

GENERAL SCIENCE

CURRICULUM FOR SECONDARY
EDUCATION (SHS 1 – 3)



NATIONAL COUNCIL FOR
CURRICULUM & ASSESSMENT
OF MINISTRY OF EDUCATION



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**NATIONAL COUNCIL FOR
CURRICULUM & ASSESSMENT
OF MINISTRY OF EDUCATION**

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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.

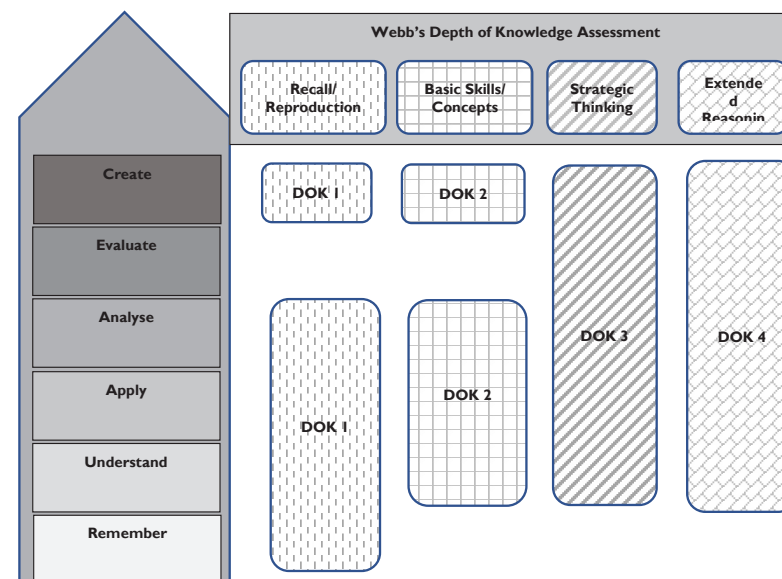


Figure 1: Revised Bloom Taxonomy combined with Webb's Depth of Knowledge for Teaching and Assessment

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 GENERAL SCIENCE

PHILOSOPHY

The next generation of learners can be empowered to acquire scientific knowledge and develop science process skills in scientific concepts through 21st Century Skills and Competencies that create opportunities that leverage practical activities in a learner-centred environment to make Science functional, leading to Glocal relevance.

VISION

A learner equipped with scientific knowledge through 21st Century Skills and Competencies who understands and applies scientific principles, solving daily scientific problems in an increasingly complex society.

GOAL

The core science curriculum is intended to create and nurture a 21st Century generation of critical thinking. These self-motivated learners will appreciate their environment and self and apply these 21st Century skills in solving Glocal scientific problems. The goals of core science include the following:

- Nurture curiosity and interest in Science.
- Develop the ability to make simple enquiries about Science and solve problems.
- Acquire scientific knowledge, science process skills, and 21st Century skills.
- Develop the ability to integrate and apply knowledge and skills.
- Become familiar with the basic language of Science.
- Recognise the social, ethical, economic, environmental, political, and technological implications of Science.
- Develop attitudes and values for responsible citizenship and commitment to promoting personal and community health.
- To prepare for further studies and future careers in Science and other disciplines.

CONTEXTUAL ISSUES

Changes in the global learning space require a shift in learning and assessment in Senior High School Science to reflect the knowledge and skills required for the 21st-century Ghanaian citizen. Science remains the central pillar to enhanced living standards and STEM development in Ghanaian society and represents a strong link in developing citizens who are empowered to address both local and global issues. However, there are numerous challenges faced by Senior High School Science learning. These include:

- the need for enacting competencies such as honesty, critical thinking, problem-solving, innovation and creativity, collaboration, and communication skills in the science teaching and learning process;
- misconceptions in Science and superstitious beliefs, such as the perception that only gifted students can study Science;
- poor results of Core Science at WASSCE;
- an absence of indigenous knowledge and practices used to teach Science for learners' easy understanding of Science, as well as the use of difficult and technical language to teach without being contextualised and making the Science socially relevant;
- learners lack of knowledge of the scientific consequences of environmental degradation leading to climate change and its attendant poor health.

There is, therefore, the need to provide direction within a contextualised, conducive and inclusive learning environment for Senior High School learning for all learners of Science and to provide innovative and creative pedagogies in the science learning space that motivate inquiry and exploration of the learners' environment to develop solutions for the problems in the environment. The learning activities for the curriculum are intended to help the learner relate concepts in Science to their environment and make Science culturally relevant and inclusive. The content will focus on the concepts that promote character qualities such as discipline and integrity, self-directed learning, self-confidence, adaptability and resourcefulness, leadership and responsible citizenship.

RATIONALE

Scientific principles and techniques are utilised in our daily lives. The study of Science enables learners to understand and comprehend scientific events and phenomena that occur in their daily lives. The quality of Core Science instruction will create the foundation for the study of science and science-related subjects at higher levels of education and offer the building blocks for the world of work. To promote sustainable development in a globally science driven environment, it is crucial for all individuals to possess a solid scientific education. The Senior High School Core Science Curriculum has taken into account learners' fundamental scientific knowledge, skills, attitudes, gender equality and social inclusion (GESI) concerns.

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SCOPE AND SEQUENCE

General Science Summary

S/N	STRAND	SUB-STRAND	YEAR 1			YEAR 2			YEAR 3		
			CS	LO	LI	CS	LO	LI	CS	LO	LI
1	Exploring Materials	Science and Materials in Nature	2	2	6	1	1	3	2	2	4
2	Processes For Living	Essentials for Survival	2	3	5	2	2	6	2	2	6
3	Vigour Behind Life	Powering the future with energy forms	1	1	2	1	1	2	1	1	2
		Forces acting on substances and mechanisms	1	1	2	1	1	1	1	1	2
		Consumer Electronics	1	1	1	1	1	2	1	1	2
4	Relationships With The Environment	The Human Body and Health	3	3	3	1	1	2	2	2	4
		Technology in our Local Industries	2	2	3	1	1	2	1	1	1
TOTAL			12	13	22	8	8	18	10	10	21

Overall Totals (SHS 1 – 3)

Content Standards (CS)	30
Learning Outcomes (LO)	31
Learning Indicators (LI)	61

YEAR ONE

Subject **GENERAL SCIENCE**
Strand **I. EXPLORING MATERIALS**
Sub-Strand **I. SCIENCE AND MATERIALS IN NATURE**

Learning Outcomes	21st-Century Skills and Competencies	GESI ¹ , SEL ² and Shared National Values
I.I.I.LO.I Evaluate the characteristics of science.	<p>Communication and Collaboration: Learners work in teams and groups to discuss and share ideas about the characteristics of science.</p> <p>Critical Thinking: Acknowledging the different opinions of different characteristics of science:</p> <ul style="list-style-type: none"> • Consider personal reactions to situations or problems and how these reactions may influence thinking. • Make simple modifications to known ideas and routine solutions to generate some different ideas and possibilities. • Examine words that show reasons and words that show conclusions. • Compare and contrast information and ideas in own and others' reasoning. • Consider how reasons and examples are used to support a point of view and illustrate meaning. • Consider ways to express and describe thinking activity, including the expression of feelings about learning, both to others and to self. 	<p>GESI: When teaching the characteristics of science, it is important to consider GESI values to ensure an inclusive and equitable learning environment for all students:</p> <ul style="list-style-type: none"> • Promote the idea that all genders and abilities have equal abilities and potential in scientific fields • Ensure representation by highlighting the contributions of scientists from different genders throughout history and in contemporary science. • Discuss how societal expectations and biases can influence perceptions of GESI roles in scientific fields and the importance of breaking free from these stereotypes. • Promote collaborative learning environments where students work together in diverse teams, respecting each other's contributions and learning from one another. • Encourage the value of diverse perspectives and experiences in scientific inquiry. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • working to build learners' self-confidence.

¹ Gender Equality and Social Inclusion

² Socio-Emotional Learning

	<ul style="list-style-type: none"> • Explore some learning strategies, including planning, repetition, rewording, memorisation and use of mnemonics. • Investigate ways to problem-solve using experiential language. • Use and give examples of different kinds of questions. Generate ideas that are new and make choices after considering personal preferences. • Identify words that indicate components of a point of view. Use reasons and examples for different purposes. • Express and describe the thinking activity. Practice some learning strategies. Demonstrate and articulate some problem-solving approaches. <p>Digital Literacy: Learning from internet resources.</p> <p>Cultural identity: Explore instances of the application of characteristics of science that are similar to the national shared values – Respect, humility, loyalty, patriotism, etc.</p>	<ul style="list-style-type: none"> • regularly acknowledge students’ strengths • fostering an environment that supports relationship building among learners and between students and staff. • allowing learners to have a decision-making role related to classroom activities and rules. • help students accurately assess their own capabilities and qualities. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
<p>I.1.1.LO.2</p> <p>Explain the functions of solids in life.</p>	<p>Digital Literacy: Learners use the internet to research to identify different solids.</p> <p>Research skills: Learners use the research to identify different solids</p> <p>Communication and Collaboration: Working in mixed-sex groups to discuss solids.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals' opinions • being sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • being aware of their own biases and stereotypes • embrace diversity and practice inclusion. <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Demonstrating respect for diversity among students

		<ul style="list-style-type: none">• Providing opportunities for learners to practise communication skills (e.g., verbalizing your message, listening to others).• Reflecting on positive and negative choices in relationships and the consequences of each choice. <p>National Values: Patience, tolerance, compassion, hard work, honesty, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars 21st- Century Skills and GESI	Assessment
I.1.1.CS.1	I.1.1.LI.1	I.1.1.AS.1
Demonstrate knowledge and understanding of the characteristics of science and show how they are applied in everyday life.	<p>Explain the characteristics of science in nature.</p> <p>Collaborative Learning:</p> <ol style="list-style-type: none"> Learners work in mixed-ability groups to discuss the various characteristics of science using videos/charts/pictures and examples from their communities and cultural backgrounds, supporting students to appreciate cultural diversity and the internet. Learners reflect and cross-share their views of different situations in life where the characteristic of science is evident. While cross-sharing, learners must demonstrate tolerance for divergent views. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	I.1.1.LI.2	I.1.1.AS.2
	<p>Design projects using the characteristics of science</p> <p>Work individually and in mixed-ability groups to design various science characteristics-based projects using books, the internet and other sources and demonstrate how the characteristics of science are used in the design.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	I.1.1.LI.3	I.1.1.AS.3
<p>Apply the characteristics of science where appropriate.</p> <p>Learners work in mixed-ability groups, supervised by the teacher to ensure all learners participate in exploring instances from their immediate environment and the internet (where possible) of the application of characteristics of science.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning	

		Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> • Internet resources such as Massive Open Online Courses (MOOCs) • Projectors • Poster pictures showing scenarios in which the characteristics of science are displayed. (E.g. https://evolution.berkeley.edu/nature-of-science/characteristics-of-science/and https://www.sciencebuddies.org/science-fair-projects/project-ideas/list) 	

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st-Century Skills and GESI	Assessment
I.1.1.CS.2	I.1.1.LI.1	I.1.1.AS.1
Know, understand, and identify the roles of solids in life.	<p>Classify different solids and their uses.</p> <p>Talk for Learning: Through a whole class session, guide learners to use charts of the periodic table to review the grouping of elements into metals, semi-metals and non-metals.</p> <p>Activity-based Learning:</p> <ul style="list-style-type: none"> • Using samples of metals, semi-metals and non-metallic materials, guide learners to identify and distinguish between their properties such as lustre, electrical and heat conductivity, density, malleability, ductility, tensile strength and sonority. • Guide learners to work in pairs to distinguish between: <ol style="list-style-type: none"> 1. metals and non-metals 2. semi-metals and non-metals 3. metals and semi-metals • Assist learners in undertaking a practical activity to demonstrate the corrosion of metals and explain how corrosion or rusting can be prevented. <p>Individualised Learning: Work individually to create mind-maps that show the relationship between the characteristic properties of metals, semi-metals and non-metals and their respective uses and applications in daily life.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	<p>I.1.1.LI.2</p> <p>Apply the properties of solids to everyday use.</p> <p>Learners research how the properties of different solids relate to their uses in life. Provide opportunities for students to evaluate various real-world scenarios and make decisions based on the information at hand.</p>	I.1.1.AS.2 Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning

	I.1.1.LI.3		I.1.1.AS.3
	<p>Discuss the relationship between binary compounds, the composition of binary compounds and the names of compounds.</p> <p>Using Talk for Learning approaches:</p> <ul style="list-style-type: none"> • Guide learners to revise from the JHS curriculum B9.1.1.1.1 about the nature of compounds. Provide opportunities for students to practise skills related to respecting others as they use the Talk for Learning approach. • With the aid of models, videos, charts, and the internet, learners discuss the relationship between binary compounds (such as CO₂, NO₂, etc.), their composition, and chemical equations. Provide opportunities for students to listen to their peers' opinions and express disagreements in constructive ways. 		<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 Resources	<ul style="list-style-type: none"> • Internet resources such as Massive Open Online Courses (MOOCs) (https://www.youtube.com/watch?v=N4MdZxI fgbA; https://www.youtube.com/watch?v=ZcF8E8aAOGs; https://www.youtube.com/watch?v=vTq4sgGd2QU) • Projectors • Charts 	<ul style="list-style-type: none"> • Pictures of Binary compounds, • Equations and reaction equations • Books and Journals. 	<ul style="list-style-type: none"> • Videos on the relationship between binary compounds, chemical equations, and names of compounds • Models

Subject **GENERAL SCIENCE**
Strand **2. PROCESSES FOR LIVING**
Sub-Strand **1. ESSENTIALS FOR SURVIVAL**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
1.2.1.LO.1		
<p>Appreciate the movement of substances in biotic and abiotic media.</p>	<p>Creativity and Innovation: Learners make presentations and model the process of osmosis.</p> <p>Communication and Collaboration: Putting learners in differentiated learning groups will facilitate communication and collaboration skills acquisition.</p> <p>Critical Thinking and Problem-Solving Skills: Learners make presentations and discuss applications of diffusion.</p> <p>Critical Thinking:</p> <ul style="list-style-type: none"> • Consider personal reactions to situations or problems and how these reactions may influence thinking. • Make simple modifications to known ideas and routine solutions to generate some different ideas and possibilities. • Examine words that show reasons and words that show conclusions. • Compare and contrast information and ideas in own and others' reasoning. 	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals' opinions. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • being aware of their own biases and stereotypes • embrace diversity and practice inclusion. <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p>

	<ul style="list-style-type: none"> • Consider how reasons and examples are used to support a point of view and illustrate meaning. • Consider ways to express and describe thinking activity, including the expression of feelings about learning, both to others and to self. • Explore some learning strategies, including planning, repetition, rewording, memorisation and use of mnemonics. • Investigate ways to problem-solve using experiential language. • Use and give examples of different kinds of questions. Generate ideas that are new and make choices after considering personal preferences. • Identify words that indicate components of a point of view. Use reasons and examples for different purposes. • Express and describe the thinking activity. Practice some learning strategies. Demonstrate and articulate some problem-solving approaches. 	<ul style="list-style-type: none"> • Demonstrating respect for diversity among learners • Reflecting on positive and negative choices in relationships and the consequences of each choice. • Incorporating emotional and behavioural regulation techniques that include breathing exercises, muscle relaxation, journaling, mindfulness exercises, and the use of nonverbal means of expression such as music, art, dance, and yoga. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
1.2.1.LO.2		
<p>Illustrate the principles of reproduction.</p>	<p>Digital Literacy:</p> <ol style="list-style-type: none"> 1. Operating videos and the internet will enhance digital literacy skills. 2. Working with videos. <p>Communication and Collaboration: Learners discuss and describe the structure of the reproductive system.</p> <p>Critical Thinking:</p> <ol style="list-style-type: none"> 1. Dealing with misconceptions. 2. Consider personal reactions to situations or problems and how these reactions may influence thinking. 3. Make simple modifications to known ideas and routine solutions to generate some different ideas and possibilities. 	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals' opinions. • being sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • being aware of their own biases and stereotypes • embrace diversity and practice inclusion.

	<ol style="list-style-type: none"> 4. Examine words that show reasons and words that show conclusions. 5. Compare and contrast information and ideas in own and others' reasoning 6. Consider how reasons and examples are used to support a point of view and illustrate meaning 7. Consider ways to express and describe thinking activity, including the expression of feelings about learning, both to others and to self. 8. Explore some learning strategies, including planning, repetition, rewording, memorisation, and use of mnemonics. 9. Investigate ways to problem-solve using experiential language. 10. Use and give examples of different kinds of questions. Generate ideas that are new and make choices after considering personal preferences. 11. Identify words that indicate components of a point of view. Use reasons and examples for different purposes. 12. Express and describe thinking activity. Practice some learning strategies. Demonstrate and articulate some problem-solving approaches. 	<p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • fostering an environment that supports relationship building among learners and between students and staff. • offering positive support when learners are having difficulties with self-regulation. • fostering learners' awareness of real-world problems and issues to apply what they are learning. • building learners' self-confidence. • offering positive support when learners are having difficulties with self-regulation. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
1.2.1.LO.3		
<p>Design Possible solutions to address sexually related societal problems.</p>	<p>Communication and Collaboration: Using Talk for Learning.</p> <p>Problem-solving skills: Calculate the menstrual cycle.</p> <p>Digital Literacy: Internet resources and making presentations using projectors/PowerPoints, etc.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals' opinions.

	<p>Global citizenship: Examining adolescent reproductive health as a global issue.</p> <p>Communication and Collaboration Using Talk for Learning</p>	<ul style="list-style-type: none"> • being sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • being aware of their own biases and stereotypes. • embrace diversity and practice inclusion • Identify and examine traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • fostering an environment that supports relationship building among learners and between learners and staff. • offering positive support when learners are having difficulties with self-regulation. • fostering learners’ awareness of real-life issues builds learners’ self-confidence. • offering positive support when learners are having difficulties with self-regulation <p>National Values Tolerance and respect for human dignity. Cleanliness, Friendliness, Respect, Empathy</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st-Century Skills and GESI		Assessment
1.2.1.CS.1	1.2.1.LI.1		1.2.1.AS.1
Demonstrate understanding and appreciation and model the movement of substances in biotic and abiotic media.	<p>Explain the concept of diffusion and its application in life.</p> <ol style="list-style-type: none"> Using the guided learning approach, put learners in mixed-ability groups to design and model the osmosis process. <p>NOTE: Ensure that learners remain attentive throughout the learning period.</p> <ol style="list-style-type: none"> Learners in mixed-sex and mixed-ability groups present their work to the class. Learners make presentations in a mixed-ability group to explain osmosis. Encourage females to play key roles in the presentation if possible. Learners should discuss the application of osmosis in everyday life. 		<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>
	1.2.1.LI.2		1.2.1.AS.2
	<p>Design, model and explain the osmosis process and indicate its application to everyday life.</p> <ul style="list-style-type: none"> Group learners according to different abilities and mixed-sex where appropriate. Use think-pair-share to discuss diffusion and its application. Demonstrate the diffusion process by using perfume/Potassium Permanganate crystals/volatile substances like camphor. <p>NOTE: Check for learners who are allergic to strong scents. Ensure that there is no air blowing. Care must be taken when introducing potassium permanganate into water. Do not use 'spread perfume'.</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 Resources	<ul style="list-style-type: none"> Cellophane or any suitable substance available. Yam tissue, potato tissue or any suitable substance available. Table salt/sugar. Water Bowl 		<ul style="list-style-type: none"> Colour (washing blue) Video Clips/2. Internet resources such as (https://www.youtube.com/watch?v=jhszFBtBPoI; https://www.youtube.com/watch?v=JnlkGtK0-Js) Liquid perfume in a container with a lid. Potassium Permanganate crystals, Camphor

Content Standards	Learning Indicators and Pedagogical Exemplars (with emphasis on 21st-Century Skills and Competencies and GESI)	Assessment
1.2.1.CS.2	1.2.1.LI.1	1.2.1.AS.1
<p>Demonstrate knowledge and understanding of the principles of reproduction and their application in addressing sexually related societal problems.</p>	<p>Explain reproduction in plants and humans.</p> <p>Activity-based Learning</p> <ul style="list-style-type: none"> • Embark on a nature walk around the school to observe different kinds of plants. • Task learners to identify the parts of the various plants observed that are used in reproduction. <p>Project-based Learning: Place learners into groups to prepare and give presentations on:</p> <ul style="list-style-type: none"> • Sexual reproduction in plants using resources such as flowers, fruits and seeds. • Asexual reproduction in plants using vegetative parts such as corm, rhizome, suckers, stem cuttings and bulbs. • Pollination and its role in sexual reproduction in plants. <p>Activity-Based Learning</p> <ul style="list-style-type: none"> • Using models, videos, pictures or charts of the female reproductive system, learners describe the structure and explain the function of the parts of the structure. • Allow learners to raise critical concerns for clarifications from experiences or misconceptions concerning the structure and function of the female reproductive system of mammals. • Be aware of stereotypes when using videos, pictures, models or charts. Learners describe the structure and explain the functions of the parts of the male reproductive system. 	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
	1.2.1.LI.2	1.2.1.AS.2

