DESIGN AND COMMUNICATION TECHNOLOGY

CURRICULUM FOR SECONDARY EDUCATION (SHS 1 - 3)

NaCCA

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.

CONTENTS

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

1. *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.

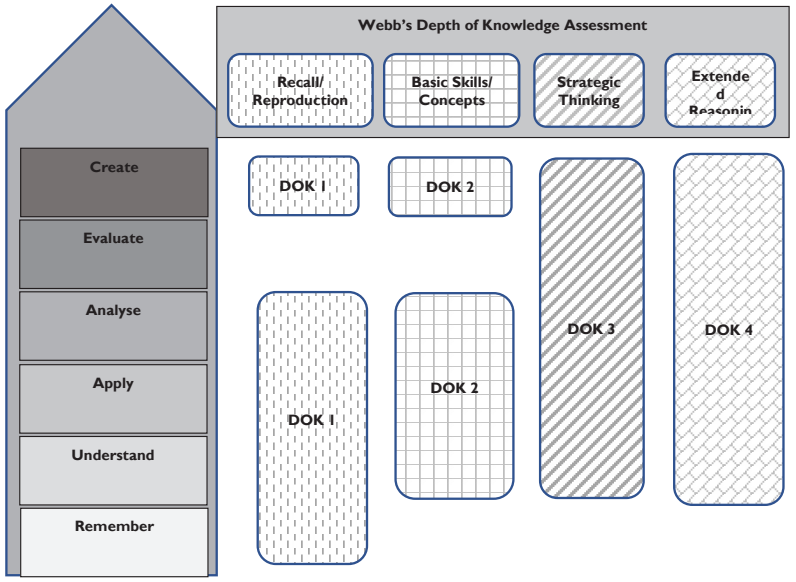

Figure 1: Revised Bloom Taxonomy combined with Webb's Depth of Knowledge for Teaching and Assessment

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 DESIGN AND COMMUNICATION TECHNOLOGY

PHILOSOPHY

The present and future generations of learners will apply technology to solve problems in their environment through creativity and innovative application of concepts for the production of artefacts. This will be done through the support of skilled and innovative teachers who are to prepare learners for life-long learning as well as introducing them to the world of work and adult life.

VISION

Equips the learners with 21st century skills: critical thinking, creativity, collaborations and innovation as well as good citizenship and competencies to identify increasingly complex societal problems and use appropriate technological skills to solve them. Thus, it prepares learners for life-long learning and introduces them to world of work and adult life.

GOAL

Goal of the Applied Technology curriculum is aimed at developing individuals to become creative, innovative, technologically inclined, digital literates and problem solvers. They should have the ability to think critically and equipped to communicate with fluency in written and spoken language, have both the confidence and competence to participate fully in Ghanaian society as responsible local and global citizens.

CONTEXTUAL ISSUES

Context	Barriers	Addresses / Opportunities
Gender	Perception of the society is that 'technical' education is not for women.	• Successful technical women role models should be used as resource persons • Use gender sensitive pedagogies
Culture	Misconception that technical programmes are meant for the academically weak students	• Technical curriculum should be made suitable for all senior secondary school students. • Pedagogy should cater for the highly proficient, proficient and the approaching proficiency
Conceptual	Teachers tend to work more with concepts, theories and principles than they do with practical application. This does not promote creativity, collaboration and innovation.	• More practical pedagogies would be employed.
Economics / Infrastructure	Inadequate technical tools, resources and equipment at secondary schools, makes teaching of the subject difficult.	• Teachers should improvise teaching and learning resources to facilitate their work. E.g., Use local industries, field trip, simulation, YOUTUBE videos

RATIONALE

Applied Technology education programme introduces the youth to appropriate skills, abilities and competencies as necessary tools for the individual to live in, adapt to the real work situation and contribute to the development of society. Applied technology education is the preparation of individuals to acquire basic scientific knowledge as well as practical skills. It further provides basis for the development of skilled manpower for the world of work. This helps in increasing the work force in the country as the youth are equipped with knowledge, aptitude and trained workable practical skills and competencies required in specific occupations.

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SCOPE AND SEQUENCE

Design and Communication Technology Summary

S/N	STRAND	SUB-STRAND	YEAR 1		
			CS	LO	LI
1.	Conceptual Drawing	Concept Sketches	1	1	3
		Object Manipulation in Drawing	1	1	3
		Pattern Design	1	1	3
		Design and Realisation	1	1	3
2.	Geometry	Plane Geometry	1	1	5
		Solid Geometry	1	1	4
		Fractal Geometry	1	1	2
Total			7	7	23

Overall Totals (SHS 1)

Content Standards	7
Learning Outcomes	7
Learning Indicators	23

Design and Communication Technology Summary - Option 1

S/N	STRAND	SUB-STRAND	YEAR 2			YEAR 3		
			CS	LO	LI	CS	LO	LI
1.	Conceptual Drawings	Concept Sketches	1	1	3	1	1	2
		Object Manipulation in Drawing	1	1	3	1	1	2
		Pattern Design	1	1	3	1	1	3
		Design and Realisation	1	1	2	-	-	-
2.	Geometry	Plane Geometry	1	1	3	1	1	5
		Solid Geometry	2	2	5	1	1	3
		Fractal Geometry	1	1	2	1	1	2
3.	Extended Drawing	Building Drawing	2	2	5	1	1	5
Total			10	10	26	7	7	22

Overall Totals (SHS 2 – 3)

Content Standards	17
Learning Outcomes	17
Learning Indicators	48

Design and Communication Technology Summary - Option 2

S/N	STRAND	SUB-STRAND	YEAR 2			YEAR 3		
			CS	LO	LI	CS	LO	LI
1.	Conceptual Drawings	Concept Sketches	1	1	3	1	1	2
		Object Manipulation in Drawing	1	1	3	1	1	2
		Pattern Design	1	1	3	1	1	3
		Design and Realisation	1	1	2	-	-	-
2.	Geometry	Plane Geometry	1	1	3	1	1	5
		Solid Geometry	2	2	5	1	1	3
		Fractal Geometry	1	1	2	1	1	2
3.	Extended Drawing	Mechanical Drawing	2	2	5	1	1	3
Total			10	10	26	7	7	20

Overall Totals (SHS 2 – 3)

Content Standards	17
Learning Outcomes	17
Learning Indicators	46

Design and Communication Technology Summary - Option 3

S/N	STRAND	SUB-STRAND	YEAR 2			YEAR 3		
			CS	LO	LI	CS	LO	LI
1.	Conceptual Drawings	Concept Sketches	1	1	3	1	1	2
		Object Manipulation in Drawing	1	1	3	1	1	2
		Pattern Design	1	1	3	1	1	3
		Design and Realisation	1	1	2	-	-	-
2.	Geometry	Plane Geometry	1	1	3	1	1	5
		Solid Geometry	2	2	5	1	1	3
		Fractal Geometry	1	1	2	1	1	2
3.	Extended Drawing	Garment Design Technology	1	1	4	1	1	4
Total			9	9	25	7	7	21

Overall Totals (SHS 2 – 3)

Content Standards	16
Learning Outcomes	16
Learning Indicators	46

YEAR ONE

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **1. CONCEPT SKETCHES**

Learning Outcomes	21st Century Skills and Competencies	GESI[1], SEL[2] and Shared National Values
1.1.1.LO.1		
Apply knowledge and skills of the concept sketches to generate and create designs using freehand drawing through the principles of perspective drawing and proportions.	The group activity ensures collaboration among learners The research activity facilitates critical thinking and communication skills Individual learning activities encourage originality and critical thinking The experiential learning approach allows for a deeper understanding of the subject matter as learners connect theoretical knowledge to real-world applications.	**GESI:** • Grouping learners into mixed gender ensures gender equality • Grouping learners into mixed ability groupings encourages equal participation among learners **SEL:** Through individual learning experiences, learners often gain deeper insights into their own strengths, weaknesses, preferences, and emotional responses **National Core Values**: Experiential learning encourages individuals to take on leadership roles, solve problems creatively, and take initiative in addressing challenges within their communities or organisations.

[1]Gender Equality and Social Inclusion
[2]Socio-Emotional Learning

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
1.1.1.CS.1	1.1.1.LI.1	1.1.1.AS.1
Apply the understanding and techniques of concept sketches in designing.	**Explain concept sketches and their applications in designing.** **Group Work/Collaborative Learning:** In mixed-ability groups present to learner's different types of sketches. Allow learners to observe the sketches and present their findings in a whole class discussion. **Problem-based Learning/Experiential Learning:** In their groups, assist learners to research and discuss concept sketches, types of sketches, their application in the design process, as well as tools and materials used for sketching. Provide access to the internet, relevant videos and charts Support learners to present their findings in a group presentation. **Group Work/Collaborative Learning:** In groups, learners use relevant resources such as photographs, videos, drawings and board illustrations to identify and record the various rendering techniques used in designing.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning:
	1.1.1.LI.2	1.1.1.AS.2
	Use basic shapes, forms and rendering techniques in designing. **Project-based learning:** Guide learners individually, to use freehand sketches to draw and render various shapes and forms with one or more of the rendering techniques they are familiar with. Encourage learners to draw both organic and inorganic objects.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	1.1.1.LI.3	1.1.1.AS.3
	Use the principles of perspective drawing and proportion in designing. **Experiential learning/collaborative learning:** Assist learners to paste their artwork on the classroom walls to create a gallery and encourage learners to appreciate each other's artwork. Learners provide constructive feedback to their classmates. **Project-based learning, Group work, collaborative learning:** In mixed-ability groups, task learners to discuss the concept of perspective and proportion related to drawing, using board illustrations, pictures, relevant videos, and charts.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning

	Experiential learning/ Group Work/collaborative learning: In groups guide learners on a nature walk in the school environment to observe scenes. Support them to sketch the scene making correct use of perspective and proportion. **Experiential learning, collaborative learning/Group work:** Assist learners to paste their drawings on the classroom walls as a gallery and encourage them to appreciate each other's drawings. Learners provide constructive feedback to their classmates.			
Teaching and Learning Materials	Models Charts Reference books Drawing studio	Access to internet LCD Projector Sketches. Pencils	Sketch pads Erasers Pencil sharpener	Drawing pens or ink Blending stumps Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **2. OBJECT MANIPULATION IN DRAWING**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
1.1.2.LO.1		
Analyse and demonstrate skills in how various objects can be manipulated by freehand drawing in line with the concepts, symbols, metaphors and narratives associated with objects	The research activity facilitates critical thinking and communication skills. The group activity ensures collaboration among learning. Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others. Individual learning promotes critical thinking and originality among learners. The brainstorming activity develops communication and learning for life while mixed ability grouping helps develop collaborative learning. Project based learning promotes critical thinking and manipulative skills.	**GESI:** • Grouping learners into mixed gender ensures gender equality. • A whole class discussion takes care of religious differences, and socio-economic differences. **SEL:** Project-based learning promotes sense of responsibility, **National Core Values**: The group activities encourage respect for each other's view

