

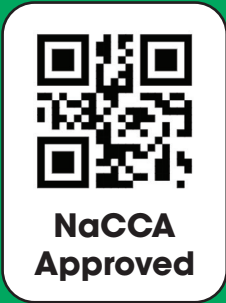
ESSENTIAL



Career Technology

Basic 9

Facilitator's Guide



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Basic 9

Facilitator's Guide

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Introduction

The Career Technology curriculum, which is called the Common Core Programme (CCP), follows the Kindergarten-Primary standards-based school curriculum that was implemented in the 2019/2020 academic year. The CCP is designed for learners in JHS 1 to JHS 3 (Basic 7 to Basic 9) as part of a holistic learning experience that prepares them for post-secondary education or the world of work.

The CCP focuses on the 4Rs (Reading, wRiting, aRithmetic and cReativity) and core competencies that will give learners the ability to apply knowledge innovatively to solve everyday problems. Personal projects, community projects and community service have been integrated into the CCP as part of a comprehensive assessment programme. The aim of this curriculum is to promote better high school education that meets the different learning needs of the young people in the country and addresses the shortfalls in the current school curriculum in relation to learning and assessment.

Learning with the CCP

The CCP for learners in junior high school emphasises a set of high, internationally benchmarked career and tertiary education-readiness standards. Learners need to acquire these standards for post-secondary education or the workplace, or both. The standards articulate what learners are expected to know, understand and be able to do by focusing on their social, emotional, cognitive and physical development.

The CCP runs from JHS 1 (Basic 7) through to JHS 3 (Basic 9).

The three domains of learning – cognitive, psychomotor and affective – are at the centre of the CCP. The aim of these learning domains is to help produce character-minded learners who can play active roles in dealing with the increasing challenges that face Ghana and the global society.

The features that shape the CCP are:

- learning and teaching approaches: the core competencies, so-called 4Rs and pedagogical approaches
- learning context: engagement service and project
- learning areas: mathematics, science, computing, languages (English, Ghanaian Languages, French and Arabic), career technology, social studies, physical and health education, creative arts and design and religious and moral education.

(See Figure 1 on page x of the Career Technology CCP Curriculum.)

Learning and teaching approaches

Core competencies

The core competencies describe the relevant global skills for learning that the CCP will help learners develop in addition to the so-called 4Rs. The global skills for learning will help learners become critical thinkers, problem-solvers, creators, innovators, good communicators and collaborators who will be digitally literate. They will become culturally and globally sensitive citizens who will be life-long learners who have a keen interest in their personal development.

Pedagogical approaches

The CCP emphasises creative and inclusive pedagogies that are anchored in authentic and enquiry-based learning, collaborative and cooperative learning, differentiated learning, holistic learning as well as cross-disciplinary learning. Learners must become fluent in the 4Rs of Reading, wRiting, aRithmetic and cReativity.

Large class teaching

Teachers who teach large classes can use peer work to engage learners. Working in pairs or in groups, will encourage learners to take greater responsibility for their own learning. Teachers need to be available when learners are working in groups so that they can help and guide learners and groups.

Pair and group work might reduce anxiety for some learners and make it easier for them to speak to their peers and ask questions without feeling intimidated.

Support for learners with special needs

It is important to understand what learners with special needs need when teaching different sub-strands. Sometimes splitting a class between teachers who are teaching the same grade can help as teachers can focus on certain groups. Co-teaching is one of the best ways to support learners with disabilities and it encourages teachers to collaborate, plan and learn together. Teachers can work together to plan their lessons. They can use the resources available in their classrooms to support learners with special needs. For example, one teacher can work in a small group with learners who have hearing disabilities, while another teacher teaches the rest of the group.

Learning context

This Facilitator's Guide supports the CCP by emphasising the engagement of learners in classroom activities and projects (both inside and outside the classroom). These projects can involve individual or group tasks that all learners are required to complete by the end of JHS 3 (Basic 9). The CCP project provides learners with contexts in which they can demonstrate creativity and inventiveness in different areas of human endeavour. Community service offers opportunities for learners to nurture, love and care for, and solve problems in their community.