	<p>Explain the female menstrual cycle and show how that can be used to address reproduction-related issues.</p> <ul style="list-style-type: none"> Put learners into mixed-ability groups and guide them to calculate the menstrual cycle using pictures/charts/videos. Using Talk for Learning strategies and reflections from Internet resources/books, compare global best practices of menstrual hygiene. 	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
	<p>1.2.1.LI.3</p> <p>Apply knowledge of reproduction-related issues (teenage pregnancy, STI, reproductive health) to address challenges of adolescent reproductive health.</p> <p>Learners work in mixed-ability groups and different ability groups using Talk for Learning approaches to examine and make presentations on adolescent reproductive health issues.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <i>Ensure that each group addresses a particular issue.</i> <i>Encourage males to play leading roles in supporting female experiences and participate fully in the activities for menstrual hygiene day, 28th May, every year.</i> 	<p>1.2.1.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 Resources</p>	<ul style="list-style-type: none"> Videos Pictures Charts/pictures and models of the reproductive system of male and female humans. Videos of the reproductive system of mammals. Internet resources such as https://www.webmd.com/baby/healthtool-ovulation-calculator; 	<ul style="list-style-type: none"> Books Charts/videos/pictures of the menstrual cycle. Internet resources such as (https://www.webmd.com/baby/healthtool-ovulation-calculator; https://www.always.com/en-us/period-calculator) Flowers, fruits and seeds

	<p>https://www.unfpa.org/resources/adolescent-sexual-and-reproductive-health;</p> <p>https://www.youtube.com/watch?v=IBHRwkZPNac;</p> <ul style="list-style-type: none"> • Journals 	<ul style="list-style-type: none"> • Vegetative parts of plants such as corm, rhizome, suckers, stem cuttings and bulbs. <p>Videos showing propagation in plants, projectors and other ICT resources.</p>
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Subject **GENERAL SCIENCE**
Strand **3. VIGOUR BEHIND LIFE**
Sub-Strand **1. POWERING THE FUTURE WITH ENERGY FORMS.**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
I.3.1.LO.1		
<p>Relate forms of energy to their sources and their generation.</p>	<p>Communication (Speaking and listening): Learners sharing ideas on the activities.</p> <p>Collaboration: Learners working together in groups to come out with various views.</p> <p>Digital Literacy: Simulations, videos and internet resources.</p> <p>Cultural Identity: examining and associating themselves with the materials from the school and home environment.</p> <p>Personal Development and leadership: Sharing reports on their projects based on usability.</p> <p>Communication and Collaboration: Communicate effectively verbally, non-verbally and through writing with peers in class.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals' opinions • being sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • being aware of their own biases and stereotypes • embrace diversity and practice inclusion. <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • giving an opportunity to explore how they learn from each other. • acknowledging one another's strengths. • working together and building self-confidence. • managing their emotional reactions, thoughts and behaviours. • coping with stressful experiences.

		<ul style="list-style-type: none">• setting goals and working towards achieving them.• learning to listen to their peers' opinions and express disagreement in constructive ways. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility, curiosity, awareness, courage, tolerance, patience, assertiveness, critical, observant, openness, Fairness,</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
I.3.1.CS.1	I.3.1.LI.1	I.3.1.AS.1
Demonstrate understanding of forms of energy, sources, their generation and effects on the environment.	<p>Describe the generation of electricity from solar cells/panels.</p> <ul style="list-style-type: none"> • Use a Talk for Learning approach to engage learners to revise various forms of electricity generation from the JHS curriculum (B7.4.2.1.1) and do group presentations. • Guide learners to use diamond nine strategy³ to brainstorm on the meaning, advantages, and disadvantages of solar energy to life and the environment. • Learners use concept maps/videos/pictures/charts/diagrams, and internet resources to describe electricity generation from solar panels to create awareness of the relationship between solar energy and the environment. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	<p>I.3.1.LI.2</p> <p>Design and build Solar panel using locally available materials.</p> <ol style="list-style-type: none"> 1. Learners watch videos/simulations or look at diagrams/drawings of how solar panels are made. 2. Provide guidelines for learners to collect different materials from their immediate environment (home and school) that can be used for building solar panels. 3. Using a Project-based approach, learners work in mixed-ability groups to design solar panels using the materials collected from the environment. 4. Provide opportunities for learners to reflect on their project through reporting, cross-sharing and think-pair-share on its usability and advantages. 	I.x.3.1.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 Resources	<ul style="list-style-type: none"> • Prototypes of solar panels • Charts, pictures, and simulations of various forms of electricity generation. 	

³ [What is diamond ranking strategy? \(k12teacherstaffdevelopment.com\)](http://k12teacherstaffdevelopment.com)

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| | <ul style="list-style-type: none">• Internet resources such as (https://www.youtube.com/watch?v=9BgDt407uQc;
https://www.youtube.com/watch?v=lxoHqV2fMK4)• Different appropriate materials from the environment. |
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Subject **GENERAL SCIENCE**
Strand **3. VIGOUR BEHIND LIFE**
Sub-Strand **2. FORCES ACTING ON SUBSTANCES AND MECHANISMS**

Learning Outcomes	21st- Century Skills and Competencies	GESI, SEL and Shared National Values
<p>1.3.2.LO.1</p> <p>Apply various forms of forces according to their effects on motions.</p>	<p>Communication and Collaboration:</p> <ol style="list-style-type: none"> 1. Working in groups will encourage sharing of ideas among learners. 2. Learners' ability to explain their views to their peers and respect each other's views will be encouraged. <p>Critical thinking and problem-solving:</p> <p>Learners will:</p> <ol style="list-style-type: none"> 3. Think strategically about the concepts and how to solve life problems. 4. Explore the applications of the concepts of forces. 5. Consider personal reactions to situations or problems and how these reactions may influence thinking. 6. Make simple modifications to known ideas and routine solutions to generate some different ideas and possibilities. 7. Examine words that show reasons and words that show conclusions 8. Compare and contrast information and ideas in own and others' reasoning. 9. Consider how reasons and examples are used to support a point of view and illustrate meaning. 10. Consider ways to express and describe thinking activity, including the expression of feelings about learning, both to others and to self. 11. Explore some learning strategies, including planning, repetition, rewording, memorisation, and use of mnemonics. 	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different beliefs, religions, and cultures • being sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • Being aware of their own biases and stereotypes • embrace diversity and practice inclusion • identify and examine traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • giving an opportunity to explore how they learn from each other. • acknowledging one another's strengths.

	<p>12. Investigate ways to problem-solve using experiential language.</p> <ul style="list-style-type: none"> ○ Use and give examples of different kinds of questions. Generate ideas that are new and make choices after considering personal preferences. ○ Identify words that indicate components of a point of view. Use reasons and examples for different purposes. ○ Express and describe thinking activity. Practice some learning strategies. Demonstrate and articulate some problem-solving approaches. 	<ul style="list-style-type: none"> ● working together and building self-confidence. ● practice managing their emotional reactions, thoughts and behaviours. ● coping with stressful experiences. ● goals setting and work towards achieving them. ● listening to their peers' opinions and expressing disagreement in constructive ways. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI		Assessment
1.3.2.CS.I	1.3.2.LI.I		1.3.2.AS.I
Recognise the various forms of forces and their effects on motions.	Identify and explain concepts associated with forces. <ul style="list-style-type: none"> Using a Talk for Learning Approach, place learners in mixed-ability/mixed-sex groups to discuss the concepts of distance, displacement, speed, velocity and acceleration with contextual examples. Using the enquiry approach, guide learners to develop task sheets to explore real life applications of the concepts of speed, displacement, velocity, and acceleration while managing technical words and terminology. Using the 3E approach⁴, guide learners to engage, explore and explain concepts such as forces, momentum and pressure. Using differentiated learning and scaffolding, guide learners to explore the applications of the concepts of forces, Momentum and Pressure in real life. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> Stop clocks/watches. Charts, pictures and models. Bicycle wheels and pendulum bobs. PHET Simulations 	<ul style="list-style-type: none"> Pendulum bob Balls (Volley, foot, basket, etc.), Trolleys 	<ul style="list-style-type: none"> Pendulum bob, Balls (Volley, foot, basket, etc.), Siphoning materials (tube, container).

⁴ [3E Framework | 3E Education](#)

Subject **GENERAL SCIENCE**
Strand **3. VIGOUR BEHIND LIFE**
Sub-Strand **3. CONSUMER ELECTRONICS**

Learning Outcomes	21st- Century Skills and Competencies	SEL and Shared National Values
<p>I.3.3.LO.1</p> <p>Identify selected electronic components and their uses in household electronic gadgets and the use of amplifiers.</p>	<p>Critical Thinking and Problem Solving:</p> <ol style="list-style-type: none"> 1. Learner’s ability to think and solve problems by designing circuits and building amplifiers. 2. Consider personal reactions to situations or problems and how these reactions may influence thinking. 3. Make simple modifications to known ideas and routine solutions to generate some different ideas and possibilities. 4. Examine words that show reasons and words that show conclusions 5. Compare and contrast information and ideas in own and others' reasoning. 6. Consider how reasons and examples are used to support a point of view and illustrate meaning. 7. Consider ways to express and describe thinking activity, including the expression of feelings about learning, both to others and to self. 8. Explore some learning strategies, including planning, repetition, rewording, memorisation, and use of mnemonics. 9. Investigate ways to problem-solve using experiential language. 10. Use and give examples of different kinds of questions. Generate ideas that are new and make choices after considering personal preferences. 11. Identify words that indicate components of a point of view. Use reasons and examples for different purposes. 12. Express and describe the thinking activity. Practice some learning strategies. Demonstrate and articulate some problem-solving approaches. 	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals' opinions • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • being of their own biases and stereotypes • embrace diversity and practice inclusion • identify and examine traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ol style="list-style-type: none"> 1. setting goals and working towards achieving them. 2. listening to their peers’ opinions and expressing disagreement in constructive ways. <ul style="list-style-type: none"> • completing their work with other peers in mixed-ability groups.

	<p>Collaboration and Communication: Learners report on their projects confidently and effectively to different participants in different contexts.</p> <p>Creativity and Innovation: Learners will be allowed to introduce their ideas in designing the documents, leading to innovation and creativity.</p>	<ul style="list-style-type: none"> ● acknowledging the importance of self and peer evaluation. ● adjusting to real-life scenarios and believing their thoughts and opinions are valued. <p>National Values: Curiosity, Awareness, Courage, Tolerance, Openness, Fairness.</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st-Century Skills and GESI	Assessment
1.3.3.CS.1	1.3.3.LI.1	1.3.3.AS.1
Demonstrate knowledge and recognition of selected electronic components and their uses in Household Electronic devices.	<p>Explain the uses of electronic components in household electronic devices and amplifiers.</p> <ul style="list-style-type: none"> • Guide learners to revise the basic components of electronics from the JHS curriculum using Talk for Learning approaches and internet resources. • Demonstrate to learners how basic components of electronics are used in circuits and electronic devices using simulations, pictures, charts and realia. • In mixed-sex and differentiated groupings, learners design circuits involving transistors and switches and use them to build amplifiers. • Address stereotypes related to electronic components and household devices and encourage all learners to actively participate in learning activities. 	<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 Resources	<ul style="list-style-type: none"> • Capacitor, LED, transistors, resistors, diodes, switches • Pictures/charts/videos of simple amplifiers. 	

