSI	2.1.1.LI.1	2.1.1.AS.1
Demonstrate knowledge and understanding of Analysing numerical data using Spreadsheet software	<p>Describe Spreadsheet software workbooks, worksheets, cell referencing</p> <p>Whole class discussion: Participate in a class discussion on spreadsheet software, considering its key features and components such as workbooks, worksheets, cell referencing, and formula bars.</p> <p>Project-Based learning:</p> <ul style="list-style-type: none"> Engage in project-based learning activities to explore and utilise the features of spreadsheet software, demonstrating an understanding of workbooks, worksheets, and cell referencing. Interactive multimedia presentations, and video analysis to discuss the concepts and explore techniques for creating electronic spreadsheets. These strategies must respond to inclusivity and equity. For example, input devices should be chosen to ensure all learners with different abilities e.g., people with visual impairment, dyslexia, and dysgraphia can analyse data. 	<p>Level 1 Recall</p> <p>Level 2 Skills of conceptual understanding</p> <p>Level 3 Strategic reasoning</p> <p>Level 4 Extended critical thinking and reasoning</p>
	2.1.1.LI.2	2.1.1.AS.2
	<p>Create and utilise formulae and functions for data analysis.</p> <p>Project-Based learning:</p> <ul style="list-style-type: none"> Work on practical assignments, individually or in groups, to create and use formulae and functions in spreadsheet software. Utilise various built-in functions, such as SUM, AVERAGE, MIN, MAX, IF, DATE, and TIME, to analyse numerical data effectively. Participate in interactive multimedia presentations and video analysis to deepen understanding of creating and using formulae and functions. 	<p>Level 1 Recall</p> <p>Level 2 Skills of conceptual understanding</p> <p>Level 3 Strategic reasoning</p> <p>Level 4 Extended critical thinking and reasoning</p>
	2.1.1.LI.3	2.1.1.AS.3
	<p>Generate and interpret graphs and charts to visualise data.</p>	<p>Level 1 Recall</p> <p>Level 2 Skills of</p>

	<p>Project-Based learning</p> <ul style="list-style-type: none"> Engage in project-based learning activities to generate different types of graphs and charts, such as bar charts/graphs, pie charts, and line graphs, using spreadsheet software. Demonstrate the ability to interpret and analyse data presented in graphical formats. Utilise interactive multimedia presentations and video analysis to explore concepts and techniques related to creating graphs and charts. 			<p>conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
	2.1.1.LI.4			2.1.1.AS.4
	<p>Apply sorting and filtering operations to manipulate tables.</p> <p>Project-Based learning:</p> <ul style="list-style-type: none"> Apply sorting operations (ascending, descending) to arrange data in tables effectively. Utilise filtering operations to display specific data subsets based on given criteria. Engage in project-based learning activities to practise and demonstrate the application of sorting and filtering operations in spreadsheet software. 			<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
	2.1.1.LI.5			2.1.1.AS.5
	<p>Save and print workbooks and worksheets (Save, Save As, Print)</p> <p>Project-Based learning</p> <ul style="list-style-type: none"> Expose learners to how to save workbooks and worksheets using appropriate file formats. Also, help them to explore how to organise and manage spreadsheet files and folders effectively. Practice printing workbooks and worksheets, utilising features such as print-preview and page-setup options. 			<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
Teaching and Learning Materials	<ul style="list-style-type: none"> Notepad or exercise book Pen 	<ul style="list-style-type: none"> Desktop computers Tablets TV 	<ul style="list-style-type: none"> Open Educational Resources (Including YouTube, MOOCs - 	<ul style="list-style-type: none"> Subject-based application software Instructional

	<ul style="list-style-type: none"> • Smartphones • Laptops 	<ul style="list-style-type: none"> • Radio 	<p>Udemy/Coursera, Khan Academy, TESSA)</p> <ul style="list-style-type: none"> • The iBox (CENDLOS) • Productivity tools 	<p>Laboratories (with multimedia equipment and smartboards)</p> <ul style="list-style-type: none"> • Maintenance and repair workshops
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Subject INFORMATION AND COMMUNICATIONS TECHNOLOGY