Learning areas and Career Technology

The CCP comprises the following learning areas:

1. Languages (English, Ghanaian Languages, French, Arabic)
2. Mathematics
3. Science
4. Creative Arts and Design (CAD)
5. Career Technology (CT)
6. Social Studies
7. Computing
8. Religious and Moral Education (RME)
9. Physical and Health Education (PHE)

Rationale

Career Technology offers training for job opportunities as an integral part of everyday life because industrial technology is the backbone of most national economies. With the introduction of Career Technology, Ghana can use its many professions to create the jobs it needs to boost the development of the country. The Career Technology course is expected to:

- improve the nation's economy by bridging the connection between schooling, employment, productivity and trade
- enhance learners' outcomes in employment-related skills and competencies.

The main strengths of Career Technology as a CCP include:

- It provides learners with the basic knowledge, skills and values to enable them to function in society.
- It creates the opportunity for learners to develop special aptitudes and talents through elective courses.
- Learners are able to solve real-life problems as content is built around problems in their society.
- The integration of subjects reinforces learners' understanding of concepts.

Philosophy

The Ministry of Education promotes two basic philosophies – teaching and learning philosophy.

The focus of the teaching philosophy:

- Effective Career Technology education should be enquiry-based so that it will ensure sustainable development.
- It must provide learners with opportunities to expand, change, enhance and modify the ways in which they view the scientific, technological, industrial, and economic world.
- Teaching CT is based on learner-centred technology. Teaching and learning approaches engage learners physically and cognitively so that they can develop knowledge, skills and attitudes.
- Learners should develop the ability to think critically, and collaborate and communicate with others. They should learn to be creative and develop new ideas, and learn to solve problems in an activity-driven environment.

The focus of the learning philosophy:

- Career Technology recognises the unique endowment of every learner.
- Learning CT promotes the development of learners' individual talents that are based on creativity, innovation, critical thinking, and their ability to express their ideas graphically.
- Learners work at their own pace without discrimination or comparison.
- Activities provide learners with opportunities to brainstorm, make decisions, express their ideas, and assess and evaluate their own ideas.
- Learners are able to discover their talents and develop their core competencies, and their functional and foundational skills.
- The classroom, workshops and laboratories encourage learners to participate and collaborate inclusively. They will learn to understand and respect their skills, abilities and experiences as well as those of others.

Aims

Teaching Career Technology involves both general and subject objectives.

General aims

This Teacher's Guide works in conjunction with the new curriculum to help individuals develop so that they will become creative, innovative, technologically minded, digital literates and problem-solvers who will develop the ability to think critically.

Subject aims

Career Technology aims to:

- educate the learner using the Head, Heart and Hands (3H) therapy
- develop the learner's thinking capacity, reasoning power and understanding of the environment
- provide learners with the opportunity to respond and act creatively according to intuition
- instil in learners a lifelong independent and critical mind for analytical and problem-solving skills such as critical analysis, creativity and innovation
- instil in learners the ability to challenge stereotypes about gender disability, religion, ethnicity, economic status and so on that would limit them in certain careers
- develop their emotional balance, material, spiritual, cultural and intellectual life
- strengthen each learner's power of imagination, creative thinking, self-expression, critical analysis, synthesis and evaluation
- predispose the learner to the technical and vocational identities of Career Technology and entrepreneurial skills needed for industrialisation
- develop in the learner the sense of appreciation and appraisal of Career Technology skills in the specific areas for future development.

The objectives of the curriculum are outlined in more detail on page xv of the Career Technology CCP Curriculum.

Learning domains

This Teacher's Guide works with the curriculum's concept of three integral learning domains that should be the basis for instruction and assessment:

- cognitive (knowledge, understanding and application)
- psychomotor (practical skills)
- affective (attitudes and values).