Subject **GENERAL SCIENCE**
Strand **4. RELATIONSHIPS WITH THE ENVIRONMENT**
Sub-Strand **I. THE HUMAN BODY AND HEALTH**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
<p>I.4.1.LO.1</p> <p>Discuss everyday hazards and how to manage them in the environment.</p>	<p>Communication and Collaboration using think-pair-share.</p> <p>Digital Literacy: the use of camera and voice recording device</p> <p>Problem-solving: Assess the possible risks and hazards associated with the industry.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals' opinions • being sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • Being aware of their own biases and stereotypes • embrace diversity and practice inclusion • identify and examine traditional gender roles and stereotypes <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • set goals and work towards achieving them. • learn to listen to their peers' opinions and express disagreement in constructive ways. • develop respectful relationships with one another, families and other people.

		<ul style="list-style-type: none"> • develop the skill of completing their work with other peers in mixed-ability groups. • acknowledge the importance of self and peer evaluation. • learn to adjust to real-life scenarios and believe their thoughts and opinions are valued. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
I.4.1.LO.2		
Distinguish various types of lifestyle diseases.	<p>Communication and Collaboration: Using Talk For Learning, think-pair-share</p> <p>Problem-solving: Allow learners to assess lifestyle diseases within their own environment.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals' opinions • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • being aware of their own biases and stereotypes • embrace diversity and practice inclusion • identify and examine traditional gender roles and stereotypes, <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Foster an environment that supports relationship building among students and between students and staff.

		<ul style="list-style-type: none"> • Offer positive support when students are having difficulties with self-regulation. • Foster students' awareness of real-life issues • Build students' self-confidence. • Offer positive support when students are having difficulties with self-regulation. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
<p>1.4.1.LO.3 Clarify the concept of drugs and reflect on their effects on humans.</p>	<p>Communication and Collaboration: Learning in differentiated groups offers the opportunity for learners to interact and work together.</p> <p>Digital Literacy: use of the internet.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • respect individuals' opinions. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of personal biases and stereotypes • embrace diversity and practice inclusion. <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • listening to their peers' opinions and expressing disagreement in constructive ways. • acknowledging the importance of self and peer evaluation.

		<ul style="list-style-type: none">• adjusting real-life scenarios and believing their thoughts and opinions are valued• helping students accurately assess their own capabilities and qualities.• becoming aware of their own emotions and internal states. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
1.4.1.CS.1	1.4.1.LI.1	1.4.1.AS.1
Demonstrate understanding of hazards in everyday life and how to manage them.	<p>Explore common risks and hazards in the environment and how to address them.</p> <ul style="list-style-type: none"> Enumerate possible hazards and risks in the home and workplace using think-pair-share. Visit a local industry that is accessible, such as sawmills, palm kernel oil production, gari processing, etc. and assess the possible risks and hazards associated with their activities. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> Pictures, charts, and videos on workplace and home hazards. Camera, voice recording device, writing materials. 	

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI		Assessment
1.4.1.CS2	1.4.1.LI.1		1.4.1.AS.1
Show understanding of Lifestyle Diseases, their causes, symptoms and prevention.	<p>Describe lifestyle diseases, their causes, effects and prevention.</p> <ul style="list-style-type: none"> ▪ Invite a resource person (Healthcare giver/Medical practitioner/public health Nurse) to talk about lifestyle diseases. ▪ Allow learners to assess these lifestyle diseases within their own environment, noting diseases that easily leads to stigmatisation, using guided inquiry and cross-share with their peers in class. ▪ Using Talk for Learning approaches, let learners show the difference in the various lifestyle diseases according to their causes, effects, preventions and how to manage stigma on recovered patients. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> • Public Address system • Resource person • Pictures/videos of humans suffering from lifestyle diseases 	<ul style="list-style-type: none"> • Charts of diseases • Health Journals 	

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI		Assessment
1.4.1.CS.3	1.4.1.LI.1		1.4.1.AS.1
Exhibit understanding of the concept of drugs and reflect on their effects on humans as well as their control.	<p>Analyse the attributes of drugs.</p> <ul style="list-style-type: none"> • Put learners in mixed-ability groups to brainstorm and come out with the attributes of drugs. • Invite a resource person to talk to learners about drugs, their attributes and harmful effects. • Learners use the internet, books, videos, and journals to search to consolidate what they have learnt on the effects of drugs on humans and how to control the use of drugs. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> • Computer with a modem, charts, videos, journals, and books showing people affected by drug abuse. • Resource person. 	<ul style="list-style-type: none"> • Active Internet services. • Computer and Mobile phones. 	

Subject **GENERAL SCIENCE**
Strand **4. RELATIONSHIPS WITH THE ENVIRONMENT**
Sub-Strand **2. TECHNOLOGY IN OUR LOCAL INDUSTRIES**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
<p>1.4.2.LO.1</p> <p>Produce local soap in the community.</p>	<p>Communication: Writing a report about the field trip.</p> <p>Collaboration and Communication: working together in mixed-ability and mixed-sex groups.</p> <p>Critical Thinking:</p> <ol style="list-style-type: none"> 1. Designing an experiment to prepare a local soap. 2. Make simple modifications to known ideas and routine solutions to generate some different ideas and possibilities. 3. Compare and contrast information and ideas in own and others' reasoning 4. Consider how reasons and examples are used to support a point of view and illustrate meaning 5. Consider ways to express and describe thinking activity, including the expression of feelings about learning, both to others and to self 6. Explore some learning strategies, including planning, repetition, rewording, memorisation, and use of mnemonics 7. Investigate ways to problem-solve using experiential language <p>Digital Literacy:</p> <ul style="list-style-type: none"> • Technology devices • Operating digital cameras and voice recording devices. 	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals' opinion • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practise inclusion • identify and examine traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Completing their work with other peers in mixed-ability groups. • Acknowledging the importance of self and peer evaluation.

		<ul style="list-style-type: none"> Adjusting to real-life scenarios and believing their thoughts and opinions are valued <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
I.4.2.LO.2		
Conduct a project on the production of an indigenous food and produce a report.	<p>Communication and Collaboration: Working in groups</p> <p>Critical Thinking: Designing the activity to prepare a local food</p> <p>Problem-solving: Designing the activity to prepare a local food</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> Respect individuals of different beliefs, ideas and abilities Value and work in groups to enhance teamwork and friendliness to model an inclusive society. Embrace diversity and practice inclusion. Gain clarity on misconceptions/ myths about gender and disabilities as they relate to group dynamics in science. Interrogate their stereotypes and biases about gender roles in indigenous food production and leadership. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> Listening to their peers' opinions and expressing disagreement in constructive ways. Developing respectful relationships with one another and other people.

		<ul style="list-style-type: none">• Developing the skill of completing their work with other peers in mixed-ability groups.• Acknowledging the importance of self and peer evaluation.• Learning to adjust to real-life scenarios and believe their thoughts and opinions are valued <p>National Values: Curiosity, vigilance, cooperation</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
I.4.2.CS.1	I.4.2.LI.1	I.4.2.AS.1
Demonstrate understanding of the process of local soap making and design methods of producing soaps for different purposes for income generation.	<p>Experiment to produce different types of soap.</p> <ul style="list-style-type: none"> Organise a visit for learners to a place where local soap is produced and observe the processes of production. Write a report on the processes involved. Putting learners in mixed-ability groups, let them search the internet, brainstorm/think-pair-share on the science in the process (Saponification) of local soap making. 	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning.</p>
	<p>I.4.2.LI.2</p> <p>Explain the processes of producing different types of soap.</p> <ul style="list-style-type: none"> Put learners into mixed-ability groups to conduct experiments to prepare a local soap. They should vary the materials (reactants) to see the outcomes. Lead learners to visit a place in your community where local soap(s) is/are produced to observe and document the stages of production and the diversity in the soaps. Learners will then reflect and make presentations. Allow learners, working in convenient groups, to use the internet, books, and journals to brainstorm and write a report on the science processes (saponification, etc.) in the stages of production of the local soap. 	<p>I.4.2.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 Resources	<ul style="list-style-type: none"> Writing materials Camera. Voice recording device Journal from a field trip Internet sources (https://www.youtube.com/watch?v=IMtzyxQiqKo, https://www.youtube.com/watch?v=Kc7duzDEa6Y) 	

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI		Assessment
I.4.2.CS.2	I.4.2.LI.1		I.4.2.AS.1
<p>Explore the production of indigenous food (gari, akeyeke, yakeyake, kenkey [Ga or Fante], aboloo, tubaani, dawadawa, etc).</p>	<p>Investigate the production of an indigenous food to identify the science processes in the stages of production.</p> <ul style="list-style-type: none"> • Place learners into mixed-ability groups and let the learners design an activity to prepare a named local food. • Lead learners to visit a place in your community where local food is produced to observe and document the stages of production and the diversity in the foods. Learners will then reflect and make presentations. • Allow learners, working in convenient groups, to use the internet, books, and journals to brainstorm and write a report on the science processes (fermentation, sun drying, etc.) in the stages of production of the local food. 		<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 Resources</p>	<ul style="list-style-type: none"> • Voice recording device • Journal from a field trip • Internet sources (https://www.youtube.com/watch?v=IMtzyxQiqKo, https://www.youtube.com/watch?v=Kc7duzDEa6Y) • Potash (ash from burnt stalks, cocoa pods, plantain peels etc.), vegetable oil, fire source, saucepan, beaker, weighing scale, common salt, water, and filter paper. • Camera and voice recording device. • Journal from field trip. 	<ul style="list-style-type: none"> • Internet resources (http://pubs.sciepub.com/jfs/5/3/3/index.html, http://pubs.sciepub.com/jfs/5/3/3/index.html) • Local food materials/ingredients • Checklist of science processes involved in processing local food. • Writing materials • Camera 	

YEAR TWO

Subject **GENERAL SCIENCE**
Strand **I. EXPLORING MATERIALS**
Sub-Strand **I. SCIENCE AND MATERIALS IN NATURE**

Learning Outcomes	21st- Century Skills and Competencies	GESI ³ , SEL ⁴ and Shared National Values
2.1.1.LO.1		
<p>Describe the nature and uses of different liquids in the Lives of humans.</p>	<p>Communication and Collaboration</p> <ol style="list-style-type: none"> 1. Working together entails listening to each other and communicating in ways that are cordial. 2. Working together in small and mixed-ability groups. <p>Metacognition: Think through their own understanding of the materials they see every day in the environment.</p> <p>Personal Development: Working and collecting materials in the environment and in groups helps learners to deepen their knowledge of personal development.</p> <p>Critical Thinking: Designing and conducting experiments.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practise inclusion • identify and examine traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <p>Self-awareness: Explore how they learn Self-Management: Manage their observations and conclusions from the experiments and discussion Social Awareness: Listen to their peers' opinions and express disagreements or offer constructive suggestions.</p>