Strand 1. ICTs IN THE SOCIETY

Sub-Strand 2. EMERGING TECHNOLOGIES AND APPLICATIONS

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>2.1.2.LO.1</p> <p>Evaluate the applications and implications of technology in various sectors of society.</p> <p>Identify and analyse technology usage patterns across different user categories.</p>	<p>Collaboration: Learners will work in mixed-ability/gender-sensitive groups (teachers should identify abilities and organise their seating), share their ideas with peers and accept constructive feedback.</p> <p>Communication: All learners will be allowed to provide oral and/or written descriptions of the steps involved in creating Word documents.</p> <p>Creativity: Learners will be allowed to identify technologies used by varied users, such as home users, small/home office users, mobile users, power users and enterprise users.</p>	<p>GESI: Offering all learners in class, irrespective of the diversity in ability, socio-cultural backgrounds, and gender, can make contributions during these activities will ensure;</p> <ul style="list-style-type: none"> • Respect for individuals of varying beliefs, religions, backgrounds and cultures • Knowledge of themselves and others’ peculiarities, strengths and weaknesses • Tolerance for diversity and respect for all • Upholding the basic tenets of information security, which are confidentiality, integrity and availability • Avoiding cyberbullying <p>SEL: Enhancing the practice through which all learners acquire and apply knowledge, skills, and attitudes;</p> <ul style="list-style-type: none"> • Reflect on their personal experiences and interactions with the internet • Develop strategies for managing their time effectively when using the internet • Manage emotions • Make responsible and caring decisions • Establish and maintain supportive relationships <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the</p>

		<p>promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, commitment and hard work.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI		Assessment
2.1.2.CSI	2.1.2.LI.1		2.1.2.AS.1
Demonstrate knowledge and understanding of Emerging Technologies	<p>Discuss the use of technology in education, healthcare, manufacturing, government, finance, entertainment, transport, and business.</p> <p>Co-operative Learning:</p> <ul style="list-style-type: none"> Using mixed-ability groups, discuss the applications of technology in education, healthcare, manufacturing, government, finance, entertainment, transport, and business. Utilise interactive multimedia presentations and video analysis to explore and assess the merits and challenges of technology in different sectors. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	2.1.2.LI.2	<p>Identify technologies used by home users, small/home office users, mobile users, power users and enterprise users.</p> <p>Project- and Problem-Based learning and practical sessions:</p> <ul style="list-style-type: none"> Participate in project-based and problem-based learning activities to identify technologies commonly used by home users, small/home office users, mobile users, power users, and enterprise users. Utilise inclusive teaching strategies, such as multimedia presentations, to ensure the understanding and engagement of diverse learners (e.g., individuals with visual impairment, dyslexia, dysgraphia). 	2.1.2.AS.2 Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	<ul style="list-style-type: none"> Notepad or exercise book Pen Smartphones Laptops Desktop computers 	<ul style="list-style-type: none"> Tablets TV and Radio Open Educational Resources (Including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) The iBox (CENDLOS) 	<ul style="list-style-type: none"> Productivity tools Subject-based application software Instructional Laboratories (with multimedia equipment and smartboards) Maintenance and repair workshops

Subject INFORMATION AND COMMUNICATIONS TECHNOLOGY

Strand 1. ICTs IN THE SOCIETY

SubStrand 3. CONNECTING AND COMMUNICATING ONLINE

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>2.1.3.CS.1</p> <p>Navigate the Web effectively using a Web browser and analyse the features and multimedia content found on websites.</p>	<p>Communication:</p> <ul style="list-style-type: none"> • All learners will be allowed to use Web addresses, browsers, web apps and mobile platforms to communicate. • All learners will be given time to discuss the types of websites, and digital media on the Web (Graphics, Audio, Videos, Plugins) <p>Collaboration: Learners will work in mixed-ability groups (the teacher should identify abilities and organise their seating to ensure mixed-ability), share their ideas with peers, and accept constructive feedback.</p>	<p>GESI: Promoting inclusivity through the use of varied types of group activities and supporting individual learners to take initiative ensures;</p> <ul style="list-style-type: none"> • Being gender-responsive and having the ability to tackle injustice, being aware of personal biases and stereotypes, • Embracing diversity and practising inclusion. • Being sensitive to the inter-relatedness of the various spheres of life, groups, and individuals, • Upholding the basic tenets of information security, which are confidentiality, integrity and availability. • Avoiding cyberbullying. <p>SEL: Promoting the practice through which all learners acquire and apply knowledge, skills, and attitudes;</p> <ul style="list-style-type: none"> • Reflect on their experiences and interactions with the internet