Knowledge, understanding and application

Under this domain, learners acquire knowledge through learning experiences. They may also show understanding of concepts by comparing, summarising, rewriting, and so on, in their own words and constructing meaning from instruction. The learner may also apply the knowledge acquired in new contexts.

At a higher level, learners may be required to analyse an issue or a problem and at a much higher level, they may be required to synthesise knowledge by integrating a number of ideas to formulate a plan, solve a problem and compose a story. Furthermore, learners may be required to evaluate, estimate and interpret a concept. At the highest level, learners may be required to create, invent, compose, design and construct. These learning behaviours: knowing, understanding, applying, analysing, synthesising, evaluating and creating, fall under the domain of knowledge, understanding and application, which are described in more detail on page xvi of the Career Technology CCP Curriculum.

Suggested teaching activities:

- Teachers select teaching and learning activities that will ensure maximum learner participation.
- Teachers avoid rote learning and drill-oriented approaches and emphasise participatory teaching and learning.
- They reorganise the suggested teaching and learning activities and add to them where necessary.
- Teachers help learners apply their knowledge in dealing with issues both in and out of school and help learners become problem-solvers.

Suggested evaluation activities:

- Teachers design sets of tasks and assignments that will challenge learners to apply their knowledge to issues and problems.
- Teachers engage learners in creating new and original items or compositions.
- Teachers assist learners in developing positive attitudes for activities.
- They emphasise the issues of conceptualisation, planning and making.
- Teachers guide learners to transform what they know, understand and can do into creating products.
- They observe and guide learners as they work independently or in groups.
- Teachers select and plan other learning activities to assist learners in acquiring, developing and demonstrating the subject-specific practices and core competencies required.

Note:

- Career Technology should be taught as a practical subject. Learners are to be taught and evaluated practically.
- There will be a few theoretical lessons, but the theory must be reinforced by practical skills.

Practical skills

Practical skills involve using tools and equipment to demonstrate manipulative skills and carry out practical operations, plan to solve practical problems and produce items. The teaching and assessment of practical skills should involve projects, case studies and creative practical tasks.

The basic skills required for effective practical work include handling tools, equipment and materials (manipulative skills), observation, craftsmanship, perception, creativity and communication.

Handling of tools/equipment/materials	The learners should be able to handle and use tools/equipment/materials properly for practical skills through creative activities.
Observation	The learners should be able to use their senses to make accurate observation of skills and techniques during demonstrations.
Craftsmanship	This involves the skilful and efficient handling of materials and tools for accomplishing specific tasks according to the level of the learners.
Perception	The learners should be able to respond to their environment using all the senses (seeing, hearing, smelling, touching, tasting and movement).
Originality/creativity	The learners should be encouraged to be creative or original and should be able to use new methods so that projects/artefacts/products are original and they do not copy existing work.
Communication	The learners should be guided to develop effective oral and written communication skills necessary for group work, reporting and appreciation.

The required attitudes and values that are expected of learners are outlined on pages xxi and xxii in the Career Technology CCP Curriculum.

Instructional expectations

Teachers can use discussions in the classroom, workshops, sites and laboratories to help learners achieve the expectations of Career Technology. These discussions can guide learners to realise that people use their creativity to solve problems.

Examples:

1. People use the products of Career Technology to provide food, clothing, shelter and furniture for their homes, schools, churches, mosques, palaces and workplaces. Creating these products provides job opportunities for many people.
2. Teachers can guide learners to identify problems that affect the individual, family, community and the country at home, at school and in the community.
3. Teachers can guide class discussions about the effects of these problems on their education, health and sanitation, cultural beliefs and practices, job creation and employment and so on.
4. Learners can use interviews, visits, observations, reading and group or class discussions to investigate the causes of these problems.
5. Teachers can guide learners (working on their own or in groups) using brainstorming, discussions, exploration with available tools, materials, instruments and techniques to design and create projects that will help solve identified problems.
6. They can ask learners to plan, display and share their artefacts in exhibitions and performances with peers and other members of the community.
7. Teachers can guide learners to appreciate, appraise and critique their works, document the outcomes, reflect creatively on their findings and use the feedback to modify products or create new projects.