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
1.1.2.CS.1	1.1.2.LI.1	1.1.2.AS.1
Demonstrate understanding and skills in object manipulation in drawing with various tools and techniques based on conceptual, symbols, metaphors and narratives associated with objects.	**Analyse and record the concept of object manipulation and manipulation techniques.** **Managing talk for learning, collaborative learning, Research:** Place learners in mixed groups and task them to use the appropriate resources to identify and record the concept of object manipulation and manipulation techniques in freehand drawing. **Collaborative learning/Group work, Experiential learning:** In mixed groups, let learners examine the various tools and techniques that can be used in object manipulation in the freehand drawing.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	1.1.2.LI.2	1.1.2.AS.2
	Experiment with various tools and techniques in drawing to manipulate organic and inorganic shapes, forms and objects. **Research, Managing Talk for Learning, Collaborative Learning, Group Work:** Place learners in mixed groups, and task them to examine how tools and techniques are used to manipulate specific objects through freehand drawing. This can be done with the aid of photographs/drawings and sketches, videos, real objects, etc **Collaborative learning/Group work, Managing talk for learning:** In small groups, ask learners to discuss how various designers have used the available tools and techniques in freehand drawing to generate a simple/complex manipulation of objects.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	1.1.2.LI.3	1.1.2.AS.3
	Use available media and techniques to manipulate objects based on conceptual, symbols, metaphors and narratives associated with objects. **Project based-learning:** Working individually, learners use the available tools and techniques in freehand drawing to generate a simple manipulation of objects. **Managing talk for learning, Collaborative learning/ Group work:** Place learners in mixed groups, and task them to examine the concept, symbolism, metaphors, and narratives associated with objects and shapes. This can be done with the aid of photographs/drawings and sketches, videos, real objects, etc.	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**

	Collaborative learning/Group learning: In small groups, learners discuss how various designers have used the available tools and techniques in freehand drawing to generate a simple/complex manipulation of objects in line with the concepts, symbolism, metaphors, and narratives associated with those objects. **Project Based-Learning, individual learning:** Working individually, learners use the available tools and freehand drawing techniques to generate a simple manipulation of objects in line with the concept, symbolism, metaphors, and narratives associated with those objects.			
Teaching and Learning Materials	Models Charts Reference books Drawing studio	Access to internet LCD Projector Sketches. Pencils	Sketch pads Erasers Pencil sharpener	Drawing pens or ink Blending stumps Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **3. PATTERN DESIGN**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
1.1.3.LO.1		
Apply the understanding and skills of creating templates and patterns to develop freehand-drawn templates and patterns as solutions in the community.	The brainstorming activity develops communication and learning for life while mixed ability grouping helps develop collaborative learning. The whole class discussion and research activities ensure collaborative learning and critical thinking skills. The research activity facilitates critical thinking and communication skills. The demonstration activity emphasises critical thinking skills while the group activity helps to promote collaborative learning. Project-based learning promotes critical thinking and manipulative skills. The activity engagement helps maintain learners' interest and attention, leading to better retention of information. By actively engaging with authentic problems, learners develop the skills, competencies, and attitudes needed to succeed in both academic and real-world contexts.	**GESI:** • Grouping learners into mixed ability grouping ensures equal participation among learners. • A whole class discussion takes care of religious differences, socio-economic differences. Learners are grouped in mixed abilities. **SEL:** **Relationship Skills:** Engaging in group learning often requires collaboration, communication, and negotiation with others **National Core Values**: Research promotes adherence to ethical principles such as honesty, integrity, transparency and respect for intellectual property.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
1.1.3.CS.1	1.1.3.LI.1	1.1.3.AS.1
Demonstrate knowledge and skill in the use of tools, materials and freehand drawing techniques to create templates and patterns as the basis for design in the community.	**Analyse the sources and use of templates and patterns in the community.** **Managing talk for learning, Experiential learning, collaborative/group learning:** Learners in small groups brainstorm, observe and use other relevant sources to identify and record the sources and uses of templates and patterns in their community. Learners can contribute in their respective capacities with vernacular responses and records, photographs and images, especially those who seldom speak or contribute in class. **Managing talk for learning:** Learners in small groups engage in class discussions on the definitions, common sources and uses of templates and patterns. Encourage learners to use examples from Ghana and other parts of the world. Learners should be encouraged to share their individual experiences from their homes and local communities. **Problem-based learning:** Learners in groups investigate reasons why existing templates and patterns in the community were created. Learners should be encouraged to use freehand annotated drawings to categorise specific templates and patterns with respective reasons.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning:
	1.1.3.LI.2	1.1.3.AS.2
	Investigate the designing and creation processes of templates and patterns. **Collaborative learning/Group work:** Learners in mixed-ability groups analyse various templates and patterns created by designers with the use of photographs, videos, drawings and sketches as well as real objects. Learners should be encouraged to share their experiences and thoughts on templates and patterns objects and products. **Problem-based learning/ Group work:** In small groups examine how designers have used available tools, materials and techniques to create their templates and patterns. Learners should be encouraged to use deductive reasoning and simple research strategies to find the processes of some popular template and pattern brands, objects and products created with freehand drawing. **Project-based learning/Collaborative learning/Group work:** Learners in groups create manual or digital tables and charts of selected examples of common products, tools, materials and techniques used to create the templates and patterns. Learners are to provide detailed	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning

	information including product images or freehand drawing objects with the tools, materials and techniques to complete the task.	
	1.1.3.LI.3	1.1.3.AS.3
	Use appropriate materials, tools and freehand drawing techniques to design and create 2-dimensional templates and patterns as interventions for challenges in the community. **Problem-based learning/ Activity based learning:** Learners in groups use appropriate tools, materials and techniques to imitate existing template and pattern designs. **Problem-based learning:** Learners in mixed-ability groups identify challenges in the community that can be addressed using templates and patterns. Learners should be encouraged to look for simple but obvious challenges and problems in the community that 2-dimensional templates and patterns can address with little effort. **Project-based learning:** Learners in groups use appropriate materials, tools and techniques to design and create 2-dimensional templates and patterns to address challenges in the community. Encourage learners to keep to the general processes for template and pattern production and plausible techniques close when working to facilitate easy reference and action.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**

Teaching and Learning Materials	Models Charts Reference books Drawing studio	Access to internet LCD Projector Sketches. Pencils	Sketch pads Erasers Pencil sharpener	Drawing pens or ink Blending stumps Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **4. DESIGN AND REALISATION**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
1.1.4.LO.1		
Demonstrate understanding of the designing process, write a situation to identify a problem in the home.	The whole class discussion and research activities ensure collaborative learning and critical thinking skills The brainstorming activity develops communication and learning for life while mixed ability grouping helps develop collaborative learning, The group activity ensures collaborative learning The demonstration activity emphasises critical thinking skills	**GESI:** • A whole class discussion takes care of religious differences, socio-economic differences. • By listening to and respecting the viewpoints of others, learners develop cultural competence, empathy, and a deeper understanding of different cultural and social contexts. **SEL:** The brainstorming activity promotes respect for diversity and inclusivity, **National Core Values**: The whole class discussion promotes respect for each other's views.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI			Assessment
1.1.4.CS.1	1.1.4.LI.1			1.1.4.AS.1
Apply the concept of designing processes in solving problems.	**Describe the processes in designing.** **Managing talk for learning/ Collaborative learning:** With the use of relevant videos, charts and the internet assist learners in a whole class discussion to explain the design process and outline the stages involved. **Managing talk for learning:** With the use of a flow chart, assist learners to review and explain all the stages in the design thinking process in a whole class discussion.			Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning:
	1.1.4.LI.2			1.1.4.AS.2
	Write a brief to an identified problem **Experiential learning, Group work/ Collaborative learning:** In mixed-ability groups of no more than five learners, learners walk around and observe the school environment to identify potential problems that need solutions. **Talk for learning:** Using the same groups assist learners to write design briefs for the identified problems they found in the school environment. Let learners present their design briefs to the whole class for discussion.			Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	1.1.4.LI.3			1.1.4.AS.3
	Generate solutions to solve identified problems. **Problem- based learning, Collaborative learning/Group work:** In a mixed-ability group of no more than five members, assist learners to develop some possible solutions to identified problems they observed in their selected environment. **Talk for learning:** Using demonstration, guide learners to critically examine how their solutions are suitable and workable in solving the identified problems.			Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	• Models • Charts	• reference books • access to internet	• LCD Projector	

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **2. GEOMETRY**
Sub-Strand **1. PLANE GEOMETRY**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
1.2.1.LO.1		
Use knowledge of plane geometry to draw plane geometrical shapes and design different artefacts based on plane geometrical figures.	The brainstorming activity develops communication and learning for life while mixed-ability grouping helps develop collaborative learning. The research and construction activities help to develop critical thinking and problem-solving skills. Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others. The demonstration activity emphasises critical thinking skills while the group activity helps to promote collaborative learning. By actively engaging with authentic problems, learners develop the skills, competencies, and attitudes needed to succeed in both academic and real-world contexts.	**GESI:** A whole class discussion takes care of religious differences, socio-economic differences. **SEL:** The brainstorming activity promotes respect for diversity and inclusivity **National Core Values**: • Honesty • Respect • Hardworking

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
1.2.1.CS.1	1.2.1.LI.1	1.2.1.AS.1
Apply the concept of plane geometry in designing.	**Explain types of plane geometrical figures and give examples.** **Talk for Learning/ Experiential learning/ collaborative learning:** **1.** With the aid of relevant pictures, cardboard charts and objects in the school environment, engage learners to brainstorm in whole class discussion to come out with the meaning of plane geometry. 2. Through mixed ability groups, assist learners to identify the various types of plane geometrical figures, give examples of each and explain their properties Examples of plane figures are: Triangles - equilateral, isosceles and scalene Quadrilaterals - square, rectangle rhombus, trapezium, trapezoid and parallelogram Polygons- pentagon, hexagon, heptagon, octagon, nonagon and decagon Let each group give a presentation based on their work and provide a summary afterwards.	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning:
	1.2.1.LI.2	1.2.1.AS.2
	Use ratio to enlarge, reduce or divide plane geometrical figures. **Collaborative learning, Group work, Managing talk for learning:** With the use of charts, pictures, internet surfing and through mixed ability grouping of 6 each, help learners to enlarge, reduce and divide given plane geometrical figures to given ratios. Assist them to also draw plane geometrical figures equal in area to given figures.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	1.2.1.LI.3	1.2.1.AS.3
	Blend circles and lines with arcs. **Collaborative learning/ Group work:** With the use of videos, charts, internet surfing, drawing instruments, and materials, demonstrate the blending of circles and straight lines with arcs. **Problem-based learning, collaborative learning/ Group work:** Through mixed gender grouping of 4 each, guide learners to design a spanner using the principle of blending circles and straight lines with arcs.	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**

	1.2.1.LI.4	1.2.1.AS.4
	Construct an ellipse as a plane geometrical figure. **Managing talk for learning, Collaborative learning/ Group work, Research:** 1. With the use of drawing instruments, charts, board illustrations and through mixed gender grouping demonstrate the construction of ellipse given the minor and major axes. 2. Learners use the concept of constructing ellipse to design table top.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	1.2.1.LI.5	1.2.1.AS.5
	Construct an Archimedean spiral as a locus. **Experiential learning, Problem -based learning:** **1.** With the aid of YouTube video, charts, cut shapes, school environment and drawing instruments, assist learners to draw an Archimedean spiral. 2. Use the concept of drawing Archimedean spiral to design a spiral stair for a two- story domestic house.	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**

Teaching and Learning Materials	● Models ● Charts ● Reference books	● Drawing studio ● Drawing instruments	● Access to internet ● LCD Projector

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **2. GEOMETRY**
Sub-Strand **2. SOLID GEOMETRY**