		<ul style="list-style-type: none"> • Develop strategies for managing time effectively when using the internet • Manage emotions • Make responsible and caring decisions • Establish and maintain supportive relationships <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National core values: Resourcefulness, self-discipline, leadership, truth, diversity, equity, adaptability, responsible citizenship, honesty, law-abiding, patriotism, faithfulness, loyalty.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI	Assessment
2.1.3.CS.1	2.1.3.LI.1	2.1.3.AS.1
Demonstrate knowledge and understanding of the World Wide Web	<p>Navigate the Web effectively using Web addresses, browsers, Web apps, and mobile platforms.</p> <p>Think-Pair-Share: Engage in a Think-Pair-Share activity to discuss the purpose and components of Web addresses (Uniform Resource Locators), Web browsers, Web apps, and mobile platforms.</p> <p>Problem-Based Learning and Practical Session: Participate in problem-based learning and practical sessions (individual and group work) to practice using Web addresses, different Web browsers (e.g., Opera Mini, Google Chrome, Mozilla Firefox, Safari, Internet Explorer), Web apps, and mobile platforms to search for and communicate information.</p>	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
	<p>2.1.3.LI.2</p> <p>Analyse and discuss the features and multimedia content found on Websites (Graphics, Audio, Videos, Plug-ins)</p> <p>Brainstorm:</p> <ul style="list-style-type: none"> • Collaborate with a partner to discuss different websites, their examples, and their relevance in various contexts. • Brainstorm and explore the different types of digital media found on websites, such as graphics, audio, videos, and plug-ins. • Demonstrate for learners the use of different digital media for communication purposes, including text, voice, and video communication, virtual meetings, email, instant messaging, and screen sharing. 	<p>2.1.3.AS.2</p> <p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>

Teaching and Learning Materials	<ul style="list-style-type: none"> • Notepad or exercise book • Pen • Smartphones • Laptops • Desktop computers 	<ul style="list-style-type: none"> • Tablets • TV and Radio • Productivity tools • Open Educational Resources (Including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) 	<ul style="list-style-type: none"> • The iBox (CENDLOS) • Subject-based application software • Instructional Laboratories (with multimedia equipment and smartboards) • Maintenance and repair workshops
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Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **2. NETWORK SYSTEMS FOR TRANSMITTING INFORMATION**
Sub-Strand **1. GUIDED AND UNGUIDED NETWORK SYSTEMS**

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>2.2.1.LO.1</p> <p>Understand the concepts and differences between Client/Server and Peer-to-Peer Networks.</p> <p>Describe and explain common network communication protocols and standards, such as Ethernet, TCP/IP, HTTP(s), SMTP, FTP, Wi-Fi, LTE, Bluetooth, IrDA, RFID, and NFC.</p>	<p>Collaboration: Learners will work in mixed-ability groups (the teacher should identify abilities and organise their seating arrangement to ensure mixed-ability), share their ideas with peers, and accept constructive feedback.</p> <p>Communication:</p> <ul style="list-style-type: none"> • All learners will be given time to provide oral and/or written descriptions of the steps involved in creating a Word document. All learners will create a teaching timetable for discussions. • All learners will be allowed to describe various network communications standards and protocols, e.g., Ethernet, token ring, TCP/IP, Wi-Fi, LTE, Bluetooth, IrDA, RFID and NFC. 	<p>GESI: Involving all learners in class irrespective of their varying abilities, gender and backgrounds, supporting them to share their views and thoughts ensures;</p> <ul style="list-style-type: none"> • Respect for individuals of varying beliefs, religions, backgrounds and cultures • Sensitivity to the inter-relatedness of the various spheres of life, groups and individuals • Awareness of personal biases, peculiarities and stereotypes • Tolerance for diversity • Upholding the basic tenets of information security, which are confidentiality, integrity and availability. • Avoiding cyberbullying <p>SEL: Promoting the development through which all learners acquire and apply knowledge, skills, and attitudes to:</p> <ul style="list-style-type: none"> • Reflect on their experiences and

		<p>understanding of communication systems.</p> <ul style="list-style-type: none"> • Discuss ethical considerations related to communications, such as privacy, security, and responsible data handling. • Develop strategies for time management when working on projects. • Feel and show empathy for others. • Manage emotions. • Make responsible and caring decisions. • Establish and maintain supportive relationships. <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, commitment and integrity.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI		Assessment
2.2.1.CS.1	2.2.1.LI.1		2.2.1.AS.1
Demonstrate basic knowledge and understanding of guided and unguided network systems	Understand the Concepts and Differences Between Client/Server and Peer-to-Peer Networks. <ul style="list-style-type: none"> Engage in interactive learner-centred teaching and learning activities to discuss and analyse the characteristics, advantages and limitations of Client/Server and Peer-to-Peer Networks. Participate in group discussions and case studies to explore real-world examples of Client/Server and Peer-to-Peer Networks and their applications. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	2.2.1.LI.2		2.2.1.AS.2
	Describe and Explain Common Network Communication Protocols and Standards, such as Ethernet, TCP/IP, HTTP(s), SMTP, FTP, Wi-Fi, LTE, Bluetooth, IrDA, RFID, and NFC. <ul style="list-style-type: none"> Engage in interactive learner-centred teaching and learning activities to describe and explain network communication protocols and standards, including their purposes, features, and functionalities. Conduct an inquiry and research project to investigate specific examples of network communication protocols and standards (e.g., Ethernet, TCP/IP, HTTP(s), SMTP, FTP, Wi-Fi, LTE, Bluetooth, IrDA, RFID, NFC) and their applications in various contexts. Participate in group discussions with the ability to understand and evaluate multiple features, discussing the importance and reasons for using communication protocols and standards. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	<ul style="list-style-type: none"> Notepad or exercise book Pen Smartphones Laptops Desktop computers 	<ul style="list-style-type: none"> Tablets TV and Radio Productivity tools Open Educational Resources (Including YouTube, MOOCs - 	<ul style="list-style-type: none"> The iBox (CENDLOS) Subject-based application software Instructional Laboratories (with multimedia equipment and