Core competencies

The core competencies are a set of skills that teachers need to help learners develop. These skills will help learners engage with the subject matter as they learn the subject. The core competencies listed below appear in each section of this Teacher's Guide and are outlined in more detail on pages xxxi and xxxii of the Career Technology CCP Curriculum:

- Critical thinking and problem-solving (CP)
- Creativity and innovation (CI)

- Communication and collaboration (CC)
- Cultural identity and global citizenship (CG)
- Personal development and leadership (PL)
- Digital literacy (DL).

Assessment

In the CCP, the ideal is that assessment involves assessment for learning, assessment of learning and assessment as learning, which are described in the text that follows.

In Career Technology, assessment is based on the three domains of learning. When developing assessment procedures, teachers should select indicators in such a way that they will be able to assess a representative sample from a given strand. Each indicator in the curriculum is seen as a criterion to be achieved by the learners. When teachers develop assessment items or questions that are based on a representative sample of the indicators taught, the assessment is called *criterion-referenced assessment*. In many cases, a teacher cannot assess all the indicators that are taught in a term or a year. The assessment procedure they use (class assessments, homework, projects and group-work presentations) must be developed in such a way that the different procedures complement each other to provide a representative sample of indicators that are taught over a period of time.

The following three domains are outlined in more detail on pages xxiii and xxiv of the Career Technology CCP Curriculum:

- Assessment for learning (AfL)
- Assessment of learning (AoL)
- Assessment as learning (AaL).

School-based assessment (SBA) covers all forms or modes of assessment that can be undertaken by a learner, teacher and head teacher to monitor a learner’s achievement over a period of time. Data collection and keeping records of the data are central to the conduct of SBA.

Assessment for learning	Assessment of learning	Assessment as learning
Class exercises	Class assessment task (CAT)	Portfolio
Quizzes	End-of-term assessment	Journal entries
Class tests (written, oral, aural and/ or practical)	End-of-year assessment	Project work
Class assessment task (CAT)	Checklist	Questionnaire

Samples of relevant records that can be kept about a learner’s learning:

- Learner’s progress record (cumulative record)
- Learner’s report card
- School-based assessment per term.

Reporting school-based assessment (SBA) in the CCP

The CCP provides levels of proficiency for learners to attain and descriptors for all three grade levels.

Level of proficiency	Benchmark	Grade level descriptor
1: Highly proficient (HP)	80% +	Learner shows high level of proficiency in knowledge, skills and values and can transfer them automatically and flexibly through authentic performance tasks.
2: Proficient (P)	68%–79%	Learner demonstrates sufficient level of proficient knowledge, skills and core understanding; can transfer them independently through authentic performance tasks.
3: Approaching proficiency (AP)	54%–67%	Learner is approaching proficiency in terms of knowledge, skills and values with little guidance and can transfer understanding through authentic performance tasks.
4: Developing (D)	40%–53%	Learner demonstrates developing level of knowledge, skills and values but needs help throughout the performance of authentic tasks.
5: Emerging (E)	0%–39%	Learner is emerging with minimal understanding in terms of knowledge, skills, and values but needs a lot of help.

In addition to the school-based assessment (SBA), a national standards assessment test is conducted in Basic 8 to provide national level indicators on learners' achievements.

Suggested time allocation

Four periods per week (each 50 minutes)

Four periods per week (200 minutes) should be allocated in two double periods (100 minutes) so that practical aspects of the subject can be covered fully.

Two or more teachers are required to teach CT

The subject is initially designed to be managed by one teacher. However, two or more teachers will be required to handle the subject, as we do not have teachers now who can teach both Home Economics and pre-technical skills.