Learning Outcomes	21st Century Skills and Competencies	GESI, SEL and Shared National Values
1.2.2.LO.1		
Use the understanding of solid geometry to draw three-dimensional objects in isometric, oblique, perspective and design artefact base on solid geometrical figures	The brainstorming activity helps the development of communication and critical thinking skills The group activity ensures collaborative learning The whole class discussion and research activities ensure collaborative learning and critical thinking skills. The research develops critical thinking skills. The project-based activity facilitates individual learning skills.	**GESI:** • Learners are engaged equally regardless of their socio-economic background, or religion. • Grouping learners into mixed-ability groupings ensures equal participation among learners. **SEL:** The group activities improve academic achievement, reduces behaviour problems, and enhances overall well-being **National Core Values**: The whole class discussion promotes respect for each other's views.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
1.2.2.CS.1	1.2.2.LI.1	1.2.2.AS.1
Apply the concept of solid geometry in designing.	**Explain types of solid geometrical figures and give examples.** **Talk for Learning:** With the use of pictures, engage learners to review their knowledge on solid geometry at the basic level and based on this, assist learners to explain solid geometry.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning:
	1.2.2.LI.2	1.2.2.AS.2
	Construct objects in isometric, oblique and perspective. **Talk for learning, Collaborative learning/ Group work, research:** Engage learners to brainstorm in groups on the ways of drawing objects in pictorial and present their findings during class discussion **Talk for learning, Problem based learning:** Use videos, board illustrations, internet surf and instruments to demonstrate the drawing of various objects in pictorial forms (Perspective, isometric and oblique). Construct solid geometrical figures in isometric, oblique and perspective using drawing instrument	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	1.2.2.LI.3	1.2.2.AS.3
	Draw the surface development of prisms. **Managing talk for learning, research:** **1.** Use models, cut shapes, internet surf and charts to assist learners to identify prisms and pyramids as types of solid geometry and describe them based on their properties in a class discussion Examples of solid geometry are: Prisms and pyramids. Prisms have parallel sides, uniform cross-section and are named after the base. Pyramids have their sides tapered to the top or apex and are named after the shape of the base.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning

	2. Let learners outline some examples of pyramids and prisms and their properties in a chart **Managing talk for learning, problem- based learning:** With the use of models, pictures and charts, guide learners to explain the principles of developing the surfaces of prisms and develop given prism surfaces using drawing instruments.		
	1.2.2.LI.4		1.2.2.AS.4
	Draw the surface development of truncated prisms. **Managing talk for learning, problem-based learning:** With the use of models, pictures, charts, board illustrations, guide learners to explain the principles of developing the surfaces of truncated prisms and develop given truncated prism surfaces using drawing instruments **Project-based learning:** In a freehand sketch, design a new milo container that will come out on 1st January of next year and use the appropriate drawing instrument to make surface development of it taking into consideration its dimensions		Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning **Level 4 Extended critical** thinking and reasoning
Teaching and Learning Materials	• Models • charts • drawing instruments	• reference books • drawing studio	• access to internet • LCD Projector

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **2. GEOMETRY**
Sub-Strand **3. FRACTAL GEOMETRY**

Learning Outcomes	21st Century Skills and Competencies	GESI, SEL and Shared National Values
1.2.3.LO.1		
Use the understanding of plane and solid geometry to create fractal designs.	The brainstorming activity helps the development of communication and critical thinking skills. The group activity ensures collaboration among learners. The research develops critical thinking and communication skills. The project-based activity facilitates individual learning skills.	**GESI:** • Learners are engaged equally regardless of their socio-economic background, religion • Grouping learners into mixed ability groupings ensure gender equality **SEL:** The brainstorming activity promotes respect for diversity and inclusivity, **National Core Values**: Research promotes adherence to ethical principles such as honesty, integrity, transparency, and respect for intellectual property.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
1.2.3.CS.1	1.2.3.LI.1	1.2.3.AS.1
Demonstrate knowledge and understanding in fractal geometry in creating fractal designs.	**Explain the basic concept of fractal geometry.** **Group work, collaborative learning, Talk for learning:** With the use of charts, videos, fabrics, flowers, leaves, and in mixed ability groups guide learners to observe the pattern of given materials and identify the common geometrical shape running through the design of the materials given. Guide learners to present their findings in a whole class discussion. **Group work/collaborative learnings, managing talk for learning:** In their groups guide learners to explain fractal geometry in their own words. **Research, group work/Collaborative learning:** Using the internet to research, guide learners to identify types of fractal geometry and present their groups findings in a whole class discussion. **Research, group work, collaborative learning, talk for learning:** Using the internet to research, guide learners to state and explain at least three applications of fractal geometry in their groups, and present in a whole class discussion.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning:
	1.2.3.LI.2	1.2.3.AS.2
	Examine the application of fractal geometry in designs. **Research, group work, talk for learning, collaborative learnings:** Using videos, charts, research and the internet, guide learners to explore varieties of fractal patterns in mixed ability groups and present their findings in a whole class discussion. **Group work, activity-based learning:** In mixed ability groups assist learners to use free hand sketches to create fractal patterns from simple geometrical figures. For example, circle, ellipse and various polygons. Ask learners to share and compare designs with other groups. **Group work, activity-based learning:** Guide learners in mixed ability groups to use drawing instruments to create fractal patterns of their choice and pin their designs on the board for review.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning

Teaching and Learning Materials	• Models • Charts	• reference books • drawing studio	• access to internet • LCD Projector	• fabrics of different designs • cutting knife

YEAR TWO

Subject DESIGN AND COMMUNICATION TECHNOLOGY
Strand 1. CONCEPTUAL DRAWING
Sub-Strand 1. CONCEPT SKETCHES

Learning Outcomes	21st Century Skills and Competencies	GESI, SEL and Shared National Values
2.1.1.LO.1		
Demonstrate basic knowledge in concept sketches by creating designs through the use of basic shapes, rendering techniques, perspective and proportions.	The group activity ensures collaboration among learners. The research activity facilitates critical thinking and communication skills. Project-based learning promotes critical thinking and manipulative skills. Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others.	**GESI:** • Grouping learners into mixed gender ensures gender equality. • A whole class discussion takes care of religious differences, and socio-economic differences. **SEL:** Talk for learning enhances social awareness and relationship skills by promoting empathy, active listening, and understanding of diverse perspectives. **National Core Values:** Research promotes adherence to ethical principles such as honesty, integrity, transparency, and respect for intellectual property**.**

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.1.1.CS.1	2.1.1.LI.1	2.1.1.AS.1
Apply the understanding of concept sketches and the techniques of rendering in designing objects in the environment.	**Analyse various basic shapes and rendering techniques used to create complex forms in freehand drawing.** **Group Work/Collaborative Learning:** Learners in groups discuss the characteristics of basic shapes and rendering techniques used to create complex forms with the aid of relevant resources such as photographs, drawings, videos, charts and actual objects in the environment. **Problem-based Learning/Experiential Learning:** Learners in groups observe how basic shapes and rendering techniques have been used to create complex forms with the aid of relevant resources such as photographs, drawings, videos, charts and actual objects in the environment. **Project-based Learning/Experiential Learning:** Let learners in groups generate manual/digital pictorial charts of basic shapes and rendering techniques that can be used to create complex forms.	**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
	Experiment with freehand sketches to create designs in 2- point perspective with emphasis on proportions using basic shapes and rendering techniques. **Group Work/Collaborative Learning:** Learners in groups discuss the characteristics of 2-point perspectives with emphasis on proportions, and how they can be used to create complex forms with the aid of relevant resources such as photographs, drawings, videos, charts and actual objects in the environment. **Project-based Learning/Experiential Learning:** Let learners in groups generate manual/digital pictorial charts of complex forms created using 2-point perspectives with emphasis on proportions. **Project-based Learning:** Let learners in groups/individuals experiment with relevant tools and techniques to create complex forms using 2-point perspectives with emphasis on proportions and freehand sketches.	**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
	Use the idea of concept sketches to create complex designs with graphite pencil and coloured pencil sketches in freehand drawing. **Collaborative Learning/Group work:** Learners in groups brainstorm to select the type of basic shapes, rendering techniques and complex forms they want to create and the relevant tools and materials they will be using. **Project-based Learning:** Guide learners in groups/individuals to create complex designs with basic shapes and rendering techniques using graphite pencil and coloured pencil sketches in freehand drawing. **Project-based Learning:** Let learners in groups generate manual/digital pictorial reports on how they created the complex designs with basic shapes and rendering techniques using graphite pencil and coloured pencil sketches in freehand drawing.			**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • Charts • reference books • drawing studio	• access to internet • LCD Projector • sketches. • Pencils	• Sketch pads • Erasers • Pencil sharpener	• Drawing pens or ink • Blending stumps • Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **2. OBJECT MANIPULATION IN DRAWING**

Learning Outcomes	21st Century Skills and Competencies	GESI, SEL and Shared National Values
2.1.2.LO.1		
Apply the understanding and skills in how simple and complex objects can be manipulated by drawing with concepts, symbols and narratives associated with objects.	The brainstorming activity develops communication and learning for life while mixed ability grouping helps develop collaborative learning. The group activities promote collaboration among learners. Project based learning encourages learners to think creatively and innovate as they design and execute their projects. By actively engaging with authentic problems, learners develop the skills, competencies, and attitudes needed to succeed in both academic and real-world contexts. Group work fosters the development of collaborative skills as learners work together to achieve common goals. and collaborate with others to solve problems and complete tasks. The experiential learning approach allows for a deeper understanding of the subject matter as learners connect theoretical knowledge to real-world applications.	**GESI:** • Grouping learners into mixed gender ensures gender equality. • Grouping learners into mixed ability groupings ensures equal participation among learners. **SEL:** Brainstorming sessions encourage students to work together, share ideas, and communicate effectively with peers **National Core Values**: Teamwork and Leadership

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.1.2.CS.1	2.1.2.LI.1	2.1.2.AS.1
Demonstrate understanding and skills in object manipulation with various tools and techniques.	**Investigate how simple and complex objects can be modified through object manipulation techniques.** **Collaborative learning/Group work Managing Talk for Learning:** Put learners in mixed groups to brainstorm how different objects can be manipulated through drawing. **Collaborative/Group learning:** In mixed groups, let learners examine selected designs to determine the possible tools and techniques that were used to manipulate the initial object. **Project-Based Learning:** Let learners work individually/in groups to generate a manual or digital pictorial table/chart of designs that have been created through object manipulation.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning:**
	2.1.2.LI.2	2.1.2.AS.2
	Experiment with how objects can be manipulated through drawing to achieve new forms. **Activity based learning, Problems-Based Learning:** In mixed groups, guide learners to examine photographs, drawings and sketches, videos, real objects, etc. to determine the possible new forms that can be derived from each of the objects. **Group work/Collaborative Learning:** In small groups, let learners use the available tools and techniques to manipulate simple/complex objects. **Activity based learning, Project-Based Learning:** Learners work individually to use the available tools and techniques to manipulate selected objects.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
	2.1.2.LI.3	2.1.2.AS.3
	Generate simple forms in line with the concepts and narratives associated with objects and designs.	**Level 1 Recall** **Level 2 Skills of conceptual understanding**