		Udemy/Coursera, Khan Academy, TESSA)	smartboards) ● Maintenance and repair workshops
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Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **2. NETWORK SYSTEMS FOR TRANSMITTING INFORMATION**
Sub-Strand **2. COMPUTER AND INFORMATION SECURITY**

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>2.2.2.LO.1</p> <p>Understand and evaluate the risks associated with the use of ICT and suggest possible preventive mechanisms to mitigate them.</p>	<p>Collaboration: Learners will work in mixed-ability groups (the teacher should identify abilities and organise their seating to ensure mixed-ability), share their ideas with peers and accept constructive feedback.</p> <p>Communication:</p> <ul style="list-style-type: none"> • All learners will be given time to discuss issues relating to the use of the Internet and network attacks (cyberbullying, malware, botnets, DOS, spoofing, hardware theft, firewalls, etc.) when networking, using the Internet, sending and receiving emails, taking part in social media, and online gaming. • All learners will be allowed to discuss preventive mechanisms for network attacks including antivirus, and firewalls (hardware/software). 	<p>GESI: Using inclusive strategies and pedagogies that promote all learners’ well-being and develop their potential will enhance;</p> <ul style="list-style-type: none"> • Respect for others and alternative views, as well as the awareness of personal biases. • Protection for the weak, working for the betterment of society, and making learners advocate for peace and justice. • Exhibiting empathy towards people with special needs. • Upholding the basic tenets of information security, which are confidentiality, integrity and availability. • Avoid cyberbullying. <p>SEL: Improving the development through which all learners acquire and apply knowledge, skills, and attitudes to:</p> <ul style="list-style-type: none"> • Reflect on their experiences and interactions with devices. • Develop strategies for maintaining safe and healthy computer workstations. • Feel and show empathy for others. • Manage emotions. • Make responsible and caring decisions. • Establish and maintain supportive relationships.

		<p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National core values: Sacrifice, selflessness, compassion, fairness, justice, generosity, cooperation, commitment, collaboration, excellence, resourcefulness, self-discipline.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI	Assessment	
2.2.2.CS.1	2.2.2.LI.1	2.2.2.AS.1	
Demonstrate knowledge and understanding of safety and security issues in ICT	<p>Understand and evaluate the risks associated with the use of ICT, including Internet and network attacks (e.g., cyberbullying, malware, botnets, denial-of-service attacks, spoofing, hardware theft, and firewalls).</p> <ul style="list-style-type: none"> Engage in group discussions and presentations to examine real-life examples of internet and network attacks, their impact, and the ethical implications associated with them. Conduct research and analysis on specific types of attacks, their methods, and potential consequences. Participate in radio presentations or other forms of communication to raise awareness about internet and network attacks and their prevention. 	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>	
	<p>2.2.2.LI.2</p> <p>Discuss and implement preventive mechanisms to mitigate computer network attacks (e.g., antivirus software, hardware and software, and firewalls).</p> <ul style="list-style-type: none"> Engage in brainstorming sessions to explore various preventive mechanisms and strategies for countering network attacks. Participate in group discussions and presentations to analyse the effectiveness of preventive mechanisms, such as antivirus software and firewalls. Discuss and share best practices for securing computer networks, including the responsible use of ICT and adherence to ethical guidelines. 	<p>2.2.2.AS.2</p> <p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>	
Teaching and Learning Materials	<ul style="list-style-type: none"> Notepad or exercise book Pen Smartphones Laptops 	<ul style="list-style-type: none"> Tablets TV and Radio Productivity tools Open Educational Resources 	<ul style="list-style-type: none"> The iBox (CENDLOS) Subject-based application or software Instructional Laboratories (with

	<ul style="list-style-type: none"> • Desktop computers 	<p>(Including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA)</p>	<p>multimedia equipment and smartboards)</p> <ul style="list-style-type: none"> • Maintenance and repair workshops
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YEAR THREE