Pedagogical approaches

Pedagogical approaches include the approaches, methods, strategies, appropriate relevant teaching and learning resources that will help ensure that every learner benefits from the teaching and learning process.

Teachers should:

- use creative approaches to create learning-centred classrooms
- position inclusion and equity at the centre of quality teaching and learning
- use differentiation and scaffolding as teaching and learning strategies
- use information and communication technology (ICT) as a pedagogical tool
- identify subject-specific instructional expectations to make the subject relevant
- integrate all assessment strategies
- use questioning techniques that promote deep learning.

This Facilitator's Guide provides teaching methodology for lessons and concepts to ensure that the correct pedagogical approach is used. However, the approach may have to be changed based on the skills levels of learners in a class. Teachers must use their own experience and discretion to adapt the methodologies as necessary.

Learning-centred pedagogy

A learning-centred classroom creates the opportunity for learners to engage in meaningful hands-on activities that relate what they are learning to the real world. Learners should discuss ideas, become actively engaged in looking for answers and work in groups to solve problems. They should also do research to find information, and analyse and evaluate information. The aim of a learning-centred classroom is to enable learners to take ownership of their learning.

Inclusion

Inclusion means ensuring access and learning for all learners, particularly those who are disadvantaged. This Facilitator's Guide contains advice about how to teach a particular concept to large classes in lessons and to learners with special needs.

Differentiation and scaffolding

Differentiation is a process whereby teachers accommodate differences (in learning styles, interest and readiness to learn) between learners so that each learner has the best possible chance of learning. Differentiation can be applied to content, tasks, questions, outcomes, groupings and support. Scaffolding refers to breaking a task up into smaller units.

Technique	Process	Example
Differentiation by task	Teachers set different tasks for learners of different abilities.	When sketching, some learners could be asked to sketch free hand while others could be asked to trace the outline of the diagram provided.
Differentiation by support	The teacher gives the needed support.	The teacher refers weak learners to the Guidance and Counselling Unit for academic support.
Differentiation by outcome	The teacher allows learners to respond at different levels.	Weaker learners are allowed more time for complicated tasks.
Scaffolding	The teacher uses a variety of instructional techniques to progress learners towards stronger understanding.	Break up the learning task, experience or concept into smaller parts and then provide learners with the support they need to learn each part.

Information communication technology (ICT)

Information communication technology (ICT) has been integrated into the Career Technology curriculum as part of the core of education, alongside reading, writing and numeracy. Thus, the curriculum is designed to use ICT as a teaching and learning tool to enhance deep and independent learning. For example, for certain sub-strands, teachers direct learners to use multimedia to support the teaching and learning process.

Expected outcomes

Improved outcomes include:

- improved teaching and learning processes
- improved consistency and quality of teaching and learning
- increased opportunities for more learner-centred pedagogical approaches
- improved inclusive education practices
- improved collaboration, creativity and higher-order thinking skills
- enhanced flexibility and a differentiated approach of delivery.

Using ICT as a teaching and learning tool gives learners access to large quantities of information online and offline. It also provides the framework for analysing data to investigate patterns and relationships. Once learners have made their findings, using ICT can help them organise, edit and print information in different ways.

Learners need to be exposed to different ICT tools including calculators, radios, cameras, cell phones, television sets and computers and related software, such as Microsoft Office packages (Word, PowerPoint and Excel) as teaching and learning tools. The exposure learners are given from JHS 1 to JHS 3 (Basic 7 to Basic 9) to use ICT will build their confidence and increase their levels of motivation to use ICT in later years, both as a tool when studying and in life in general. ICT use for teaching and learning is expected to enhance learners' quality and competence levels.

Organisation and structure of the curriculum

This guide follows the curriculum. Content has been organised under the key headings below. The content standards are organised by grade level. Within each grade level, the contents are grouped by strands and then by sub-strands that have related indicators:

- Class is the grade level or year.
- Strands refer to the main branches of the content.
- Sub-strands are larger groups of related indicators. Indicators from different sub-strands may be closely related.
- Content standards are groups of related indicators.
- Indicators are learning outcomes that define what learners should know and be able to do.