		<p>Relationship Skills: Offer opportunities to manage interpersonal conflicts in groups and during discussion of observations.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI		Assessment
2.1.1.CS.1	2.1.1.LI.1		2.1.1.AS.1
Demonstrate understanding of liquids in the Lives of humans.	Differentiate among acids, bases and water. Group/Collaborative Learning: Set up activities for different abilities and/or mix sex (where applicable) and supervise groups to perform experiments, observe and discuss the differences in acids, bases/alkalis, salts and water according to how they observe the activities individually and in groups.		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	2.1.1.LI.2		2.1.1.AS.2
	Apply the knowledge of acids and bases in analysing the formation of salts and their uses. Collaborative Learning: <ul style="list-style-type: none"> Provide worksheets as guidelines for groups of learners and supervise them to explore the mixing of acids and bases/alkalis to form salts. Let learners represent the combinations with equations and cross-share. Using think-pair-share, learners discuss the uses of salts. Pay attention to less assertive and other learners who need additional support. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
2.1.1.LI.3		2.1.1.AS.3	
Describe how to measure the concentration of solutions and how to use the pH scale to identify the concentration of acids and bases/alkalis. Problem-Based Learning: In small mixed-ability groups, set up experiments for learners and supervise groups while providing support for learners who need extra support to prepare solutions of various concentrations and to identify acids, bases or alkalis using the pH scale.		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning	
Teaching and Learning Resources	<ul style="list-style-type: none"> Acid (HCl or any suitable one) 	<ul style="list-style-type: none"> measuring cylinders weighing scale 	<ul style="list-style-type: none"> mineral acids pH scale

	<ul style="list-style-type: none">• base/Alkali (CaO, $\text{Na}_2\text{O}/\text{Ca}(\text{OH})_2$, NaOH etc) reagents• conical flasks• white tiles• 250ml beakers	<ul style="list-style-type: none">• indicators• 1-litre volumetric flasks• alkali	<ul style="list-style-type: none">• stirrers• pipettes• distilled water
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Subject **GENERAL SCIENCE**
Strand **2. PROCESSES FOR LIVING**
Sub-Strand **1. ESSENTIALS FOR SURVIVAL**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
2.2.1.LO.1		
Model and describe the structure and function of the human body parts that are responsible for the removal of waste.	<p>Collaboration and Communication: Learners work in mixed-sex groups to develop collaborative skills. Communication skills are developed when learners discuss in groups.</p> <p>Critical thinking and problem-solving: Give all learners equal opportunity to provide oral and/or written descriptions of the steps involved in the processes for the removal of waste from the human body system.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practice inclusion • identify and challenge traditional gender roles and stereotypes. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
2.2.1.LO.2		
Recognise and explain that the energy released during respiration is used to drive	<p>Digital Literacy:</p> <ul style="list-style-type: none"> • Working with videos and the internet will develop learners' digital literacy skills. • Using internet resources and videos 	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p>

<p>processes in the human body.</p>	<p>Collaborative and Communication skills:</p> <ul style="list-style-type: none"> • Group work and discussions. • Using Talk For Learning in groups and whole class discussions. • Communication skills are developed as they share ideas in their various groups. <p>Self-confidence: Learners work in mixed-ability groups, share ideas and build their confidence level.</p>	<ul style="list-style-type: none"> • gain respect for individuals of different backgrounds. • being sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practise inclusion • identify and challenge traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science teaching pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <p><i>Responsible Decision Making:</i> Offer learners opportunities to make connections between classroom activities and their personal goals.</p> <p><i>Self-awareness:</i> Explore how they learn and build self confidence.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
2.2.1.CS.1	2.2.1.LI.1	2.2.1.AS.1
Demonstrate an understanding of how waste substances are removed from the human body.	<p>Analyse the structure and function of the excretory organs in the human body.</p> <p>Group work/collaborative Learning: Using models or videos, put learners in mixed-ability groups and supervise groups to analyse the structure and function of excretory organs in the human body system.</p>	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
	<p>Describe the processes for the removal of waste from the human body.</p> <p>Project-based Learning:</p> <ul style="list-style-type: none"> In mixed-ability groups, do a mini-investigation on the processes of removal of waste by the human excretory system using technological devices. In mixed-ability/ mixed-sex groups, perform an activity to demonstrate the process for the removal of waste from the human body system. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
2.2.1.LI.3	2.2.1.AS.3	
	<p>Evaluate disorders of the human excretory organ system.</p> <p>Project-based Learning:</p> <ol style="list-style-type: none"> In mixed-ability groups, do a mini-investigation on disorders of the human excretory system using internet resources and library sources that should be available to learners in advance. Learners do group critiquing of their investigations. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> Models or videos (see the link below) (https://www.kenhub.com/en/library/anatomy/human-body-systems) chart/picture, books Books 	<ul style="list-style-type: none"> Internet resources Journals Magazines

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI		Assessment
2.2.1.CS.2	2.2.1.LI.1		2.2.1.AS.1
Demonstrate knowledge and ability to carry out research on how air moves in and out of humans.	Explain, with diagrams, the concept of the movement of air in humans and its importance. Initiating Talk for Learning and Collaborative Learning: <ul style="list-style-type: none"> With the aid of charts, models, pictures, etc., learners discuss and ascertain in groups of mixed-ability the movement of air in humans from the nostrils to the lungs. Learners brainstorm on the importance of the movement of air in humans from the nostrils to the lungs. 		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 the structure of the lungs and investigate the products of aerobic respiration. Group work/collaborative Learning: <ul style="list-style-type: none"> With the aid of Models, videos, and charts, learners describe the structure of the human lungs in whole class discussion. In differentiated learning groups, use think-pair-share to investigate the products of aerobic respiration, supported by models, books, pictures, videos and internet sources. Learners reflect on the concepts of breathing and respiration and discuss the misconceptions between the two concepts. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
2.2.1.LI.3		2.2.1.AS.3	
Discuss disorders associated with the respiratory system. Initiating Talk for Learning and Group work/collaborative Learning: <ul style="list-style-type: none"> Put learners in differentiated learning groups to review the structure of the lungs after viewing videos/models or pictures of the human lungs with various disorders. Through think-pair-share, learners assess the effects of smoking on the structure of the lungs aided by pictures/videos and models. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning	
Teaching and Learning Resources	<ul style="list-style-type: none"> Models or videos, pictures/charts/books and internet resources showing aerobic respiration. Models/pictures/charts or videos and internet resources 	<ul style="list-style-type: none"> Books Journals 	

Subject **GENERAL SCIENCE**
Strand **3. VIGOUR BEHIND LIFE**
Sub-Strand **1. POWERING THE FUTURE WITH ENERGY FORMS**

Learning Outcomes	21st- Century Skills and Competencies	GESI, SEL and Shared National Values
<p>2.3.1.LO.1</p> <p>Construct and analyse electric circuits in determining resistance, potential difference, and current and distinguish between step-up and step-down transformers.</p>	<p>Communication: Learners are given the opportunity to share their views through group work.</p> <p>Digital literacy skills will be enhanced as learners watch and operate videos and carry out simulations.</p> <p>Critical Thinking: Learners are encouraged to explore a variety of circuits and how they are used in homes and schools.</p> <p>Personal development and leadership as learners are given the opportunity to take up leadership roles in groups to explain their research findings. Learners use their roles assigned to them to express their views using their own language on the task.</p> <p>Critical thinking and problem-solving: Learners use the experiment to solve problems of electrocution among people when they touch electric appliances with wet hands.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes. • embrace diversity and practise inclusion. • identify and examine traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <p><i>Self-Awareness:</i> make learners feel successful and confident</p> <p><i>Social Awareness:</i> help learners to be aware of real-world problems and issues from the construction of cells from local materials.</p>

		<ul style="list-style-type: none">• <i>Self-Management</i>: help learners work together in groups and with partners. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
2.3.1.CS.1	2.3.1.LI.1	2.3.1.AS.1
<p>Demonstrate understanding of electricity as a form of energy.</p>	<p>Explain the concept of electrical energy and power.</p> <ul style="list-style-type: none"> • Review previous knowledge of sources of electrical energy through collaborative learning by using PHET simulations, pictures and videos. Ensure groups are manageable and supervised appropriately. • Put learners in mixed-ability groups to construct functional electric circuits and use them to calculate current, resistance and voltage while providing positive remarks to group work. • Demonstrate how meter reading is carried out and how to calculate energy consumed with meter reading and communicate their findings in groups. • Using inclusive and differentiated learning, the teacher demonstrates to learners how appliance troubleshooting at home or school is done and dispels misconceptions and stereotypes about males' and females' abilities in handling electricity. • Learners research on how to conduct energy audits, energy savings plans, and safety devices used in electrical circuits. • Through experiments, lead learners to demonstrate the electrical conductivity of different liquids (distilled water, drinking water, lemon juice, sugar solution, coconut oil, vinegar, and other appropriate liquids) • Use models, pictures and charts to help learners make their own cells through project-based teaching. • Assist learners to explain the heating effect of electric currents using Talk for Learning approaches. <p>NOTE: Learners should not taste the liquids during the activities.</p>	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
	2.3.1.LI.2	2.3.1.AS.2
	<p>Explain the principle of the transformer and its function.</p> <p>Demonstrate the build-up and usage of step-up and step-down transformers using practical activities.</p>	<p>Level 1 Recall Level 2 Skills of conceptual understanding</p>

		Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning on how the transformer works.
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Teaching and Learning Resources	<ul style="list-style-type: none"> • PHET simulations, pictures, videos, charts and models showing sources of electrical energy. • LEDs, bulbs, dry cells, connecting wires and switches. • Meter, Videos, pictures and charts showing meter readings. 	<ul style="list-style-type: none"> • Testers, sockets. • Metal pins, rubber cap of injection bottle, connecting wires, distilled water, drinking water, vinegar, sugar solution and lemon juice. • Pictures and charts of step-up and step-down transformers.
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Subject **GENERAL SCIENCE**
Strand **3. VIGOUR BEHIND LIFE**
Sub-Strand **2. FORCES ACTING ON SUBSTANCES AND MECHANISMS**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
<p>2.3.2.LO.1</p> <p>Explain and apply the concept of upthrust and the law of floatation in real life.</p>	<p>Communication and Collaboration:</p> <ul style="list-style-type: none"> • Learners do group presentations about their findings. • Personal development and leadership • Learners take leadership roles in reporting their findings. <p>Critical thinking and Problem-solving: Learners design and make prototype ships, canoes and other objects that use the law of floatation.</p> <p>Cultural identity: Learners use appropriate local materials to create their projects.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different opinions. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practise inclusion • identify and examine traditional gender roles and stereotypes. <p>SEL: Learners having experienced a teaching method that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • <i>Self-Awareness:</i> Help learners explore how they learn and assess their own capabilities and abilities as well as develop self confidence.