	Managing Talk for Learning: Learners in mixed groups examine concepts, symbolisms, and narratives associated with specific designs and objects using resources like photographs, drawings, sketches, videos, real objects, etc **Project-Based Learning/Experiential Learning:** In small groups, let learners select a simple design and use the available tools and free-hand drawing techniques to imitate the object they have selected. **Project-Based Learning:** Let learners work individually/in groups to use the available tools and techniques to create a design in line with specific concepts, symbolisms and narratives.			**Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • Charts • reference books • drawing studio	• access to internet • LCD Projector • sketches. • Pencils	• Sketch pads • Erasers • Pencil sharpener	• Drawing pens or ink • Blending stumps • Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **3. PATTERN DESIGN**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
2.1.3.LO.1		
Apply the understanding and skills of creating templates and patterns to develop freehand-drawn 2-dimensional templates and patterns for new concepts and designs.	Group work fosters the development of collaborative skills as learners work together to achieve common goals. and collaborate with others to solve problems and complete tasks. By actively engaging with authentic problems, learners develop the skills, competencies, and attitudes needed to succeed in both academic and real-world contexts.	**GESI:** A whole class discussion takes care of religious differences, socio-economic differences. **SEL:** Activity-based learning provides rich opportunities for students to develop collaboration, critical thinking, emotional regulation, empathy, self-management, relationship skills, leadership, and reflection **National Core Values**: Teamwork and Leadership

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.1.3.CS.1	2.1.3.LI.1	2.1.3.AS.1
Demonstrate knowledge and skill in using freehand drawing techniques to create 2-dimensional templates and patterns for concepts and designs.	**Select appropriate drawing materials and tools that can be used to create 2-dimensional free hand-drawn templates and patterns.** **Group work/Collaborative Learning:** In mixed-ability groups, learners brainstorm to come up with ideas for drawing freehand templates and patterns. This could be a theme or an idea, and what the 2-dimensional template and pattern drawing is for; e.g. art, design, textiles, etc. **Group work/Collaborative Learning:** Project-based Learning: Learners in mixed-ability groups develop many small sketches and drawings based on their ideas to see which ones could work as 2-dimensional templates and patterns. **Problem-based learning:** Learners in mixed-ability groups identify and select appropriate materials and tools, such as pencils, pens, markers, saws, knives, blades, cardboards, wood board, foam, styrofoam, etc. for their free hand-drawn 2-dimensional template and pattern projects.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning:**
	2.1.3.LI.2	2.1.3.AS.2
	Develop appropriate drawing framework and necessary elements to create 2-dimensional templates and patterns. **Group work/Collaborative Learning; Problem-based Learning:** 1. Learners in small groups brainstorm to determine appropriate dimensions and proportions for 2-dimensional free hand-drawn templates and patterns. 2. learners can refer to the small sketches they did in LI 1 **Group work/Collaborative Learning; Problem-based Learning:** Learners in small groups identify and develop steps to create 2-dimensional free hand-drawn templates and patterns. The steps can include drawing simple shapes or light outlines by using soft strokes to plan how the finished drawing will look. This will help as a rough guide for the drawing. **Group work/Collaborative Learning, Project-based Learning:** Learners in small groups used the steps they developed to create 2-dimensional free hand-drawn templates and patterns with appropriate details, textures and ornamentations. As details are added to the 2-dimensional	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**

	free hand-drawn templates and patterns, ensure that everything looks balanced and organised. Pay attention to how different parts of the created design come together to form a cohesive template and pattern**.**			
	2.1.3.LI.3			2.1.3.AS.3
	Finalise the 2-dimensional template and pattern design. **Managing Talk for Learning:** 1. Learners in their groups present their developed 2-dimensional free hand-drawn templates and patterns in class and record criticisms and suggestions from their peers. 2. Learners should look at their work objectively with their peers for things they can improve. They should also gather feedback from their peers. **Group work/Collaborative Learning, Problem-based Learning:** Learners In small groups use the feedback they receive from their peers in class discussion to make their drawings better. **Group work/Collaborative Learning, Project-based Learning:** Learners in small groups write a report explaining how they made their drawings and demonstrate how their 2-dimensional free hand-drawn templates and patterns can be useful for the community.			**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	Models Charts reference books drawing studio	access to internet LCD Projector sketches. Pencils	Sketch pads Erasers Pencil sharpener	Drawing pens or ink Blending stumps Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **4. DESIGN AND REALISATION**

Learning Outcomes	21st Century Skills and Competencies	GESI, SEL and Shared National Values
2.1.4.LO.1		
With the idea of a developed solution in mind, explain the exploded view, draw the exploded view of the artefact, prepare a working drawing and cutting list for the construction of an artefact.	The group activity ensures collaborative learning. The research activity facilitates critical thinking and communication skills. The brainstorming activity develops communication and learning for life The activity engagement helps maintain learners' interest and attention, leading to better retention of information.	**GESI:** A whole class discussion takes care of religious differences, socio-economic differences. **SEL:** Self-Management: Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: Research promotes adherence to ethical principles such as honesty, integrity, transparency, and respect for intellectual property.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.1.4.CS.1	2.1.4.LI.1	2.1.4.AS.1
Apply the concept of designing processes in solving problems.	**Draw exploded views of final solutions.** **Managing talk for learning:** Review learners' knowledge in the design process through whole class discussion to bring out the new topic. **Managing talk for learning/ Experiential learning:** With the use of videos, simulations and board illustrations, explain the exploded view. **Managing talk for learning:** With the use of sketches, board illustrations, pictures and drawing instruments demonstrate the drawing of exploded views of objects. **Activity-based learning, Talk for learning:** With the use of drawing instrument and the understanding of the exploded view concept, draw the exploded view of a given final solution" **Managing talk for learning:** Explain working drawing with the use of sketches and charts. From the sketches, demonstrate the making of a working drawing of an artefact using drawing instruments.	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning:**
	2.1.4.LI.2	2.1.4.AS.2
	Make a neat working drawing. **Activity-based learning, talk for learning:** Prepare neat working drawings based on the knowledge acquired from the demonstration.	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**

Teaching and Learning Materials				
	• Models • Charts	• reference books • drawing studio	• access to internet • LCD Projector	• sketches. • Drawing instruments

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **2. GEOMETRY**
Sub-Strand **1. PLANE GEOMETRY**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
2.2.1.LO.1		
Use the knowledge of plane geometry to draw plane geometrical shapes and design different artefact based on plane geometrical figures.	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others The activity engagement helps maintain learners' interest and attention, leading to better retention of information. By actively engaging with authentic problems, learners develop the skills, competencies, and attitudes needed to succeed in both academic and real-world contexts.	**GESI:** Talk for learning takes care of religious differences and socio-economic differences. **SEL:** Self-Management: Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: Research promotes adherence to ethical principles such as honesty, integrity, transparency, and respect for intellectual property.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.2.1.CS.1	2.2.1.LI.1	2.2.1.AS.1
Apply the concept of plane geometry in designing	**Draw orthographic projections of given objects.** **Managing talk for learning, Activity based learning:** Through demonstration and the understanding gained from the concepts of plane geometry, assist learners to draw Orthographic Projections in first and third angles. **Activity based learning:** Use the knowledge gained from the principles of drawing orthographic views to find the true lengths, true angles of inclination and traces of lines in space	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
	Explain the principles underlying the working of Loci and construct loci. **Managing talk for learning** With the use of pictures, videos and charts, explain the principles underlying the operations of loci, for example Helix, link mechanism and Involute as types of loci. **Experiential learning, Managing talk for learning:** With the use of board instruments demonstrate to learners the construction of involutes and helix **Activity based learning:** Guide learners to use the principles to construct involutes of various shapes and helix.	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
	Design an artefact using the principle of loci. **Research, Collaborative learning/ Group Work, Managing talk for learning:** Assist learners to use relevant resources to research on the working principles of a car jack and produce pictures and videos of examples of car jacks that works on the principles of helix**.** Assist learners to present their findings in a whole class discussion. **Activity-based learning, individual learning:** Ask learners to provide sketches of examples of car jacks that works on the principles of helix	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**

	Individual learning, Activity based learning, Problem based learning: Guide learners individually to design a car jack using the working principles of the helix			
Teaching and Learning Materials	• Models • Charts	• reference books • drawing studio	• Drawing instruments • access to internet	• LCD Projector

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **2. GEOMETRY**
Sub-Strand **2. SOLID GEOMETRY**

Learning Outcomes	21st Century Skills and Competencies	GESI, SEL and Shared National Values
2.2.2.LO.1		
Based on the understanding gained from the study of the concepts of solid geometry, construct complex solid geometrical objects.	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others. The activity engagement helps maintain learners' interest and attention, leading to better retention of information. Project based learning encourages learners to think creatively and innovate as they design and execute their projects	**GESI:** **Equal Participation**: Project based learning encourages all team members to contribute their skills and insights which promotes equal participation and contribution from all team members. **SEL:** Engaging in project-based learning promotes empathy as students explore the experiences and challenges faced by individuals from different backgrounds. This promotes a deeper understanding of diversity and encourages compassionate action. **National Core Values**: Talk for learning encourages students to communicate openly and respectfully with their peers and teachers.
2.2.2.LO.2		
Use the knowledge of AutoCAD to draw simple plane figures.	The experiential learning approach allows for a deeper understanding of the subject matter as learners connect theoretical knowledge to real-world applications. The activity engagement helps maintain learners' interest and attention, leading to better retention of information.	**GESI:** **Inclusive Learning Environment**: Activity based learning encourages active participation from all students, fostering an inclusive classroom where diverse perspectives and experiences are valued. **SEL:** **Self-Awareness and Identity Exploration**: Experiential learning

		encourages learners to explore their own identities and privileges in relation to the subject matter. This process promotes self-awareness and a deeper understanding of social issues. **National Core Values**: **Team-Based Activities**: Experiential learning often involves teamwork and collaborative problem-solving. Working in diverse groups encourages effective communication, respect for different viewpoints, and inclusive decision-making processes.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.2.2.CS.1	2.2.2.LI.1	2.2.2.AS.1
Apply the concept of solid geometry in designing.	**Construct the surface development of pyramids.** **Managing talk for learning:** **1.** Review learners' understanding of solid geometrical figures and the development of surfaces of prisms through brainstorming board sketches and illustrations. 2. With the aid of models, pictures, videos and charts, assist learners to explain the principles of developing pyramids. 3. Demonstrate the development of the surfaces of types of pyramids with the use of drawing instruments. **Activity based learning:** Guide learners to develop the surfaces of some given pyramids such as rectangular, pentagonal and hexagonal pyramids	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning:
	2.2.2.LI.2	2.2.2.AS.2
	Draw the curve of intersections of objects meeting at right angles. **Managing talk for learning, Collaborative Learning/ Group work:** In mixed ability grouping and with the use of models, pictures and charts, help learners to explain the principles of intersections and present their findings in a whole class discussion **Managing talk for learning:** Demonstrate the drawing of curves of intersection of square and cylindrical pipes meeting at right angles using board illustrations and drawing instrument. **Activity based learning:** With the use of instrument and the application of the concept of intersection, draw the curve of intersection of two cylindrical pipes of different diameters meeting at right angles.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
	2.2.2.LI.3	2.2.2.AS.3
	Design an artefact using the concept of solid geometry. **Project-based learning:** In small groups assist learners to design artefact using the concepts of solid geometry.	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning

			Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	• Models • Charts • reference books	• drawing studio • Drawing instruments	• access to internet • LCD Projector

<table>
<tr><th>Content Standards</th><th colspan="3">Learning Indicators and Pedagogical Exemplars with 21st Century and GESI</th><th>Assessment</th></tr>
<tr><td>2.2.2.CS.2</td><td colspan="3">2.2.2.LI.1</td><td>2.2.2.AS.1</td></tr>
<tr><td rowspan="3">Use the knowledge of AutoCAD to draw simple plane figures.</td><td colspan="3">Demonstrate the use of basic concepts of CAD in developing drawings.