Curriculum coverage table – Basic 9

Strand 1: Health and safety			
Content standard	Indicator	Page references	
		LB	TG
Sub-strand 1.1: Personal hygiene and food hygiene			
B9.1.1.1 Demonstrate skills that relate to personal and food hygiene to self	B9.1.1.1.1: Practise good grooming	2–3	1–8
	B9.1.1.1.2: Observe appropriate food hygiene practices	4–7	
Sub-strand 1.2: Personal, workshop and food laboratory safety			
B9.1.2.1 Demonstrate skills that relate to personal, workshop and laboratory safety	B9.1.2.1.1: Describe procedures for reporting accidents and unsafe practices in school and in the laboratory/workshop/site	8–11	9–15
	B9.1.2.1.2: Use appropriate personal protective equipment when working	12–13	
	B9.1.2.1.3: Maintain safe working environments	14–16	
Sub-strand 1.3: Environmental health			
B9.1.3.1 Demonstrate understanding and practice of environmental health in the school/home	B9.1.3.1.1: Discuss the causes and prevention of poor sanitation in the school/home/community/workshop/site/laboratory	17–20	16–24
B9.1.3.2 Demonstrate understanding of clean energy, and Improved Cookstoves (ICS) and their accompanying fuels	B9.1.3.2.1: Discuss what is meant by clean energy and improved cookstoves and fuels	20–22	
	B9.1.3.2.2: Discuss the benefits of improved cookstoves and fuels	22–23	
Strand 1 Revision questions			
		24	25

Strand 2: Materials for production			
Content standard	Indicator	Page references	
		LB	TG
Sub-strand 2.1: Compliant materials			
B9.2.1.1 Demonstrate skills in selecting compliant materials for making products and artefacts	B9.2.1.1.1: Discuss the factors that influence the selection of compliant materials	27–29	26–29
Sub-strand 2.2: Resistant materials			
B9.2.2.1 Demonstrate skills in selecting resistant materials for making products/artefacts	B9.2.2.1.1: Discuss the factors that influence the selection of resistant materials	30–33	30–36
	B9.2.2.1.2: Discuss the reasons why resistant materials require particular techniques and tools for their safe handling and use	34–37	
Sub-strand 2.3: Smart and modern materials			
B9.2.3.1 Demonstrate understanding of using smart and modern materials for making products/artefacts	B9.2.3.1.1: Discuss reasons for using smart and modern materials for making products/artefacts	38–42	37–40
	B9.2.3.1.2: Demonstrate techniques for making prototypes/projects to solve problems in the environment using smart and modern materials	42–43	

Sub-strand 2.4: Food commodities (animal and plant sources)			
B9.2.4.1 Demonstrate skills in selecting food commodities in meal preparation	B9.2.4.1.1: Discuss how to select food commodities used for meal preparation	45–47	41–46
B9.2.4.2 Demonstrate skills in planning meals for various members of the family	B9.2.4.2.1: Discuss the basic food requirements for different members of the family	48–53	
Strand 2 Revision questions			
		54	47