		<ul style="list-style-type: none"> • <i>Self-Management</i>: Help learners set goals and achieve them in presentations and develop strategies to help manage their group work and presentations. • <i>Social Awareness and Relationship skills</i>: help learners to recognise and listen to their peers' ideas, disagree to agree on ideas and manage their personal conflicts peacefully. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
2.3.2.CS.1	2.3.2.LI.1	2.3.2.AS.1
Recognise the various types of motions, their applications and the forms of forces which act on the body.	<p>Discuss the relationship between upthrust and the law of floatation.</p> <ul style="list-style-type: none"> • Using diamond nine, learners explain the concept of upthrust and the Law of Floatation. • Using project-based approach, learners design and make prototype ships, canoes, and other objects which operate based on the Law of Floatation. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning that use the principle of floatation.
Teaching and Learning Resources	<ol style="list-style-type: none"> 1. Beakers, water, simulations, videos. 2. Measuring cylinders, beakers, water and irregular objects. 	

Subject **GENERAL SCIENCE**
Strand **3. VIGOUR BEHIND LIFE**
Sub-Strand **3. Consumer Electronics**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
<p>2.3.3.LO.1</p> <p>Apply the knowledge of doping to explain the formation and behaviour of a P- N junction diode.</p>	<p>Collaboration: Learners work in mixed-ability groups to share their ideas with peers.</p> <p>Communication: Learners are given equal opportunities to provide both oral and written steps for classifying semiconductors.</p> <p>Digital Literacy: Learners observe a video of doping and simulate doping.</p> <p>Critical thinking and problem-solving: Learners create and apply ideas about how to build phone chargers.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different opinions. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practise inclusion • identify and challenge traditional gender roles and stereotypes <p>SEL: Learners having experienced a teaching method that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • <i>Self-Awareness:</i> help learners to expand their vocabulary, manage their feelings and expressions and develop self confidence

		<p><i>Self-Management:</i> provide opportunities for learners to manage their work and set goals they can achieve.</p> <ul style="list-style-type: none"> • <i>Social Awareness and Relationship Skills:</i> Provide opportunities for learners to listen to their peers' opinions, express disagreement in constructive ways, demonstrate respect for each other, resolve interpersonal conflicts with each other and communicate positively in class. • <i>Responsible Decision-Making:</i> Provide opportunities for learners to make decisions in group work, work with their peers to solve problems and make connections between classroom activities and their personal goals. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
2.3.3.CS.1	2.3.3.LI.1	2.3.3.AS.1
Demonstrate knowledge and recognition of selected electronic components and their uses in household electronic devices.	<p>Explain the principle of 'doping' behaviour in relation to semiconductors.</p> <ul style="list-style-type: none"> Engage learners through Talk For Learning strategies to classify solid materials into conductors, insulators and semiconductors using simulations, charts and videos. While managing the words/terms that look technical or may be perceived as 'masculine'. Lead learners through demonstrations and group discussions using concept maps, practical activities and simulations to explain the concept of doping and its applications to the behaviour of P-N junction diode formation in consumer electronics. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	<p>2.3.3.LI.2</p> <p>Perform experiments using circuits containing LEDs and diodes to build phone chargers.</p> <p>Project-based Learning: Put learners in mixed-ability groups while paying close attention to learners who need extra support for differentiated learning. Guide learners to build phone chargers using appropriate electronic components.</p> <p>NOTE: In addition to phone chargers, any appropriate electronic device can be built</p>	2.3.3.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 Resources	<ul style="list-style-type: none"> Simulations Charts of solid materials videos P-N junction diodes. LEDs 	<ul style="list-style-type: none"> Diodes Resistors Capacitors Connecting wires Circuit board
		<ul style="list-style-type: none"> Breadboards Plastic materials Tester Metal leads.

Subject **GENERAL SCIENCE**
Strand **4. RELATIONSHIP WITH THE ENVIRONMENT**
Sub-Strand **1. THE HUMAN BODY AND HEALTH**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
<p>2.4.1.LO.1</p> <p>Analyse pathogenic diseases, their symptoms, causes, effects and preventions.</p>	<p>Communication and Personal Development: Learners develop written and oral communication skills as they write and read reports.</p> <p>Critical Thinking and Problem-Solving: Through the application of knowledge in common diseases.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practise inclusion <p>SEL: Learners having experienced a teaching method that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • <i>Self-Awareness:</i>Practice identifying and expressing their feelings about stereotypes in infections and pathogenic infections through group work, discussions and reflections. • <i>Self-Management/Social Awareness:</i> Help learners to set targets in a bid to identify pathogenic diseases in the communities and

		<p>describe them and explain the stereotypes for presentation in the classroom</p> <ul style="list-style-type: none">• <i>Relationship skills</i>: help learners work in groups and collaborate to analyse pathogenic infections. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars (with 21st-Century Skills and Competencies and GESI)	Assessment
2.4.1.CS.1	2.4.1.LI.1	2.4.1.AS.1
Demonstrate knowledge and understanding of pathogenic diseases of humans.	<p>Examine the characteristics, causes, symptoms and preventions of pathogenic diseases.</p> <p>Talk for Learning: Using mixed-ability groups while supervising groups to discuss symptoms and prevention of pathogenic diseases.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	<p>2.4.1.LI.2</p> <p>Examine specific pathogenic diseases within the community and describe their causes, symptoms and prevention.</p> <p>Problem-based Learning: Assign learners in groups or individually to identify a pathogenic disease in the community, describe it and explain how it can be prevented. Encourage learners to identify the myths and misconceptions surrounding these diseases while helping them to appreciate the stereotypes associated with these infections.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> • Charts of people showing symptoms of pathogenic diseases. • Wall charts showing causes, symptoms and prevention of pathogenic diseases. 	

Subject **GENERAL SCIENCE**
Strand **4. RELATIONSHIPS WITH THE ENVIRONMENT**
Sub-Strand **2. TECHNOLOGY IN LOCAL INDUSTRIES**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
2.4.2.LO.1		
Describe the production process of indigenous beverages.	<p>Communication: Learners interact with resource persons and write a report. They also write down their observations.</p> <p>Digital Literacy:</p> <ol style="list-style-type: none"> 1. Using voice recording gadgets and a camera. 2. Taking photographs and recording the processes involved. <p>Critical Thinking through designing the flow charts.</p> <p>Personal development by doing individual design and experiment.</p> <p>Creativity and Innovation through designing the experiment</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • respect individuals of different beliefs, religions, and cultures • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of personal biases and stereotypes • embrace diversity and practise inclusion <p>SEL: Learners having experienced a teaching method that ensures social and emotional learning skills (SELS) and working with each other will lead to</p> <ul style="list-style-type: none"> • <i>Self-Awareness:</i> help learners acknowledge their strengths and develop self confidence in exploring indigenous production. • <i>Social Awareness:</i> helps learners to develop respect for others.

		National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI		Assessment
2.4.2.CS.1	2.4.2.LI.1		2.4.2.AS.1
Explore the production of indigenous Beverages.	<p>Explain the science in the production of indigenous beverage.</p> <p>Project-based Learning:</p> <ul style="list-style-type: none"> Put learners in mixed-ability groups to visit a local industry where indigenous beverages are produced. Observe and document the processes involved in the production of indigenous beer/gin. In mixed groups, initiate a Talk For Learning approach to cross-share their presentations from the study trip to the local industry. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	2.4.2.LI.2		2.4.2.AS.2
	<p>Design an experiment to produce a local beverage.</p> <p>Problem-based Learning: Guide learners to design a flow chart for the preparation of indigenous beverages and use it to prepare the beverages.</p>		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> Voice recording gadgets Camera Writing materials 	<ul style="list-style-type: none"> Raw materials for beverage production (sugarcane, maize, millet, etc.) Plastic Glass 	<ul style="list-style-type: none"> Earthenware energy source (Heat, electricity, solar)

YEAR THREE

Subject **GENERAL SCIENCE**
Strand **I. EXPLORING MATERIALS**
Sub-Strand **I. SCIENCE AND MATERIALS IN NATURE**

Learning Outcomes	21st-Century Skills and Competencies	GESI⁵, SEL⁶ and Shared National Values
3.1.1.LO.1		
<p>Explore the composition of air and the laboratory preparation and uses of oxygen and carbon dioxide.</p>	<p>Communication and Collaboration:</p> <ul style="list-style-type: none"> • Learners working in groups will foster collaboration among themselves, and as they interact verbally, their communication skills will be enhanced. • Learners develop collaboration and communication skills through classroom and laboratory interactions. <p>Digital Skills and Personal Development: Exploring the internet and working in the laboratory, the learners will enhance their research skills and digital skills.</p> <p>Critical Thinking: It will take critical thinkers to make deductions from the experiments learners perform. Research skills are acquired in the process of manipulating materials and reagents and making inferences. Research skills and critical thinking are acquired in the process of manipulating materials and reagents and making inferences.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes. • embrace diversity and practice inclusion. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Fostering learners' awareness of real-world problems and issues to apply what they are learning. • Learners' choices about ways they can present their ideas.

		<ul style="list-style-type: none"> Learners acquire multiple options for communicating with the teacher and themselves. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
<p>3.1.1.LO.2</p> <p>Describe and analyse the origin and composition of natural gas.</p>	<ul style="list-style-type: none"> Communication and Collaboration: By working in groups, learners will interact and speak to each other to enhance collaboration and communication skills. Digital Literacy: By surfing the internet and watching videos for information, learners will sharpen their digital literacy skills. 	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> respect individuals of different opinions. be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals.