Experiential learning, managing talk for learning:
1. Assist learners to explain CAD and why there is the need to use CAD. Computer Aided Design (CAD) means designing and drafting with the aid of a computer. Design is creating a real product from an idea. Drafting is production of the drawings that are used to document a design. It is important to use CAD because it is faster to create complex designs.
2. Assist learners to launch the CAD interface and identify the pallets. Examples of pallets are application menu, quick access toolbar, info centre, ribbon, status bar, command window, drawing area, properties toolbar user coordinate system (UCS).
3. Assist learners to state the uses of the various pallets identified. Assist learners to set the drawing area i.e the unit, the scale and the size of drawing area.
4. Demonstrate the use of the basic drawing tools in CAD for learners to practise.</td><td>Level 1 Recall
Level 2 Skills of conceptual understanding
Level 3 Strategic reasoning
Level 4 Extended critical thinking and reasoning:</td></tr>
<tr><td colspan="3">2.2.2.LI.2</td><td>2.2.2.AS.2</td></tr>
<tr><td colspan="3">Manipulate drawings CAD tools through editing and plotting techniques.

Activity based learning, experiential learning, Managing talk for learning: Assist learners to identify the editing or modifying tools. Guide learners to edit or modify drawings using the appropriate tools. Examples of editing or modification tools are Trim, Break, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Extend, Chamfer, Fillet and erase.</td><td>Level 1 Recall
Level 2 Skills of conceptual understanding
Level 3 Strategic reasoning
Level 4 Extended critical thinking and reasoning</td></tr>
<tr><td>Teaching and Learning Materials</td><td>• Computer laptop
• computer desktop
• windows tablet</td><td>• computer mouse
• autocad architecture desktop
• optitex/pattern design</td><td colspan="2">• LCD projector
• Access to internet</td></tr>
</table>

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **2. GEOMETRY**
Sub-Strand **3. FRACTAL GEOMETRY**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI[3], SEL[4] and Shared National Values**
2.2.3.LO.1		
Use the understanding of plane and solid geometry to create fractal designs.	Group work fosters the development of collaborative skills as learners work together to achieve common goals. and collaborate with others to solve problems and complete tasks. Activity based learning and Project based learning encourages learners to think creatively and innovate as they design and execute their projects.	**GESI:** Group work takes care of religious differences, socio-economic differences. **SEL:** Self-Management: Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: Research promotes adherence to ethical principles such as honesty, integrity, transparency, and respect for intellectual property.

[3]Gender Equality and Social Inclusion
[4]Socio-Emotional Learning

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.2.3.CS.1	2.2.3.LI.1	2.2.3.AS.1
Demonstrate knowledge and understanding of fractal geometry in creating fractal designs.	**Use various geometric shapes to create complex fractal designs.** **Group Work/Collaborative Learning:** Learners in groups discuss the characteristics of geometric shapes to be used to create fractal designs with the aid of relevant resources such as photographs, drawings, videos, charts and real objects in the environment. **Problem-based Learning/Experiential Learning:** Learners in groups observe how geometric shapes have been used to create fractal designs with the aid of relevant resources such as photographs, drawings, videos, charts and real objects in the environment. **Project-based Learning/Experiential Learning:** Let learners in groups generate manual/digital pictorial charts of geometric shapes that can be used to create fractal designs.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	2.2.3.LI.2	2.2.3.AS.2
	Experiment with the creation of various fractal designs using geometric shapes. **Group Work/Collaborative Learning:** Learners in groups discuss the characteristics of self -similar fractal designs and how they can be created with the aid of relevant resources such as photographs, drawings, videos, charts and actual objects in the environment. **Project-based Learning/Experiential Learning:** Let learners in groups generate manual/digital pictorial charts of self-similar fractal designs created using geometric shapes **Project-based Learning:** Let learners in groups/individuals experiment with relevant tools and techniques to create self- similar fractal designs	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**

	2.2.3.LI.3	2.2.3.AS.3
	Draw orthographic views of given objects **Managing talk for learning and problem solving:** 1. Through demonstration and the understanding gained from the concepts of plane geometry, assist learners to precisely draw Orthographic Projections in first and third angles **2.** Use the knowledge gained from the principles of drawing orthographic views to find the true lengths, true angles of inclination and traces of lines in space	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
	2.2.3.LI.4	2.2.3.AS.4
	Design artefact with loci **Discussion, demonstration and problem solving:** 1. With the use of pictures, videos and charts, help learners to vividly explain the principles underlying the operations of Helix and Involute as types of loci. 2. Guide learners to accurately design a car jack using the working principles of the helix	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**

Teaching and Learning Materials	• Models • Charts • Reference books	• Drawing studio • Drawing instruments	• Access to internet • LCD Projector

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **3. EXTENDED DRAWING**
Sub-Strand **1. BUILDING DRAWING**

Learning Outcomes	21st Century Skills and Competencies	GESI, SEL and Shared National Values
2.3.1.LO.1		
Employ the understanding of floor plans with the use of building codes, standards and symbols, make the sketches of elevations of buildings and use the drawing instrument to draw some of them.	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others. The activity engagement helps maintain learners' interest and attention, leading to better retention of information.	**GESI:** **Valuing Diversity**: Talk for learning fosters an environment where diverse cultural backgrounds, beliefs, and practices are respected and integrated into the learning process. This helps learners develop cultural sensitivity and awareness. **SEL:** **Self-Management**: Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: **Leadership Development**: Through Talk for learning, individuals can develop leadership skills by taking initiative in discussions and promoting inclusive practices within their communities and organisations.
2.3.1.LO.2		
Use your understanding on the principles of electrical circuit and circuit diagrams to explain electrical circuit and circuit diagrams.	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others	**GESI:** **Equal Participation**: Project based learning encourages all team members to contribute their skills and insights

	The activity engagement helps maintain learners' interest and attention, leading to better retention of information. Group work fosters the development of collaborative skills as learners work together to achieve common goals. and collaborate with others to solve problems and complete tasks.	which promotes equal participation and contribution from all team members. **SEL:** Engaging in project-based learning promotes empathy as students explore the experiences and challenges faced by individuals from different backgrounds. This promotes a deeper understanding of diversity and encourages compassionate action. **National Core Values**: Project based learning emphasises communication skills, including active listening, negotiation, and respectful dialogue. These skills are essential for effective teamwork and collaboration across diverse groups.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.3.1.CS.1	2.3.1.LI.1	2.3.1.AS.1
Understand the concept of building drawing.	**Explain building elevations in relation to building plans.** **Managing talk for learning:** **1.** With the aid of a model, assist learners to explain the concept of elevations. 2. Assist learners to identify the various components that can be seen in the elevations and how they are represented.	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	2.3.1.LI.2	2.3.1.AS.2
	Make freehand sketches of elevations of simple domestic buildings in relation to their plans. **Managing talk for learning, Experiential learning:** Sketch the south, north, east and west elevations from a given floor plan using freehand.	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	2.3.1.LI.3	2.3.1.AS.3
	Draw elevations of simple buildings in relation to their plans using appropriate drawing instruments. **Activity based learning:** Draw the south, north, east and west elevations from a given floor plan using drawing instruments and scale rules.	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**

Teaching and Learning Materials	• Models • charts and drawing instruments, such as set-squares, protractor, pair of compasses and dividers	• reference books • drawing studio	• access to internet • LCD Projector

<table>
<tr><th>Content Standards</th><th colspan="3">Learning Indicators and Pedagogical Exemplars with 21st Century and GESI</th><th>Assessment</th></tr>
<tr><td>2.3.1.CS.2</td><td colspan="3">2.3.1.LI.1</td><td>2.3.1.AS.1</td></tr>
<tr><td rowspan="3">Understand the principles of Electrical drawings (Understand the application of the principles of Electrical drawings).</td><td colspan="3">Distinguish between electrical circuit and electronic circuit.

Managing talk for learning
1. With the aid of real objects, models and board illustration, learners brainstorm to come up with the difference between electrical circuits and electronic circuits.
2. Assist learners to outline the components in electronic and electrical circuits and explain their functions.</td><td>Level 1 Recall
Level 2 Skills of conceptual understanding
Level 3 Strategic reasoning
Level 4 Extended critical thinking and reasoning</td></tr>
<tr><td colspan="3">2.3.1.LI.2</td><td>2.3.1.AS.2</td></tr>
<tr><td colspan="3">Use electronic and electrical symbols to draw simple electronic and electrical circuit diagrams.

Activity based learning, Experiential learning: Guide learners to use a switch, fuse and circuit breakers to design a simple electrical circuit. Again assist the learners to use a cell, a lamp and a diode to design an electronic circuit

Activity based learning: With the use of drawing instrument, learners make neat circuit diagrams from the electrical and electronic circuits designed

Collaborative learning/ Group work, Project-based learning
1. Through brainstorming, charts, pictures and in mixed gender grouping, assist learners to design an electrical or electronic circuit using five different components and use a drawing instrument to develop it into a circuit diagram.
2. Use the circuit diagram to explain schematic diagram"</td><td>Level 1 Recall
Level 2 Skills of conceptual understanding
Level 3 Strategic reasoning
Level 4 Extended critical thinking and reasoning</td></tr>
<tr><td>Teaching and Learning Materials</td><td>• Models
• Charts
• Reference books</td><td>• Drawing studio
• Drawing instruments</td><td>• Access to internet
• LCD Projector</td><td></td></tr>
</table>

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **3. EXTENDED DRAWING**
Sub-Strand **2. MECHANICAL DRAWING**

Learning Outcomes	21st Century Skills and Competencies	GESI, SEL and Shared National Values
2.3.2.LO.1		
Make accurate sectional drawings of machine parts or components, adhering to the principles of sectioning in engineering.	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others The activity engagement helps maintain learners' interest and attention, leading to better retention of information.	**GESI:** **Valuing Diversity**: Talk for learning fosters an environment where diverse cultural backgrounds, beliefs, and practices are respected and integrated into the learning process. This helps learners develop cultural sensitivity and awareness. **SEL:** **Self-Management:** Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: **Leadership Development**: Through Talk for learning, individuals can develop leadership skills by taking initiative in discussions and promoting inclusive practices within their communities and organisations.
2.3.2.LO.2		
Use your understanding on the principles of electrical circuit and circuit diagrams to explain electrical circuit and circuit diagrams,	Group work fosters the development of collaborative skills as learners work together to achieve common goals. and collaborate with others to solve problems and complete tasks.	**GESI:** Group work takes care of religious and socio-economic differences **SEL:** **Self-Management:** Activity-based learning encourages students to take

	The activity engagement helps maintain learners' interest and attention, leading to better retention of information.	responsibility for their learning and behaviour. **National Core Values**: **Leadership Development**: Through Talk for learning, individuals can develop leadership skills by taking initiative in discussions and promoting inclusive practices within their communities and organisations.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.3.2.CS.1	2.3.2.LI.1	2.3.2.AS.1
Understand the concept of building drawing.	**Explain the principles of sectional drawing.** **Managing talk for learning:** With the use of models, internet surfing, pictures, videos, charts and in mixed ability groupings assist learners to explain the principles and rules of sectional drawing, outline various types of sectional drawing, and present a comprehensive report in a whole class discussion. **Activity-based learning** Demonstrate the drawing of the various types of sections with the use of board illustrations and in freehand. Guide the learners to also draw the various sections in freehand in their sketch pads	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	2.3.2.LI.2	2.3.2.AS.2
	Draw the sectional views of machine parts and components using drawing instruments **Activity-based learning, Experiential learning:** Help learners to use drawing instruments to draw the sections of some parts of a machine such as a bolt, nut, thread, full, half, broken out, offset sections, etc.	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	2.3.2.LI.3	2.3.2.AS.3
	Draw the sectional views of machine parts and components with drawing instruments. **Activity-based learning, Problem - based learning:** With the use of real objects, models, board illustration and with an understanding of the concept of sectioning, guide learners to draw the sectional views of some complex machine parts and components.	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • Charts • Reference books • Drawing studio • Drawing instruments • Access to internet • LCD Projector	