Subject INFORMATION AND COMMUNICATIONS TECHNOLOGY

Strand I. ICTs IN THE SOCIETY

Sub-Strand I. ORGANISING, MANAGING AND PRESENTING INFORMATION USING ESSENTIAL PRODUCTIVITY TOOLS

Learning Outcomes	21 st Century Skills and Competencies	GESI ⁵ , SEL ⁶ and Shared National Values
<p>3.1.1.LO.1</p> <p>Develop and use essential skills to communicate information using presentation software and desktop publishing tools.</p>	<p>Collaboration: Learners will work in mixed-ability/gender-sensitive groups (the teacher should identify learners' abilities and organise their seating to achieve this), share their ideas with peers and accept constructive feedback.</p> <p>Communication:</p> <ul style="list-style-type: none"> ● All learners will be given time to develop their presentations (Animation, transition, Presenter view slides, Master slide) ● All learners will be allowed to address problems that may occur after printing and publication <p>Creativity: Learners will be allowed to introduce their ideas in designing the documents leading to innovation and creativity.</p> <p>Personal development: Through individual works based on interest and ability (this requires the identification of learners' interests/abilities and supporting their learning that is linked to what interests them).</p> <p>Critical thinking and problem solving: Through the use of</p>	<p>GESI: Creating equal opportunities for all learners to participate in class, through the use of balanced gender groups leads to;</p> <ul style="list-style-type: none"> ● Tolerance and respect for each other ● Confidence and efficacy in their ability to perform ● Awareness of themselves and others, taking into consideration their biases and stereotypes. ● Upholding the basic tenets of information security, which are confidentiality, integrity and availability. ● Avoiding cyberbullying <p>SEL: Encouraging the process through which all learners acquire and apply knowledge, skills, and attitudes to:</p> <ul style="list-style-type: none"> ● Manage emotions

⁵ Gender Equality and Social Inclusion

⁶ Socio-Emotional Learning

	<p>essential skills to communicate information using Presentation software and desktop publishing tools, giving equal opportunities to both males and females.</p>	<ul style="list-style-type: none"> • Achieve personal and collective goals • Feel and show empathy for others • Establish and maintain supportive relationships • Make responsible and caring decisions <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, commitment and integrity.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI	Assessment
3.1.1.CSI	3.1.1.LI.1	3.1.1.AS.1
Demonstrate knowledge and understanding of Presentation software and Desktop Publishing Software	<p>Discuss Presentation Software and its Features (Windows, Animation, Transition, Presenter view slides, Master slides)</p> <ul style="list-style-type: none"> Engage in brainstorming sessions to explore different presentation software, examples, such as MS PowerPoint, Google Slides, Prezi, Lotus Freelance, Ludus, Open Office Impress, Slide Bean, etc. Participate in group discussions to evaluate the merits and demerits of using presentation software. Analyse the features of presentation software, including Windows, Animation, Transitions, Presenter view slides, and Master slides. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.1.1.LI.2	3.1.1.AS.2
	<p>Develop slides, format tables, and incorporate charts, graphs, animation, and transitions in a slide presentation.</p> <ul style="list-style-type: none"> Work individually or in mixed-ability groups to create slide presentations on a topic of learners' choice, applying formatting techniques, and using tables, charts, graphs, animation, and transitions. Engage in interactive multimedia presentations and video analysis to learn and explore techniques for formatting tables, creating charts and graphs, and incorporating animation and transitions. Use project-based learning to apply animation, transitions, and other features to enhance the visual appeal and effectiveness of slide presentations. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.1.1.LI.3	3.1.1.AS.3
<p>Create and save a publication using desktop publishing software, such as MS Publisher or Adobe.</p> <ul style="list-style-type: none"> Engage in group discussions to understand the features and uses of desktop publishing software, such as MS Publisher and Adobe. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic	

	<ul style="list-style-type: none"> • Discuss the steps involved in creating and saving a publication, including working with text, adding building blocks, and utilising various tools. • Apply project-based learning within practical sessions to create and save text, add building blocks, and utilise the tools in desktop publishing software. 			<p>reasoning Level 4 Extended critical thinking and reasoning</p>
	3.1.1.LI.4			3.1.1.AS.4
	<p>Utilise basic tools in desktop publishing to add pictures, text boxes, tables, word art, and picture frames to a publication.</p> <ul style="list-style-type: none"> • Engage in discussions to understand and explore the basic tools used in desktop publishing, such as text boxes, tables, word art, and picture frames. <p>Project-Based Learning</p> <ul style="list-style-type: none"> • Participate in project-based learning activities to practice using these tools and enhance publications with visual elements. • Embrace diversity and practice inclusion by creating publications that accommodate different abilities and promote accessibility. 			<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
<p>Teaching and Learning Materials</p>	<ul style="list-style-type: none"> • Notepad or exercise book • Pen • Smartphones • Laptops 	<ul style="list-style-type: none"> • Desktop computers • Tablets • TV and Radio 	<ul style="list-style-type: none"> • Productivity tools • Open Educational Resources (including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) • The iBox (CENDLOS) 	<ul style="list-style-type: none"> • Subject-based applications or software • Instructional Laboratories (with multimedia equipment and smartboards) • Maintenance and repair workshops

Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **1. TECHNOLOGIES IN THE SOCIETY**
Sub-Strand **2. EMERGING TECHNOLOGIES AND APPLICATIONS**

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>3.1.2.LO.1</p> <p>Analyze and discuss the affordances and impact of digital tools in various domains.</p> <p>Evaluate the role of social media as communication and collaboration tools in society.</p>	<p>Collaboration: Learners will work in mixed ability/gender-sensitive groups (the teacher should identify learners' abilities and organise their seating to achieve this), share their ideas with peers and accept constructive feedback.</p> <p>Communication: All learners will be given time to provide oral and/or written descriptions of the steps involved in the roles emerging technologies play in today's society.</p> <p>Creativity: Learners will be allowed to identify technologies used by home users, small/home office users, mobile users, power users and enterprise users.</p>	<p>GESI: Ensuring all learners in class irrespective of the diversity in ability, socio-cultural backgrounds, and gender and soliciting contributions from all learners ensures;</p> <ul style="list-style-type: none"> • Respect for individuals of varying beliefs, religions, backgrounds and cultures • Knowledge of themselves and others' peculiarities, strengths and weaknesses • Tolerance for diversity and respect for all. • Upholding the basic tenets of information security, which are confidentiality, integrity and availability. • Avoiding cyberbullying <p>SEL: Enhancing the practice through which all learners acquire and apply knowledge, skills, and attitudes;</p> <ul style="list-style-type: none"> • Reflect on their personal experiences and interactions with the internet • Develop strategies for managing their time effectively when using the internet

		<ul style="list-style-type: none"> • Manage emotions • Make responsible and caring decisions • Establish and maintain supportive relationships <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, commitment and hard work.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI		Assessment
3.1.2.CS.1	3.1.2.LI.1		3.1.2.AS.1
Demonstrate knowledge and understanding of emerging technologies	<p>Analyse and Discuss the Affordances and Impact of Digital Tools in Various Domains.</p> <ul style="list-style-type: none"> Engage in interactive multimedia presentations and video analysis to explore and discuss the use of emerging technologies in education, healthcare, manufacturing, government, finance, entertainment, transport, and business. Investigate and analyse the benefits and limitations of digital tools in different contexts, such as enhancing productivity, enabling remote collaboration, facilitating data analysis, etc. Reflect on the ethical considerations and potential societal impacts of emerging technologies. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.1.2.LI.2	3.1.2.AS.2	
	<p>Evaluate the Role of Social Media as Communication and Collaboration Tools in Society. (Example Facebook, Twitter , Instagram, LinkedIn, YouTube, etc.)</p> <ul style="list-style-type: none"> Participate in Think-Pair-Share activities and discussions to examine the role of social media platforms like Facebook, Twitter / X, Instagram, LinkedIn, YouTube, and other relevant platforms as tools for communication and collaboration. Research to understand the purposes, features, and current trends of different social media platforms. Share personal experiences and insights regarding specific social media platforms they have used, discussing the advantages, disadvantages, and potential impact on individuals and society. Engage in discussions that explore the effects of social media on privacy, mental health, relationships, information sharing, and societal dynamics. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	<ul style="list-style-type: none"> Notepad or exercise book Pen 	<ul style="list-style-type: none"> Tablets TV and Radio 	<ul style="list-style-type: none"> The iBox (CENDLOS) Subject-based application

	<ul style="list-style-type: none"> • Smartphones • Laptops • Desktop computers 	<ul style="list-style-type: none"> • Productivity tools • Open Educational Resources (including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) 	<ul style="list-style-type: none"> software • Instructional Laboratories (with multimedia equipment and smartboards) • Maintenance and repair workshops
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Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **1. ICTs IN THE SOCIETY**
Sub-Strand **3. CONNECTING AND COMMUNICATING ONLINE**