Strand 3: Tools, equipment and processes			
Content standard	Indicator	Page references	
		LB	TG
Sub-strand 3.1: Measuring and marking out			
B9.3.1.1 Demonstrate understanding of measuring and marking-out tools and equipment	B9.3.1.1.1: Discuss tools and equipment used for measuring and marking out	56–60	48–58
	B9.3.1.1.2: Demonstrate how to use the tools and equipment for measuring and marking out	60–65	
	B9.3.1.1.3: Demonstrate how to care for and maintain measuring and marking out tools used for making artefacts/products	66–67	
Sub-strand 3.2: Cutting and shaping			
B9.3.2.1 Demonstrate the understanding of cutting/ shaping tools and equipment used for making artefacts/ products	B9.3.2.1.1: Discuss tools and equipment used for cutting and shaping	68–81	59–68
	B9.3.2.1.2: Demonstrate how to use shaping and cutting tools and equipment for producing artefacts/ products	82–84	
Sub-strand 3.3: Joining and assembling			
B9.3.3.1 Demonstrate understanding of materials, tools and equipment used for joining and assembling artefacts/products	B9.3.3.1.1: Discuss joining and assembling materials, tools and equipment used for making artefacts/products	86–92	69–77
	B9.3.3.1.2: Demonstrate appropriate skills in the use of joining and assembling tools and equipment for making artefacts/products	93–102	
	B9.3.3.1.3: Demonstrate how to care for and maintain joining and assembling tools	103	
Sub-strand 3.4: Kitchen essentials			
B9.3.4.1 Demonstrate skills of selecting and purchasing kitchen essentials and understanding and skills in the choice of basic kitchen essentials	B9.3.4.1.1: Select and purchase suitable kitchen essentials to meet specific needs	104–106	78–82
	B9.3.4.1.2: Demonstrate understanding of using mechanical or labour-saving kitchen essentials	107–109	
Sub-strand 3.5: Finishes and finishing			
B9.3.5.1 Demonstrate understanding of application of finishes	B9.3.5.1.1: Demonstrate the techniques of applying finishes to resistant materials	110–116	83–86
	B9.3.5.1.2: Demonstrate basic skills and processes for finishing edges of articles in sewing	117–120	
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		121–122	87

Strand 4: Technology			
Content standard	Indicator	Page references	
		LB	TG
Sub-strand 4.1: Simple structures and mechanisms, electric and electronic systems			
B9.4.1.1 Demonstrate knowledge of mechanisms in projects construction	B9.4.1.1.1: Describe mechanisms used for making products/artefacts	125–127	88–94
	B9.4.1.1.2: Describe the features and principles of operations of mechanisms	128–138	
	B9.4.1.1.3: Design and make simple school technology projects using two or more of the mechanisms	139–140	
Strand 4 Revision questions			
		141–142	95

Strand 5: Designing and making of artefacts/products			
Content standard	Indicator	Page references	
		LB	TG
Sub-strand 5.1: Communicating designs			
B9.5.1.1 Demonstrate understanding of developing surfaces of objects for production/manufacturing	B9.5.1.1.1: Describe prisms and pyramids and discuss the importance of developing them	144–148	96–102
	B9.5.1.1.2: Develop surfaces of pyramids using instruments	149–152	
B9.5.1.2 Demonstrate understanding of orthographic projections	B9.5.1.2.1: Describe the principles of orthographic projections	153–155	
	B9.5.1.2.2: Draw objects in first and third angle orthographic projection	156–157	
Sub-strand 5.2: Designing			
B9.5.2.1 Demonstrate knowledge of Designing	B9.5.2.1.1: Identify user requirements	161–162	103–107
	B9.5.2.1.2: Clarify user requirements	162–163	
	B9.5.2.1.3: Generate ideas	163	
	B9.5.2.1.4: Develop the selected solution	164	
Sub-strand 5.3: Planning for making artefacts/products			
B9.5.3.1 Demonstrate understanding of planning for making artefacts/products/meals	B9.5.3.1.1: Identify basic dry methods of cooking and foods that can be prepared using the method	165–168	108–115
	B9.5.3.1.2: Demonstrate skills in menu planning	169–170	
	B9.5.3.1.3: Demonstrate how to clarify user requirements	171–172	
	B9.5.3.1.4: Describe ways of using the natural building materials for production	173–176	
Sub-strand 5.4: Making artefacts from compliant, resistant materials and food ingredients			
B9.5.4.1 Demonstrate understanding of gathering materials, tools and equipment for making/preparing meals and articles	B9.5.4.1.1: Demonstrate skills in preparing food using the dry methods of cooking	177–179	116–121
	B9.5.4.1.2: Create advanced articles using crocheting and embroidery stitches	180–183	
	B9.5.4.1.3: Demonstrate how to gather materials, tools, and equipment for making artefacts	184–185	
Strand 5 Revision questions			
		186	122