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.3.2.CS.2	2.3.2.LI.1	2.3.2.AS.1
Understand the principles of Electrical drawings (Understand the application of the principles of Electrical drawings).	**Distinguish between electrical circuit and electronic circuit.** **Managing talk for learning:** With the aid of real objects, models and board illustration, learners brainstorm to come up with the difference between electrical circuits and electronic circuits. Assist learners to outline the components in electronic and electrical circuits and explain their functions.	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
	2.3.2.LI.2	2.3.2.AS.2
	Use electronic and electrical symbols to draw simple electronic and electrical circuit diagrams. **Activity based learning, Experiential learning:** Guide learners to use a switch, fuse and circuit breakers to design a simple electrical circuit. Again, assist the learners to use a cell, a lamp and a diode to design an electronic circuit **Activity based learning:** With the use of drawing instrument, learners make neat circuit diagrams from the electrical and electronic circuits designed **Collaborative learning/ Group work, Project-based learning:** Through brainstorming, charts, pictures and in mixed gender grouping, assist learners to design an electrical or electronic circuit using five different components and use a drawing instrument to develop it into a circuit diagram. Use the circuit diagram to explain schematic diagram"	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • Charts • Reference books • Drawing studio • Drawing instruments • Access to internet • LCD Projector	

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **3. EXTENDED DRAWING**
Sub-Strand **3. GARMENT DESIGN TECHNOLOGY**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
2.3.3.LO.1		
Use the principles and skills of concept sketches, object manipulation and geometrical drawings to design garments for different vocations.	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others. The activity engagement helps maintain learners' interest and attention, leading to better retention of information. Project based learning encourages learners to think creatively and innovate as they design and execute their projects	**GESI:** Grouping learners into mixed ability groupings encourages equal participation among learners **SEL:** Through individual learning experiences, learners often gain deeper insights into their own strengths, weaknesses, preferences, and emotional responses **National Core Values**: Experiential learning encourages individuals to take on leadership roles, solve problems creatively, and take initiative in addressing challenges within their communities or organisations.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
2.3.3.CS.1	2.3.3.LI.1	2.3.3.AS.1
Demonstrate understanding and techniques in conceptual and geometrical drawings in designing garments.	**Assess the tools used in garment design, and their applications.** **Group work/Collaborative Learning, Activity-based learning:** Let learners in groups explain garments through the use of videos, photographs, drawings, charts etc. Present their findings in a whole class discussion. **Research, group work/Collaborative learning and Activity-based learning:** 1. Help learners in their groups to find out the importance of garment in the society with the use of internet surf, videos, photographs, drawings, etc. Generate a manual chart of some garments and their importance/uses. **2.** Present report in a whole class discussion **Collaborative Learning, Research, Experiential learning and Activity-based learning:** in mixed groups, let learners examine the various tools that are used for garment design and pattern making. Prepare a manual report to be presented in a whole class discussion.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	2.3.3.LI.2	2.3.3.AS.2
	Take accurate body measurements to prepare a bodice block. **Collaborative Learning, research, and experiential learning:** 1. Let learners in groups explain body measurement and its importance with the use of relevant resources. 2. Tabulate the importance of body measurement during the group discussion and present findings in a whole class discussion **Research and group work:** 1. Help learners in their groups to come out with the principles underpinning the process of body measurement using internet surf, videos, photographs, drawings, etc. 2. Generate a manual chart of some principles underlying the process of body measurement. Present report in a whole class discussion	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning

	Collaborative Learning, research: 1. In groups let learners identify the parts of the body that need to be measured with the use of relevant resources. 2. Make a digital or manual chart of the parts to be measured when the client is a man, woman, or child. 3. Present findings in a whole class discussion **Project-based learning and Group work:** 1. Pair learners and ask them to take their body measurements taking into consideration the principles and concepts underpinning body measurement using the appropriate tools and materials. 2. Learners use their measurements to prepare bodice block, skirt block and sleeve block	
	2.3.3.LI.3	2.3.3.AS.3
	Draft garment patterns using bodice block, skirt block and sleeve block. **Collaborative Learning, research, experiential learning:** 1. Let learners in mixed groups explain drafting in garment design, its importance, and the tools used in drafting using appropriate resources, materials, and relevant information systems. 2. Let learners prepare a manual chart of some faults in drafting and their reasons. 3. Learners present their report in a whole class discussion **Group work, research, experiential learning:** 1. With the use of relevant resources, let learners brainstorm and come out with the principles guiding the drafting of garment parts (patterns). 2. Let the groups present their findings in a whole class discussion **Project-based learning, experiential learning:** Using the body blocks developed from the body measurement and the drafting principles, let learners individually draft body blocks for themselves taking into consideration all allowances.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**

<table>
<tr><td></td><td colspan="3">2.3.3.LI.4</td><td>2.3.3.AS.4</td></tr>
<tr><td></td><td colspan="3">Cut out the patterns to be used for the garment.

Collaborative and activity-based learning:
1. Let learners in their groups search for the details and other information that should be recorded or marked clearly on the pattern before cutting using internet surfing, relevant books, and videos.
2. Let the learners in their groups present their findings in a whole class discussion

Project based activity, individual learning:
1. Guide the learners to record the details and other information that were found in their search on their patterns individually. The details and other information should be clearly marked.
2. Learners go round to see what their colleagues have done

Project based activity, group work: Assist learners in groups to cut their basic blocks to correspond with the various pattern marking symbols

Individual learning: Guide learners on how to care and maintain the basic blocks they have prepared in order to keep them safe. Learners design and make a bag for storage.

Project based activity, individual learning: Help learners to cut out the pattern pieces very carefully and cut as many parts as required to make the cloth into garment. Mark all pattern details on the right side of the pattern.</td><td>Level 1 Recall
Level 2 Skills of conceptual understanding
Level 3 Strategic reasoning
Level 4 Extended critical thinking and reasoning</td></tr>
<tr><td>Teaching and Learning Materials</td><td>• Sketch pad
• Pair of scissors
• Cutting knife</td><td>• Fabrics
• Access to internet
• LCD projector</td><td>• Photographs
• Drawings</td><td>• Measuring tape
• charts
• papers</td></tr>
</table>

YEAR THREE

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **1. CONCEPT SKETCHES**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
3.1.1.LO.1		
Demonstrate basic knowledge in concept sketches by creating designs through the use of basic shapes, rendering techniques, perspective and proportions	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others. The activity engagement helps maintain learners' interest and attention, leading to better retention of information. Project based learning encourages learners to think creatively and innovate as they design and execute their projects	**GESI:** **Valuing Diversity**: Talk for learning fosters an environment where diverse cultural backgrounds, beliefs, and practices are respected and integrated into the learning process. This helps learners develop cultural sensitivity and awareness. **SEL:** **Self-Management:** Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: **Leadership Development**: Through Talk for learning, individuals can develop leadership skills by taking initiative in discussions and promoting inclusive practices within their communities and organisations.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
3.1.1.CS.1	3.1.1.LI.1	3.1.1.AS.1
Apply the understanding of concept sketches and the techniques of rendering in designing objects in their environment	**Experiment with freehand sketches to create designs in 3- point perspective with emphasis on proportions using basic shapes and rendering techniques.** **Group Work/Collaborative Learning:** Learners in groups discuss the characteristics of 3-point perspectives with emphasis on proportions, and how they can be used to create complex forms with the aid of relevant resources such as photographs, drawings, videos, charts and actual objects in the environment. **Project-based Learning/Experiential Learning:** Let learners in groups generate manual/digital pictorial charts of complex forms created using 3-point perspectives with emphasis on proportions. **Project-based Learning:** Let learners in groups/individuals experiment with relevant tools and techniques to create complex forms using 3-point perspectives with emphasis on proportions and freehand sketches.	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.1.1.LI.2	3.1.1.AS.2
	Use the idea of concept sketches to create complex designs with graphite pencil and coloured pencil sketches in freehand drawing **Collaborative Learning:** Learners in groups brainstorm to select the type of basic shapes, rendering techniques and complex forms they want to create and the relevant tools and materials they will be using. **Project-based Learning:** Guide learners in groups/individuals to create complex designs with basic shapes and rendering techniques using graphite pencil and coloured pencil sketches in freehand drawing. **Project-based Learning:** Let learners generate manual/digital pictorial reports individually on how they created the complex designs with basic shapes and rendering techniques using graphite pencil and coloured pencil sketches in freehand drawing.	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
Teaching and Learning Materials	• Models • Charts	• Drawing instruments • Access to internet • Pencils • Sketch pads • Drawing pens or ink • Blending stumps

	• Reference books • Drawing studio	• LCD Projector • sketches.	• Erasers • Pencil sharpener	• Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **2. OBJECT MANIPULATION IN DRAWING**

Learning Outcomes	21st Century Skills and Competencies	GESI, SEL and Shared National Values
3.1.2.LO.1		
Apply skills in object manipulation to create simple and complex designs as interventions for societal problems using free-hand drawing	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others. Project based learning encourages learners to think creatively and innovate as they design and execute their projects Experiential learning often involves real-world scenarios or hands-on activities that require students to analyse information, evaluate options, and apply knowledge to solve problems. This process enhances their critical thinking skills and ability to make informed decisions.	**GESI:** **Valuing Diversity**: Talk for learning fosters an environment where diverse cultural backgrounds, beliefs, and practices are respected and integrated into the learning process. This helps learners develop cultural sensitivity and awareness. **SEL:** **Self-Management:** Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: **Leadership Development**: Through Talk for learning, individuals can develop leadership skills by taking initiative in discussions and promoting inclusive practices within their communities and organisations.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
3.1.2.CS.1	3.1.2.LI.1	3.1.2.AS.1
Demonstrate understanding and skills in the use of object manipulation techniques to create simple and complex designs as interventions for societal problems.	**Use techniques in object manipulation to generate simple designs from natural objects.** **Managing Talk for Learning:** Learners in mixed groups generate a manual/digital pictorial table/chart of designs and objects created by manipulating natural objects. **Experiential Learning:** In mixed groups, let learners select and use freehand drawing techniques to imitate designs created by manipulating natural objects. **Project-Based Learning:** Learners work individually/in groups to create designs from natural objects using freehand drawing and object manipulation techniques.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
	3.1.2.LI.2	3.1.2.AS.2
	Use object manipulation techniques to create simple and complex designs as interventions for societal problems. **Collaborative/Group learning:** In small groups, let learners identify and examine how simple/complex designs created by manipulating objects can be used as interventions for challenges in society. **Problems-Based Learning:** In small groups, let learners generate a digital/manual pictorial table/chart of designs and objects created by manipulating objects that can be used as interventions for challenges in society. **Project-Based Learning:** let learners work individually/in groups to use the available tools and techniques to create simple and complex designs as interventions for challenges in society using object manipulation techniques and freehand drawing.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • Charts • reference books • drawing studio	• access to internet • LCD Projector, sketches. • Pencils • Sketch pads • Erasers • Pencil sharpener • Drawing pens or ink • Blending stumps • Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **1. CONCEPTUAL DRAWING**
Sub-Strand **3. PATTERN DESIGN**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
3.1.3.LO.1		
Apply the understanding and skills of creating templates and patterns to develop freehand-drawn 3-dimensional templates and patterns for objects and concepts.	Group work fosters the development of collaborative skills as learners work together to achieve common goals. and collaborate with others to solve problems and complete tasks. Project based learning encourages learners to think creatively and innovate as they design and execute their projects Experiential learning often involves real-world scenarios or hands-on activities that require students to analyse information, evaluate options, and apply knowledge to solve problems. This process enhances their critical thinking skills and ability to make informed decisions.	**GESI:** **Equal Participation**: Project based learning encourages all team members to contribute their skills and insights which promotes equal participation and contribution from all team members. **SEL:** Engaging in project-based learning promotes empathy as students explore the experiences and challenges faced by individuals from different backgrounds. This promotes a deeper understanding of diversity and encourages compassionate action. **National Core Values**: Project based learning emphasises communication skills, including active listening, negotiation, and respectful dialogue. These