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>3.1.3.LO.1</p> <p>Utilize various collaboration tools for effective communication and synchronization.</p>	<p>Communication: All learners will be allowed to use web addresses, browsers, web apps and mobile platforms to communicate.</p> <p>Collaboration: Learners will work in mixed-ability groups (the teacher should identify abilities and organise their seating to ensure mixed-ability), share their ideas with peers and accept constructive feedback.</p>	<p>GESI: Encouraging all learners' participation in different learning contexts leads to;</p> <ul style="list-style-type: none"> • Embracing diversity, exhibiting empathy towards people with special needs, respecting the opinions of others and using gender-sensitive language. Learners exhibit respect for intellectual property and cultural products. • Upholding the basic tenets of information security, which are confidentiality, integrity and availability. • Avoiding cyberbullying <p>SEL: Promoting the practice through which all learners acquire and apply knowledge, skills, and attitudes;</p> <ul style="list-style-type: none"> • Reflect on their personal experiences and interactions with the internet • Develop strategies for managing their time effectively when using the

		<p>internet</p> <ul style="list-style-type: none"> • Manage emotions • Make responsible and caring decisions • Establish and maintain supportive relationships • Have fair access and maintain net neutrality <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Values: Empathy, selflessness, transparency, patriotism, charity, tolerance, loyalty</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI	Assessment
3.1.3.CSI	3.1.3.LI.1	3.1.3.AS.1
Demonstrate knowledge and understanding of Collaboration tools for Communication and synchronisation	<p>Create and Set up Communication Tools (Synchronous(Real-time) and/or Asynchronous Communication) (Zoom, Google Meet, Facebook, other video conferencing platforms, instant messaging, telephone conversation / Email, messengers, Intranet, etc.)</p> <p>Problem-based learning and practical sessions (Individual and Group Work)</p> <ul style="list-style-type: none"> • Identify and select appropriate communication tools for different scenarios, considering factors such as real-time or asynchronous communication, the nature of the information being shared, and the target audience. • Set up and configure communication tools such as Zoom, Google Meet, Microsoft Teams, other video conferencing platforms, instant messaging applications, email systems, and intranets. • Participate in problem-based learning and practical sessions, both individually and in group work, to engage in effective communication using collaboration tools. • Demonstrate proficiency in using Web browsers, Web Apps, and mobile platforms to facilitate communication and collaboration. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.1.3.LI.2	3.1.3.AS.2
	<p>Discuss the Types of Websites and Digital Media on the Web (Graphics, Audio, Videos, Plug-ins)</p> <ul style="list-style-type: none"> • Discuss and analyse the different types of Websites, including informational, e-commerce, social networking, and multimedia-based Websites. • Identify and evaluate various forms of digital media, such as graphics, audio files, videos, and plug-ins, and their roles in enhancing communication and user engagement. • Practice utilising text, voice, and video communication in virtual meetings, email exchanges, instant messaging conversations, and screen-sharing activities to 	Level 1 Recall: Level 2 Skills of conceptual understanding: Level 3 Strategic reasoning: Level 4 Extended critical thinking and reasoning:

	effectively communicate information and ideas.		
	<ul style="list-style-type: none"> Apply appropriate digital media elements to enhance the clarity and impact of communication materials. 		
Teaching and Learning Materials	<ul style="list-style-type: none"> Notepad or exercise book Pen Smartphones Laptops Desktop computers 	<ul style="list-style-type: none"> Tablets TV and Radio Productivity tools Open Educational Resources (including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) 	<ul style="list-style-type: none"> The iBox (CENDLOS) Subject-based application software Instructional Laboratories (with multimedia equipment and smartboards) Maintenance and repair workshops

Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **2. NETWORK SYSTEMS FOR TRANSMITTING INFORMATION**
Sub-Strand **1. GUIDED AND UNGUIDED NETWORK SYSTEMS**

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>3.2.1.LO.1</p> <p>Connect and use Standards and devices for network communication</p>	<p>Collaboration: Learners will work in mixed-ability groups (the teacher should identify learners’ abilities and organise their seating to ensure mixed-ability), share their ideas with peers and accept constructive feedback.</p> <p>Communication: All learners will be allowed to describe commonly used devices e.g. broadband, modems, wireless access points, routers, network cards, hubs and switches</p>	<p>GESI: Creating an inclusive learning environment for all to participate in lessons will enable learners;</p> <ul style="list-style-type: none"> • Be sensitive to the various eras of art-making as testaments to spheres of life among groups, and individuals. • Embrace diversity, practise inclusion, exhibit empathy towards people with special needs, respect the opinions of others and use gender-sensitive language. • Exercise empathy to users of the internet space, and be sensitive to the inter-relatedness of the various expressions as a testament of the spheres of life among groups, and individuals. • Uphold the basic tenets of information security, which are confidentiality, integrity and availability. • Avoid cyberbullying