		<ul style="list-style-type: none"> • be aware of personal biases and stereotypes. embrace diversity and practice inclusion. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Providing opportunities for learners to listen to their peers' opinions and express disagreements in constructive ways through social awareness. • Providing opportunities for learners to practise communication skills (e.g., verbalising your message, listening to others) • Encouraging learners to develop their own strategies on how to complete a task or learn a new concept to promote responsible decision-making • Offering learners with a range of strategies to help them manage their work (e.g., checklists, reminders, prompts) <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
3.1.1.CS.1	3.1.1.LI.1	3.1.1.AS.1
Explore the concept of 'Air' as a mixture of useful gases in nature and understand the preparation of oxygen and carbon dioxide and their uses in human life.	<p>Identify air as a mixture and explain the uses of the components of air.</p> <p>Experiential Learning:</p> <ul style="list-style-type: none"> • Put learners in differentiated groups to explore, through laboratory activities, pictures, charts and videos from internet sources, air as a mixture, noting the various compositions of the gases, their relative abundance and their uses in nature. • Engage learners to perform simple experiments to test for the various components of air. • Provide an enabling environment for all learners to take part in all the activities to ensure the success of the lesson. 	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
	3.1.1.LI.2	3.1.1.AS.2
	<p>Prepare carbon dioxide and discuss its uses.</p> <p>Inclusive and Differentiated Learning: Put learners in different ability groups, guide them through demonstration in a laboratory or classroom on how to prepare carbon dioxide gas, and discuss its characteristics and uses and support learners who may react to the environment or materials (allergies).</p>	<p>Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning</p>
	3.1.1.LI.3	3.1.1.AS.3
<p>Prepare oxygen and discuss its uses.</p> <p>Experiential Learning: Put learners in different ability groups, guide them through demonstrations in a laboratory or classroom on how to prepare oxygen gas and discuss its characteristics and uses and also support learners who may react to the environment or materials (allergies).</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 Resources	<ul style="list-style-type: none"> • Internet sources such as MOOCs (E.g. https://www.youtube.com/watch?v=4p_aoxLlzs0; https://www.youtube.com/watch?v=eLIRijPpkIM) • A trough or a big bowl • Candle • Matches • measuring cylinder • Plastic bowl/trough • delivery tubes 	<ul style="list-style-type: none"> • Dilute hydrochloric acid (HCl) • Calcium Carbonate (CaCO₃)/eggshell • Beakers • conical flasks • collecting jars • charts • pictures illustrating that air is a mixture. 	<ul style="list-style-type: none"> • gas jar • thistle funnels or improvised forms of these materials • Hydrogen peroxide • Potassium Chlorate • delivery tube • water trough, etc. • Requisite glassware and reagents or improvised materials such as jugs,
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st-Century Skills and GESI	Assessment
3.1.1.CS2	3.1.1.LI.1	3.1.1.AS.1
Know, understand and identify the origin and composition of natural gas.	<p>Discuss the composition and uses of oil and natural gas.</p> <p>Collaborative and inquiry-based teaching approach:</p> <ul style="list-style-type: none"> • Use think-pair-share to initiate a discussion on the composition, usefulness and need for oil and gas discoveries in Ghana's economy. Give learners a take-home assignment to collate the benefits and dangers associated with oil and gas exploration in Ghana for discussion in the next lesson. • Put learners in mixed-ability/differentiated learning groups and provide them with books, pictures, charts, internet sources, and videos on the process of oil and gas extraction for learners to critically explore and discuss in their groups. Guide learners to use the language of the content and respect all ideas. • Provide the groups with a checklist to guide them to focus on fracturing or fracking of fluids in their discussion to build learners' self-confidence. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> • Books, videos, charts and pictures of oil and gas exploration. 	

Subject **GENERAL SCIENCE**
Strand **2. PROCESSES FOR LIVING**
Sub-Strand **1. ESSENTIALS FOR SURVIVAL**

Learning Outcomes	21st- Century Skills and Competencies	GESI, SEL and Shared National Values
<p>3.2.1.LO.1</p> <p>Model the structure of the nervous system and describe the functions of the parts of the nervous system.</p>	<p>Creativity and innovation: Using their imagination in role-playing the parts and functions of the central nervous system.</p> <p>Digital Literacy:</p> <ul style="list-style-type: none"> • Learning with videos and internet resources supports the acquisition of digital literacy skills. • Surfing the internet for videos. <p>Collaboration and Communication: Learners acquire collaborative and communication skills during interaction and discussion.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practise inclusion. • identify and examine traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will:</p> <ul style="list-style-type: none"> • Provide opportunities for students to work together in groups or with partners. • Provide opportunities for students to evaluate their own work. • Work to build learners' self-confidence.

		<p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
3.2.1.LO.2		
<p>Demonstrate how movement occurs in parts of the human body.</p>	<p>Collaboration and Communication: Learners interact in groups to develop collaboration and communication skills.</p> <p>Digital Literacy: Digital literacy is acquired when learners surf the internet in search of information.</p> <p>Global and Local Citizenship: Surfing the internet to gather information helps learners broaden their sphere of knowledge about the subject matter and understanding of their place in the world.</p> <p>Collaboration and Communication: Interactions in class will enable learners to acquire collaboration and communication skills</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • respect individuals of different opinions. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of personal biases and stereotypes • embracing diversity and practising inclusion <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Providing opportunities for learners to listen to their peers’ opinions and express disagreements in constructive ways through social awareness. • Providing opportunities for learners to practise communication skills (e.g., verbalizing your message, listening to others).

		<ul style="list-style-type: none">• Encouraging learners to develop their own strategies for how to complete a task or learn a new concept to promote responsible decision-making.• Offering learners with a range of strategies to help them manage their work (e.g., checklists, reminders, prompts). <p>National Core Values: Tolerance, humility, hard work, respect, friendliness</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
3.2.1.CS.1	3.2.1.LI.1	3.2.1.AS.1
Model and demonstrate understanding of the nervous system, its parts and uses.	<p>Analyse the central nervous system.</p> <p>Experiential Learning: Put learners in mixed groups to role-play the parts and functions of the central nervous system using models, videos and pictures.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.2.1.LI.2	3.2.1.AS.2
	<p>Explain the peripheral nervous system.</p> <p>Project-based Learning: Create different task groups and provide for groups the guidelines to work on the peripheral nervous system, such as examining the structure in relation to the functions using various models, pictures, videos, etc. and write reports. In the task groups, provide support to learners to reflect and present their reports.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.2.1.LI.3	3.x.2.1.AS.3
	<p>Describe autonomic nervous system.</p> <p>Group work/collaborative Learning: In their differentiated learning groups, learners match the structure of neurons to their functions. Support groups to exchange and discuss their matchings and describe the structure and functions of the neuron.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic Reasoning Level 4 Extended critical thinking and reasoning.
3.2.1.LI.4	3.2.1.AS.4	
<p>Discuss the generation and transmission of nerve impulses.</p> <p>Problem-Based Learning and Initiating Talk for Learning:</p>	Level 1 Recall Level 2 Skills of conceptual understanding	

	<ul style="list-style-type: none"> • Learners Think-pair and share in same-ability groups the pathways of communication within and between neurons using diagrams/video/pictures/simulation. • In a whole class discussion led by the teacher, guide learners to brainstorm on three of the major neurotransmitters and describe their functions. 	Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> • Models, Videos, books and Pictures of the central nervous system. • Models, pictures, books, videos and the internet show the peripheral nervous system. • Computer/internet, diagrams/video/pictures and drawing paper 	

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
3.2.1.CS.2	3.2.1.LI.1	3.2.1.AS.1
Develop an understanding of the relationships between bones, skeleton and muscles and the principles underlying the movement of various parts of the human body.	<p>Model and discuss the structure of the skeleton and muscles</p> <p>Collaborative Learning:</p> <ul style="list-style-type: none"> Learners use think-pair-share in mixed-ability groups to model and describe the structure and functions of the parts of the skeleton. Learners work in mixed-ability groups to describe the general structure and functions of human muscles and their attachment to skeletons human muscles' general structure and functions and share their ideas with peers using a model, picture or diagram. Learners use think-pair-share in mixed-ability groups to model and describe the nature of the movement of muscles. Summarise the movement of muscles into categories. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.2.1.LI.2	3.x.2.1.AS.2
	<p>Demonstrate and explain the structure and function of the movement of muscle tissues.</p> <p>Initiating Talk for Learning: Let learners think-pair-share using video, pictures, and personal experience to describe how muscles bring about movement in humans. Discuss how challenges arise for human movement and encourage learners to appreciate the diversity in limb.</p> <p>NB: Explain the sliding filament model of muscle.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> Chart/picture/model of the general structure of the human skeleton Picture videos 	

Subject **GENERAL SCIENCE**
Strand **3. VIGOUR BEHIND LIFE**
Sub-Strand **1. POWERING THE FUTURE WITH ENERGY FORMS.**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
<p>3.3.1.LO.1</p> <p>Analyse light energy and its uses in nature.</p>	<p>Communication and Collaboration: Learners work in groups to share ideas among themselves.</p> <p>Critical thinking and problem solving: Relating concepts of lenses and mirrors to life. e.g., vision, navigating in water bodies, etc.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practise inclusion. • identify and challenge traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will:</p> <ul style="list-style-type: none"> • Give learners opportunities to explore how they learn through self-awareness. • Provide opportunities for learners to listen to their peers’ opinions and express disagreements in constructive ways through social awareness. • Encourage learners to develop their own strategies for how to complete a task or learn a

		<p>new concept to promote responsible decision-making.</p> <ul style="list-style-type: none">• Provide opportunities for learners to practise communication skills (e.g., verbalising your message, listening to others).• Offer learners a range of strategies to help them manage their work (e.g., checklists, reminders, prompts). <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
3.3.1.CS.1	3.3.1.LI.1	3.3.1.AS.1
Demonstrate understanding of light energy, its sources and generation.	<p>Explain the concept of light energy and its uses.</p> <p>Group work: Guide learners to revise through brainstorming (review from B7.4.1.3 in JHS curriculum) in differentiated learning groups, the concept of light energy and discuss the domestic and industrial uses of light.</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>
	<p>3.3.1.LI.2</p> <p>Explore lenses and mirrors in relation to light energy in life.</p> <p>Project-based Learning: Let learners work in mixed-ability groups to discuss the types of mirrors and lenses using projects developed from mirrors and lenses.</p> <p>Diamond Nine: Let learners work according to different ability groups or pairs to discuss:</p> <ol style="list-style-type: none"> 1. Snell's law 2. Total internal reflection 3. Refractive index 4. Differences between lasers and fibre optics 5. How fibre optics work 6. Real and apparent depth. <p>Collaborative Learning:</p> <ol style="list-style-type: none"> 1. Put learners in smaller convenient groups to observe samples of projectors, simple microscopes, and periscopes and discuss their functions in industry and everyday life. 2. Guide learners to build prototypes of periscopes and demonstrate their usage in life. 3. Assist learners to brainstorm on professions that use knowledge of periscopes in their operations. <p>Talk for Learning: In mixed-ability groups, let learners demonstrate how lenses are used to correct eye defects. Using charts and models, let learners explain the causes of eye defects.</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 Resources	<ul style="list-style-type: none"> • Pictures, videos and charts showing the concept of light, PHET simulations • Simulations, • Realia of lenses and mirrors, • Videos, charts and models. 	