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
3.1.3.CS.1	3.1.3.LI.1	3.1.3.AS.1
Demonstrate knowledge and skill in using freehand drawing techniques to create 3-dimensional templates and patterns for objects and concepts.	**Select appropriate drawing materials and tools that can be used to create 3-dimensional free hand-drawn templates and patterns.** **Group work/Collaborative Learning: In mixed-ability groups**: learners brainstorm to come up with ideas for drawing freehand templates and patterns. This could be a theme, an object or an idea, and what the 3-dimensional template and pattern drawing is for; e.g. objects, forms, gadgets, vehicles, etc. **Group work/Collaborative Learning; Project-based Learning:** Learners in mixed-ability groups develop many small sketches and drawings based on their ideas to see which ones could work as 3-dimensional templates and patterns. **Problem-based learning:** Learners in mixed-ability groups identify and select appropriate materials and tools, such as pencils, pens, markers, saws, knives, blades, cardboards, wood board, foam, styrofoam, etc. for their free hand-drawn 3-dimensional template and pattern projects.	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
	3.1.3.LI.2	3.1.3.AS.2
	Develop appropriate drawing framework and necessary elements to create 3-dimensional templates and patterns. **Group work/Collaborative Learning; Problem-based Learning:** **1.** Learners in small groups brainstorm to determine appropriate dimensions and proportions for 3-dimensional free hand-drawn templates and patterns. 2. Learners can refer to the small sketches they did in LI 1 **Group work/Collaborative Learning; Problem-based Learning:** Learners in small groups identify and develop steps to create 3-dimensional free hand-drawn templates and patterns. The steps can include drawing simple shapes or light outlines using soft strokes to plan how the finished drawing will look. This will help as a rough guide for the drawing. **Group work/Collaborative Learning; Project-based Learning:** Learners in small groups used the steps they developed to create 3-dimensional free hand-drawn templates	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**

	and patterns with appropriate details, textures and ornamentations. As details are added to the 3-dimensional free hand-drawn templates and patterns, ensure that everything looks balanced and organised. Pay attention to how different parts of the created design come together to form a cohesive template and pattern.			
	3.1.3.LI.3			3.1.3.AS.3
	Finalise the 3-dimensional template and pattern design. **Managing Talk for Learning:** Learners in groups present their developed 3-dimensional free hand-drawn templates and patterns in class and record criticisms and suggestions from their peers. Learners should look at their work objectively with their peers for things they can improve. They should also gather feedback from their peers. **Group work/Collaborative Learning; Problem-based Learning:** Learners In small groups use the feedback they receive from their peers in class discussion to make their drawings better. **Group work/Collaborative Learning; Project-based Learning:** Learners in small groups write a report explaining how they made their drawings and demonstrate how their 3-dimensional free hand-drawn templates and patterns can be useful for the community.			Level I Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • Charts • reference books	• drawing studio • access to internet • LCD Projector, sketches.	• Pencils Sketch pads • Erasers • Pencil sharpener	• Drawing pens or ink • Blending stumps • Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **2. GEOMETRY**
Sub-Strand **1. PLANE GEOMETRY**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
3.2.1.LO.1		
Use the concepts of plane geometry to construct complex plane geometrical shapes and design different complex artefact based on plane geometrical figures	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others. Group work fosters the development of collaborative skills as learners work together to achieve common goals. and collaborate with others to solve problems and complete tasks. Project based learning encourages learners to think creatively and innovate as they design and execute their projects	**GESI** • Learners are engaged equally regardless of their socio-economic background, or religion. • Grouping learners into mixed-ability groupings ensures equal participation among learners. **SEL:** The group activities improve academic achievement, reduce behaviour problems, and enhance overall well-being **National Core Values**: The whole class discussion promotes respect for each other's views.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
3.2.1.CS.1	3.2.1.LI.1	3.2.1.AS.1
Apply the concept of plane geometry in applied technology.	**Explain the concept of auxiliary projection.** **Initiating talk for learning and Research:** Put learners in small groups of four (4) and with the use of charts, internet surf, pictures and YouTube videos engage them in a discussion to explain auxiliary projection. Ask the leaders to present their report in a whole class discussion.	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
	Draw auxiliary elevation and plan (primary) of given objects. **Managing talk for learning, Activity- based learning:** 1. Demonstrate the construction of primary auxiliary elevation and plan to learners using appropriate drawing instruments 2. Help learners individually to construct primary auxiliary elevation and plan of given objects using the appropriate drawing instruments.	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	3.2.1.AS.3
	Construct the types of arch and their applications in real life ituation. **Initiating talk for learning and Research:** With the use of pictures, videos, environmental observation and internet surf engage learners in small groups and in a whole class discussion to come out with the explanation of arches and outline the common types of arches **Project- based learning, Activity based learning:** Guide the learners individually to design an arch that can be used on the door of a chapel and draw it using appropriate tools and instrument **Activity based learning:** 1. With their knowledge in blending of circles and lines with arcs help learners through demonstration to draw types of arches using the appropriate drawing instrument. 2. Guide the learners individually to design an arch that can be used on the door of a chapel and draw it using appropriate tools and instrument	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
	Explain the principles of forces acting on beams and trusses. **Managing talk for learning:** Use charts, board illustrations, the internet and pictures to assist learners understand forces through group discussion. Then engage learners in a whole class discussion to explain the principles of forces acting on beams and trusses.	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.2.1.LI.5	3.2.1.AS.5
	Find the magnitude of reaction forces keeping beams and trusses in equilibrium. **Initiating talk for learning:** Use charts, board illustrations and pictures to review learners' understanding of forces through group discussion. Then engage learners in a whole class discussion to explain the principles of forces acting on beams and trusses **Activity-based learning, managing talk for learning:** With the use of charts, pictures, videos, internet surfing, and using appropriate drawing instruments, guide learners in small group discussion and through demonstration to draw concentrated and varied forces acting on beams. **Activity-based learning:** Assist them to find the magnitude of the reaction forces that are keeping the beams in equilibrium from their drawings **Activity-based learning:** **1.** Help the learners to draw bending moment and shear force diagrams using appropriate drawing tools and equipment 2. Use the appropriate drawing instrument to demonstrate the drawing of concentrated loads acting on trusses. 3. Use the drawing to find the magnitudes of the reaction forces keeping the trusses in equilibrium in given structures	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**

Teaching and Learning Materials	• Models • Charts • reference books	• drawing studio • access to internet • LCD Projector, sketches	• Pencils Sketch pads • Erasers • Pencil sharpener	• Drawing pens or ink • Blending stumps • Charcoal

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **2. GEOMETRY**
Sub-Strand **2. SOLID GEOMETRY**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
3.2.2.LO.1		
Use the concept of intersection to draw and design artefact.	Talk for learning encourages learners to articulate their thoughts, ask questions, and explain concepts to others. Activity based learning encourages students to communicate their ideas, thoughts, and findings effectively.	**GESI:** A whole class discussion takes care of religious differences, socio-economic differences. **SEL:** Self-Management: Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: Research promotes adherence to ethical principles such as honesty, integrity, transparency, and respect for intellectual property

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
3.2.2.CS.1	3.2.2.LI.1	3.2.2.AS.1
Apply the concept of solid geometry in designing.	**Draw the curve of intersections of solids of the same sides meeting at different angles.** **Managing talk for learning:** **1.** With the use of videos and pictures review learners' knowledge on intersections from year two through group activities and help them to explain the curve of intersections of square and cylindrical pipes of the same sides meeting at different angles 2. Demonstrate the construction of curves of intersection of square and cylindrical pipes of the same sides meeting at an angle other than ninety degrees (90°) using appropriate drawing instruments. **Activity based learning:** Help learners to draw the curve of intersection of given pipes using drawing instrument**.**	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	3.2.2.LI.2	3.2.2.AS.2
	Draw the curve of intersections of solids of different sides and meeting at different angles. **Managing talk for learning:** 1. With the use of videos and pictures review learners' knowledge on intersections from year two through group activities and help them to explain the curve of intersections of square and cylindrical pipes of different sides meeting at different angles 2. Demonstrate the construction of curves of intersection of square and cylindrical pipes of different sides meeting at an angle other than ninety degrees (90°) using appropriate drawing instrument **Activity based learning:** Help learners to draw the curve of intersection of given pipes using drawing instrument	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning

	3.2.2.LI.3		3.2.2.AS.3
	Design artefact using the concept of curve of intersection. **Project-based learning, Activity based learning:** In mixed ability groups of no more than four members assist learners to design artefacts using the concept of curve intersection		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • Charts • drawing instruments such as set-squares • protractor	• pair of compasses • dividers • reference books	• drawing studio • access to internet • LCD Projector

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **2. GEOMETRY**
Sub-Strand **3. FRACTAL GEOMETRY**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
3.2.3.LO.1		
Demonstrate knowledge and understanding of fractal geometry in creating fractal designs.	By engaging in experiential learning activities, students are encouraged to think creatively, explore new ideas, and generate innovative solutions. Activity based learning engages students in activities that require them to analyse information, evaluate options, and solve problems. By encountering real-world challenges and tasks, students develop critical thinking skills and learn to apply knowledge in practical situations. Group work where students work together to complete tasks or projects. By interacting with peers, sharing ideas, and dividing responsibilities, students learn teamwork skills, effective communication, and how to collaborate to achieve common goals.	**GESI:** **Valuing Diversity**: Talk for learning fosters an environment where diverse cultural backgrounds, beliefs, and practices are respected and integrated into the learning process. This helps learners develop cultural sensitivity and awareness. **SEL:** **Self-Management:** Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: **Leadership Development**: Through Talk for learning, individuals can develop leadership skills by taking initiative in discussions and promoting inclusive practices within their communities and organisations.