		<p>SEL: Promoting the development through which all learners acquire and apply knowledge, skills, and attitudes to:</p> <ul style="list-style-type: none"> • Reflect on their personal experiences and understanding of communication systems • Discuss ethical considerations related to communications, such as privacy, security, and responsible data handling • Develop strategies for time management when working on projects • Feel and show empathy for others • Manage emotions • Make responsible and caring decisions • Establish and maintain supportive relationships <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing about the sequence of their activities.</p>
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		National Values: Ingenuity, hard work, excellence, cooperation, collaboration, patriotism, cultural awareness
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI			Assessment
3.X2.1.CSI	3.2.1.LI.1			3.2.1.AS.1
Demonstrate basic knowledge and understanding of guided and unguided network systems	<p>Describe Commonly used Devices (e.g., broadband, modems, wireless access points, routers, network cards, hubs and switches).</p> <ul style="list-style-type: none"> Engage in interactive and learner-centred teaching and learning activities to explore and understand the purpose and function of network devices, such as broadband, modems, wireless access points, routers, network cards, hubs, and switches. Conduct brainstorming sessions to discuss the significance of these devices in our society and daily lives, highlighting their roles in enabling network communication and connectivity. Analyse and compare the characteristics, advantages, and limitations of different network devices to develop a comprehensive understanding of their applications and usage scenarios. 			Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	<ul style="list-style-type: none"> Notepad or exercise book Pen Smartphones Laptops 	<ul style="list-style-type: none"> Desktop computers Tablets TV and Radio 	<ul style="list-style-type: none"> Productivity tools Open Educational Resources (including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) The iBox (CENDLOS) 	<ul style="list-style-type: none"> Subject-based application software Instructional Laboratories (with multimedia equipment and smartboards) Maintenance and repair workshops

Subject **INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Strand **2. NETWORK SYSTEMS FOR TRANSMITTING INFORMATION**
Sub-Strand **2. COMPUTER AND INFORMATION SECURITY**

Learning Outcomes	21 st Century Skills and Competencies	GESI, SEL and Shared National Values
<p>3.2.2.LO.1</p> <p>Investigate cyber security or crimes related to computer systems</p>	<p>Collaboration: Learners will work in mixed-ability groups (the teacher should identify learners’ abilities and organise their seating to ensure mixed-ability), share their ideas with peers and accept constructive feedback.</p> <p>Communication: All learners will be allowed to investigate cyber security or crimes related to computer systems.</p>	<p>GESI: Working inclusively, cross-sharing of knowledge and understanding between and among groups and individuals for instance leads to;</p> <ul style="list-style-type: none"> • Respecting individuals of varying beliefs, religions and cultures • Being sensitive to the inter-relatedness of the various spheres of life, groups and individuals • Being aware of personal biases and stereotypes • Embracing diversity and practising inclusion. • Upholding the basic tenets of information security, which are confidentiality, integrity and availability. • Avoiding cyberbullying <p>SEL: Improving the development through which all learners acquire and apply knowledge, skills, and attitudes to:</p> <ul style="list-style-type: none"> • Reflect on their personal experiences and interactions with

		<p>devices</p> <ul style="list-style-type: none"> • Develop strategies for maintaining safe and healthy computer workstations • Feel and show empathy for others • Manage emotions • Make responsible and caring decisions • Establish and maintain supportive relationships <p>These may be done by the teacher through modelling emotional self-regulation and decision-making, the promotion of positive self-talk with self-made portraits, the creation of a vision board, creating respectful icebreakers for healthy debates, encouraging diversity presentations, and learners writing on the sequence of their activities.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, commitment and hard work</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21 st Century and GESI		Assessment
3.2.2.CS.1	3.2.2.LI.1		3.2.2.AS.1
Demonstrate knowledge and understanding of Safety and security Issues in ICT	<p>Discuss the Fundamental Objectives of Computer Security.</p> <p>Inquiry-Based Approach:</p> <ul style="list-style-type: none"> • Engage in interactive and learner-centered teaching and learning activities to explore the fundamental objectives of computer security • Conduct brainstorming sessions to explore the fundamental objectives of computer security • Analyse the fundamental objectives of computer security 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	<p>3.2.2.LI.2</p> <p>Discuss the Threats to Computer Security and how to Prevent such Threats.</p> <p>In different mixed-ability groups, task learners to surf the net and discuss the threats to computer security and how to prevent such threats. Encourage respect and tolerance of all opinions and encourage all learners to share ideas</p>		3.2.2.AS.2 Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	<ul style="list-style-type: none"> • Notepad or exercise book • Pen • Smartphones • Laptops • Desktop computers 	<ul style="list-style-type: none"> • Tablets • TV and Radio • Productivity tools • Open Educational Resources (including YouTube, MOOCs - Udemy/Coursera, Khan Academy, TESSA) 	<ul style="list-style-type: none"> • The iBox (CENDLOS) • Subject-based application software • Instructional Laboratories (with multimedia equipment and smartboards) • Maintenance and repair workshops