Subject **GENERAL SCIENCE**
Strand **3. VIGOUR BEHIND LIFE**
Sub-Strand **2. FORCES ACTING ON SUBSTANCES AND MECHANISMS**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
3.3.2.LO.1		
<p>Explain the concept of momentum and its application.</p>	<p>Communication and Collaboration: Learners develop listening and communication skills as they present their findings for discussion and accept different opinions from their peers.</p> <p>Digital Literacy: Through the use of videos and simulations, learners improve their digital literacy skills.</p> <p>Critical Thinking: by analysing the effects of forces on simple machines.</p> <p>Problem-solving: Learners will apply the knowledge of reducing the effects of friction in simple machines to everyday life.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes • embrace diversity and practise inclusion • identify and challenge traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Building learners' self-confidence to create self-awareness. • Providing opportunities for learners to practise skills related to respecting others.

		<ul style="list-style-type: none">• Learners acquire multiple options for communicating with the facilitator.• Working with learners to solve problems <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st-Century Skills and GESI	Assessment
3.3.2.CS.1	3.3.2.LI.1	3.3.2.AS.1
Recognise the various forms of forces and their effects on motion.	<p>Identify different types of forces and their daily applications.</p> <p>Collaborative Learning:</p> <ul style="list-style-type: none"> • Use concept maps to explain different types of forces. • Using 3E learning model, let learners engage, explore and explain the applications of forces. NB: Emphasise frictional forces, factors influencing fluid friction and increase or decrease of friction. • Engage learners to discuss frictional force its effects and how to reduce it. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	<p>3.3.2.LI.2</p> <p>Examine the differences between elastic and inelastic collisions of moving objects.</p> <p>Inquiry-based Teaching:</p> <ul style="list-style-type: none"> • Let learners explore the differences between elastic and inelastic collisions and collision of moving objects. • Learners discuss measures of avoiding collision with moving objects in their mixed-ability groups. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> • Charts, pictures, videos, simulations and realia of simple machines. • Simulations/videos, and pictures. 	

Subject **GENERAL SCIENCE**
Strand **3. VIGOUR BEHIND LIFE**
Sub-Strand **3. CONSUMER ELECTRONICS**

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
<p>3.3.3.LO.1</p> <p>Apply knowledge of electronic circuits to identify careers in electronics.</p>	<p>Communication and Collaboration:</p> <ul style="list-style-type: none"> • Learners share ideas among their peers. • Learners develop writing and listening skills from classroom interactions. <p>Digital Literacy: The use of digital devices to give information.</p> <p>Personal development: Learners explain their individual views about their work.</p> <p>Leadership as learners take up the responsibility of sharing their thoughts with their peers.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes. • embrace diversity and practise inclusion. • identify and challenge traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Working with learners to solve problems to develop responsible decision-making

		<ul style="list-style-type: none">• Creating an environment in which learners believe that their thoughts and opinions are valued.• Providing opportunities for learners to work together in groups or with partners to promote relationship skills. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st-Century Skills and GESI		Assessment
3.3.3.CS.1 Demonstrate knowledge and recognition of selected electronic components and their uses in household electronic devices.	3.3.3.LI.1 Discuss consumer electronic devices and their components. Experiential Learning: Using inclusive and differentiated learning, engage learners to observe pictures, videos and drawings of consumer electronics devices and discuss their components.		3.3.3.AS.1 Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.3.3.LI.2 Explore Consumer Electronic careers. Inquiry-based Teaching: <ul style="list-style-type: none"> • Let learners explore and explain career opportunities available in the field of consumer electronics. • Assist learners to work in mixed-ability groups to use concept maps to illustrate the importance of consumer electronics and present their findings in class. • Address common misconceptions about electronic components and household appliances. 		3.3.3.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 Resources	<ul style="list-style-type: none"> • Mobile phones, • Laptops • Television • Simulations 	<ul style="list-style-type: none"> • videos and charts of consumer electronics devices and how they work in relation to electronic circuits. • Resource person • videos and pictures of professions associated with consumer electronics. 	

Subject
Strand
Sub-Strand

GENERAL SCIENCE
4. RELATIONSHIPS WITH THE ENVIRONMENT
1. THE HUMAN BODY AND HEALTH

Learning Outcomes	21st-Century Skills and Competencies	GESI, SEL and Shared National Values
<p>3.4.1.LO.1</p> <p>Describe the various features of heredity.</p>	<p>Collaboration and Communication: skills, accepting constructive feedback, and sharing through group work and accepting constructive feedback as well as sharing of ideas among learners.</p> <p>Digital Literacy skills using the internet to explore information.</p>	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes. • embrace diversity and practise inclusion. • identify and challenge traditional gender roles and stereotypes. <p>SEL: Learners having experienced a teaching method that ensures social and emotional learning skills (SELS) and working with each other will lead to: <i>Self-awareness:</i> Learners accurately assess their own capabilities and qualities.</p>

		<p><i>Self-Management:</i> Learners manage their observations and conclusions from the experiments and discussion.</p> <p><i>Social Awareness:</i> Learners listen to their peers' opinions and express disagreements or offer constructive suggestions.</p> <p><i>Relationship Skills:</i> Learners offer learners multiple options for communicating with peers and teachers.</p> <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
3.4.1.LO.2		
Design mind maps and concept maps of some Mendelian crossing to sex determination in humans.	<p>Personal development: Through individual work based on their interest and abilities, learners enhance their personal development</p> <p>Critical thinking and problem solving: Applying the concept of Mendelian crossing to sex determination will enhance their critical thinking and solve problems skills.</p> <p>Collaboration and Communication: Through group discussion, learners will interact and talk to one another to enhance collaboration and communication skills.</p>	<p>GESI: Working with each other in an inclusive way, cross-sharing of knowledge and understanding between and amongst groups and individuals, for instance, leads to:</p> <ul style="list-style-type: none"> • respecting individuals of different 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 practice inclusion. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Providing opportunities for learners to practise communication skills (e.g., verbalising your message, listening to others.

		<ul style="list-style-type: none">• Encouraging learners to develop their own strategies for how to complete a task or learn a new concept to promote responsible decision-making.• Offer learners a range of strategies to help them manage their work (e.g., checklists, reminders, prompts). <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
3.4.1.CS.1	3.4.1.LI.1	3.4.1.AS.1
Apply knowledge of human reproduction to understand heredity.	<p>Discuss heredity using traits observed in humans.</p> <p>Collaborative Learning:</p> <ol style="list-style-type: none"> 1. Put learners in mixed-ability groups to review reproduction in humans (from year 2). <ul style="list-style-type: none"> • Allow learners to discuss, through a whole class session, traits and features that make humans, plants, and animals look similar or different. • Using think-pair-share and guide learners to describe features of hereditary in humans with the aid of pictures, videos and models. 	<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>3.4.1.LI.2</p> <p>Discuss hereditary diseases in humans.</p> <p>Talk for Learning and Exploratory Approach:</p> <ul style="list-style-type: none"> • Using Think-Pair-Share, discuss hereditary traits. • Explore hereditary diseases/disorders: sickle cell, haemophilia, diabetes, cleft lip and palate. <p>Note: Ensure that the language of teaching and interaction is devoid of stereotypes. Encourage learners to share experiences.</p>	<p>3.4.1.AS.2</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 Resources	<ul style="list-style-type: none"> • Pictures and wall charts. • Models and videos • Computer with modem 	

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI	Assessment
3.4.1.CS.2	3.4.1.LI.1	3.4.1.AS.1
Explore and model sex determination in humans	<p>Draw Mendelian crossings to explain sex determination in humans.</p> <p>Diamond 9 approach:</p> <ul style="list-style-type: none"> • Using the Diamond 9 Approach, allow learners to discuss their understanding of Mendelian crossing to show sex determination. • Get learners to compare individual drawings with drawings on pictures, videos or charts and critique themselves. • Using videos and pictures, put learners into groups to discuss and draw some Mendelian crossings and explain how this show exemplifies sex determination. 	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.4.1.LI.2	3.4.1.AS.2
	<p>Explore selected traits in humans using applications of Mendelian crossing.</p> <p>Talk for Learning: In mixed-ability groups, learners select genes represented by letters of the alphabet and use them to draw Mendelian crossings for the following traits: height, skin colour, baldness, etc.</p>	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> • Wall charts • Books • Pictures and videos on Mendelian crossing. 	

Subject **GENERALSCIENCE**
Strand **4. RELATIONSHIPS WITH THE ENVIRONMENT**
Sub-Strand **2. TECHNOLOGY IN LOCAL INDUSTRIES**

Learning Outcomes	21st- Century Skills and Competencies	GESI, SEL and Shared National Values
<p>3.4.2.LO.1</p> <p>Evaluate the scientific processes involved in indigenous texture production and its economic importance.</p>	<ul style="list-style-type: none"> • Learners acquire digital literacy skills through the use of cameras and voice recording devices. • Communication and Collaboration skills are acquired through interactions with peers and industry workers. • Critical Thinking: Generation of ideas about the stages involved in gari processing. 	<p>GESI: Learners having experienced a science pedagogy that embeds or aligns gender equality and social inclusion and working in an inclusive way, cross-sharing knowledge and understanding among groups and individuals lead them to:</p> <ul style="list-style-type: none"> • gain respect for individuals of different backgrounds. • be sensitive to the inter-relatedness of the various spheres of life, groups, and individuals. • be aware of their own biases and stereotypes. • embrace diversity and practice inclusion. • identify and challenge traditional gender roles and stereotypes. <p>SEL: Learners having experienced a science pedagogy that ensures social and emotional learning skills (SELS) and working with each other will lead to:</p> <ul style="list-style-type: none"> • Helping expand learners' emotional vocabulary and their abilities to identify physical sensations related to feelings to create self-awareness.

		<ul style="list-style-type: none"> • Offering learners opportunities to set goals and work to achieve them to develop self-management. • Providing opportunities for learners to reflect on positive and negative choices in relationships and the consequences of each choice. • Offering learners choices about ways they can present their ideas for responsible decision-making. <p>National Core Values: Tolerance, friendliness, open-mindedness, patience, hard work, humility</p>
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Content Standards	Learning Indicators and Pedagogical Exemplars with 21st- Century Skills and GESI		Assessment
3.4.2.CS.1	3.4.2.LI.1		3.4.2.AS.1
Demonstrate knowledge of the scientific processes involved in gari production.	<p>Analyse the scientific processes involved in indigenous texture production.</p> <p>Experiential Learning:</p> <ul style="list-style-type: none"> • Visit a gari processing site in your locality to get first-hand information on how gari is produced. • Put learners in mixed-sex or mixed-ability groups to discuss their findings from the field trip and write reports. Provide opportunities for learners to actively listen to others' views. • Using diamond 9 discussion, learners enumerate the economic importance of gari and present ideas in class for discussion. 		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
Teaching and Learning Resources	<ul style="list-style-type: none"> • Camera • Voice recording device • Pen 	<ul style="list-style-type: none"> • Notebooks/pads. • Charts and pictures of people at a gari processing site 	