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
3.2.3.CS.1	3.2.3.LI.1	3.2.3.AS.1
Demonstrate knowledge and understanding of fractal geometry in creating fractal designs.	**Select various geometric shapes used to create complex fractal designs.** **Group Work/Collaborative Learning:** Learners in groups discuss the characteristics of geometric shapes to be used to create complex fractal designs with the aid of relevant resources such as photographs, drawings, videos, charts and real objects in the environment. **Problem-based Learning/Experiential Learning:** Learners in groups observe how geometric shapes have been used to create complex fractal designs with the aid of relevant resources such as photographs, drawings, videos, charts and real objects in the environment. **Project-based Learning/Experiential Learning:** Let learners in groups generate manual/digital pictorial charts of geometric shapes that can be used to create complex fractal designs.	Level 1 Recall **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	3.2.3.LI.2	3.2.3.AS.2
	Use the idea of fractal geometry to create complex fractal designs. **Collaborative Learning/Managing talk for learning:** Learners in groups brainstorm to select the types of geometric shapes they will want to use to create complex fractal designs and the relevant tools and materials that will be used. **Project-based Learning, Activity-based learning:** Guide learners in groups/individuals to create complex fractal designs using the selected geometric shapes and relevant tools and materials **Project-based Learning, Activity-based learning:** Let learners generate manual/digital pictorial reports individually on how they created the complex designs with the geometric shapes and the relevant materials and tools	**Level 1 Recall** **Level 2 Skills of conceptual understanding** **Level 3 Strategic reasoning** **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • Charts • pair of compasses • dividers • drawing studio • access to internet	

	• drawing instruments such as set-squares • protractor	• reference books	• LCD Projector

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **3. EXTENDED DRAWING**
Sub-Strand **1. BUILDING DRAWING**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
3.3.1.LO.1		
Employ the understanding of floor plan and sectioning with the use of building codes, standards and symbols.	By engaging in experiential learning activities, students are encouraged to think creatively, explore new ideas, and generate innovative solutions. **Digital Literacy**: research often involves using technology tools and online resources for information gathering, and analysis. Activity based learning engages students in activities that require them to analyse information, evaluate options, and solve problems. By encountering real-world challenges and tasks, students develop critical thinking skills and learn to apply knowledge in practical situations.	**GESI:** A whole class discussion takes care of religious differences, socio-economic differences. **SEL:** Self-Management: Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: Research promotes adherence to ethical principles such as honesty, integrity, transparency, and respect for intellectual property

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
3.3.1.CS.1	3.3.1.LI.1	3.3.1.AS.1
Understanding the concept of building drawing.	**Explain floor plan in relation to building codes, standards and symbols.** **Research, collaborative learning/ Group work:** **1.** With relevant resources engage learners in mixability groups to discuss building codes, standards and symbols with examples 2. With relevant resources task learners to explain floor plans and its relevance to the building industry	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	3.3.1.LI.2	3.3.1.AS.2
	Make freehand sketches of floor plan of simple domestic buildings. **Experiential learning, Managing talk for learning:** Lead learners to a nearby dugout foundation of a building and task learners to observe the layout. **Note:** In cases where there are no such instances, you may consider a virtual form. **Managing talk for learning, Activity-based learning:** Task learners to produce a free hand sketch of the floor plan they observed and allow learners to make modifications to their sketches if they need be.	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.3.1.LI.3	3.3.1.AS.3
	Draw floor plan of simple buildings using appropriate drawing Instruments or CAD **Managing talk for learning, Activity-based learning:** Using the free hand sketches of floor plans produced, assist learners to use the appropriate drawing instruments or CAD to draw the floor plans correctly. Taking into consideration the dimensions.	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning
	3.3.1.LI.4	3.3.1.AS.4
	Explain sectioning in relation to building codes, standards and symbols **Research, Collaborative learning/ Group work:** With relevant resources engage learners in mixability groups to discuss sectioning and its relevance to the building industry.	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning

	Experiential learning, managing talk for learning: 1. Show to learners a model of a cross section through a domestic building showing all the sectional members 2. Instances where a model is not available, you may consider a virtual form. **3.** Assist learners to identify the sectional parts discussed earlier on the model.		
	3.3.1.LI.5		3.3.1.AS.5
	Draw the sectioning of simple buildings using appropriate drawing Instruments or CAD **Managing talk for learning, Activity-based learning:** Using the drawings produced earlier assists learners to introduce a cutting plane and draw the sectioning with appropriate drawing instruments or CAD, considering the dimensions.		Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • charts and drawing instrument • set-squares • protractor	• pair of compasses • dividers • reference books	• drawing studio • access to internet • LCD Projector.

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **3. EXTENDED DRAWING**
Sub-Strand **2. MECHANICAL DRAWING**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
3.3.2.LO.1		
Apply the concept of assembly and working drawings in applied technology.	The group activity leads to collaboration and communication Managing talk for learning facilitates critical thinking and communication The research activity facilitates the development of critical thinking, problem-solving	**GESI**: Grouping learners into mixed gender or mixed ability ensures gender equality **SEL:** Self-Management: Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: Research promotes adherence to ethical principles such as honesty, integrity, transparency, and respect for intellectual property

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
3.3.2.CS.1	3.3.2.LI.1	3.3.2.AS.1
Understand the concept of Mechanical drawing.	**Explain the principles of assembling component Parts.** **Research, Managing talk for learning:** 1. With the use of internet surfing, YouTube videos, pictures, charts and board illustrations, review learners' knowledge on sectional drawing in year two. 2. Engage learners in group discussion to outline the types of assembly drawings and explain them 3. Assist the learners to come out with a comprehensive report from their research on the types, uses and explanation of assembly drawings in a whole class discussion	Level 1 Recall **Level 2 Skills of conceptual understanding** Level 3 Strategic reasoning Level 4 Extended critical thinking and reasoning
	3.3.2.LI.2	3.3.2.AS.2
	Prepare assembly drawing from component parts. **Experiential learning, Activity-based learning:** 1. Let learners look around in the classroom, outside the classroom and mention some objects or artefacts they see. 2. Write the names of the objects or artefact on the board and help learners identify the parts making the objects or the artefact mentioned. 3. Ask learners to find out the quantity of each part, give each item/part a number and make a bill of materials for the parts. **Activity- based learning:** 1. Guide learners to measure the parts and draw them using the appropriate drawing tools. Through You Tube videos, board illustrations, charts and simulations, demonstrate the assembly drawing of the parts first in a picture form, then in section to show the interior view of the parts and then the exploded view also to show the flow of the assembly of the parts 2. Assist learners to prepare assembly drawing to scale using the appropriate drawing tools	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**
	3.3.2.LI.3	3.3.2.AS.3
	Prepare detailed working drawings to scale using appropriate drawing instrument or CAD	Level 1 Recall Level 2 Skills of conceptual understanding

	Managing talk for learning, Activity-based learning: 1. Use board illustrations, pictures, and charts to engage learners in a whole class discussion to explain detailed working drawing 2. Demonstrate the preparation of detailed working drawing with the use of board illustrations, charts, videos and pictures in a whole class. 3. Prepare detailed working drawings of a given machine part or system to scale using appropriate drawing instruments and CAD.			Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**
Teaching and Learning Materials	• Models • charts and drawing instruments • such as set-squares	• protractor • pair of compasse • dividers	• reference books • drawing studio	• access to internet • LCD Projector.

Subject **DESIGN AND COMMUNICATION TECHNOLOGY**
Strand **3. EXTENDED DRAWING**
Sub-Strand **3. GARMENT DESIGN TECHNOLOGY**

Learning Outcomes	**21st Century Skills and Competencies**	**GESI, SEL and Shared National Values**
3.3.3.LO.1		
Use the principles and skills of concept sketches, object manipulation and geometrical drawings to design garments for different vocations.	Through research learners learn how to locate relevant information, assess its reliability and validity, and use it ethically in their work. Activity-Based Learning is a student-centred approach where learning takes place through hands-on activities, tasks, and experiences. This methodology promotes several essential critical thinking and problem-solving skills Project based learning ensures learners think creatively and generate innovative solutions to complex problems.	**GESI**: Grouping learners into mixed gender or mixed ability ensures gender equality **SEL:** Self-Management: Activity-based learning encourages students to take responsibility for their learning and behaviour. **National Core Values**: Research promotes adherence to ethical principles such as honesty, integrity, transparency, and respect for intellectual property

Content Standards	Learning Indicators and Pedagogical Exemplars with 21st Century and GESI	Assessment
3.3.3.CS.1	3.3.3.LI.1	3.3.3.AS.1
Demonstrate understanding and techniques in conceptual and geometrical drawings in designing garments.	**Grade patterns to different sizes** **Group work/Collaborative Learning:** Let learners in groups explain pattern grading in different sizes using the standard size charts through the use of videos, photographs, drawings, and charts and present their findings in a whole class discussion. **Research, Group work, Experiential learning:** Help learners in their groups to find out the importance of grading patterns in sizes with the use of internet surfing, videos, photographs and drawings. Let the learners examine the various garment sizes that can be graded during garment design and pattern making. Generate a manual or digital chart of grading, sizing and their importance/uses. Present their reports in a whole class discussion **Project based learning, Group work:** Pair learners and ask them to identify their various partners sizes on the standard size chart and make patterns for them using a base pattern as a guide.	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	3.3.3.AS.2
	Examine garment designs to break patterns down into different components **Group work/Collaborative Learning:** Let learners in groups examine garment designs and describe the various style lines or details in them. Assist learners to break down garment designs into various components indicating the pattern symbols through the use of videos, photographs, drawings and charts. Let them present their findings in a whole class discussion **Research, group work:** Help learners in their groups to find out the importance of garment design examination with the use of internet surfing, videos, photographs, drawings, etc. Assist learners to break down examined style lines or details into different components. Generate a manual chart on garment design examination and pattern breakdown with their importance/uses. Present report in a whole class discussion **Collaborative Learning, research, experiential learning:** In mixed groups, let learners identify various garment design examinations and components of pattern	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning

	breakdown during garment design. Prepare a manual report to be presented in a whole class discussion **Project based learning, Group work:** Pair learners and ask them to identify various garment designs from different sources to examine the style lines or details and break them down into different components with the appropriate pattern drafting tools.	
	3.3.3.LI.3	3.3.3.AS.3
	Manipulate patterns to make adaptations of different garment designs **Group work/Collaborative Learning:** Let learners in groups explain pattern design manipulation and adaptations through the use of videos, photographs, drawings, charts etc. Present their findings in a whole class discussion **Research, group work:** Help learners in their groups to find out the relevance of pattern design manipulation and adaptation with the use of internet surf, videos, photographs, drawings, etc. Generate a manual chart on pattern design manipulation and adaptation with their relevance/uses. Present report in a whole class discussion **Collaborative Learning, research, communication, experiential learning:** In mixed groups, let learners examine pattern designs and use their findings for manipulation and adaptation during garment design and pattern making. Prepare a manual report to be presented in a whole class discussion **Project based learning, Group work:** Pair learners and ask them to use their basic blocks as a guide to manipulate and adapt different garment designs. Let the groups paste their designs on the classroom walls for critiquing by their peers	Level 1 Recall Level 2 Skills of conceptual understanding Level 3 Strategic reasoning **Level 4 Extended critical thinking and reasoning**
	3.3.3.LI.4	3.3.3.AS.4
	Make Pattern adjustments and alterations **Group work/Collaborative Learning:** Let learners in groups explain pattern adjustments and alterations through the use of videos, photographs, drawings, charts etc. Present their findings in a whole class discussion	Level 1 Recall Level 2 Skills of conceptual understanding **Level 3 Strategic reasoning** Level 4 Extended critical thinking and reasoning

	Research, group work: Help learners in their groups to find out the importance of pattern adjustments and alterations with the use of internet surf, videos, photographs, drawings, etc. Generate a manual chart on pattern adjustments and alterations with their importance/uses. Present report in a whole class discussion **Collaborative Learning, research, experiential learning:** In mixed groups, let learners examine pattern adjustments and alterations during garment design and pattern making. Prepare a manual report to be presented in a whole class discussion **Project based learning, Group work:** Pair learners and ask them to identify different garment fitting problems and discuss how they can be adjusted and altered using their knowledge in pattern adjustment and alterations		
Teaching and Learning Materials	• Sketch pad • Pair of scissors • Cutting knife • Fabrics	• Access to internet • LCD projector • Photographs • Drawings	• Measuring tape • charts • papers