Strand 6: Entrepreneurial skills			
Content standard	Indicator	Page references	
		LB	TG
Sub-strand 6.1: Career pathways and career opportunities			
B9.6.1.1 Demonstrate understanding about the changing nature of the workplace, the value of work to society, and the connection of work to the achievement of personal goals	B9.6.1.1.1: Describe how the changing nature of the workplace can bring about global competition and technology	188–189	123–126
	B9.6.1.1.2: Analyse the value of work to the individual and society in general	190–191	
	B9.6.1.1.3: Develop a career plan that would assist in the transition from school to eventual entry into a career option	192	

Sub-strand 6.2: Establishing and managing a small business enterprise			
B9.6.2.1 Demonstrate understanding of establishing and managing a small business enterprise	B9.6.2.1.1: Describe how to start and run a small business	193–196	127–130
	B9.6.2.1.2: Explain how to manage resources of small business enterprises	196–198	
Strand 6 Revision questions			
		199	131

This section includes the Basic 9 curriculum coverage table and a table with time allocations per topic.

The coverage table is based on the current three terms per year for dates declared for the 2022 school year.

Allowance has been given for 7 weeks of exams (2, 2, 3). This means that 29 weeks of teaching (12, 10, 7) or 114 periods are allocated in the table.

However, depending on a teacher's district, municipal, metropolitan area, the subject coordinators will provide a scheme of learning for their schools to streamline the teaching and learning based on the curriculum.

The table gives the time allocation (in periods) per sub-strand.

Strand	Sub-strand	Time allocation (hours)
1. Health and safety	1.1 Personal hygiene and food hygiene	4
	1.2 Personal, workshop and food laboratory safety	4
	1.3 Environmental health	6
2. Materials for production	2.1 Compliant materials	6
	2.2 Resistant materials	8
	2.3 Smart and modern materials	4
	2.4 Food commodities (animal and plant sources)	2
3. Tools, equipment and processes	3.1 Measuring and marking out	8
	3.2 Cutting and shaping	8
	3.3 Joining and assembling	8
	3.4 Kitchen essentials	8
	3.5 Finishes and finishing	8
4. Technology	4.1 Simple structures and mechanisms, electric and electronic systems	6
5. Designing and making of artefacts and products	5.1 Communicating designs	10
	5.2 Designing	4
	5.3 Planning for making artefacts	4
	5.4 Making artefacts from compliant, resistant materials and food ingredients	10
6. Entrepreneurial skills	6.1 Career pathways and career opportunities	4
	6.2 Establishing and managing a small business enterprise	4
	Total	116

Please note:

In the learning support material **Module** refers to **Strand** and **Topic** refers to **Sub-strand**.

Module 1 Health and safety

Topic 1.1 Personal hygiene and food hygiene

Content standard

- B9.1.1.1: Demonstrate skills that relate to personal and food hygiene to self

Indicators

- B9.1.1.1.1: Practise good grooming
- B9.1.1.1.2: Observe appropriate food hygiene practices

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.6: Demonstrate a thorough understanding of a generalised concept and facts specific to task or situation
- **Creativity and innovation (CI)**
 - CI 5.5: Ability to try new alternatives and different approaches
 - CI 6.2: Ability to reflect on approaches to creative task and evaluate the effectiveness of tools used
- **Communication and collaboration (CC)**
 - CC 8.1: Speak clearly and explain ideas
 - CC 8.2: Explain ideas in a clear order with relevant details
- **Personal development and leadership (PL)**
 - PL 5.6: Ability to set and maintain personal standards and values

1. Introduction

This topic deals with two types of hygiene: personal hygiene and food hygiene. Practising both can help us be healthy. In this topic, we will look at various food hygiene practices and demonstrate food hygiene practices in class.

2. Learning expectations

Learners need to be able to:

- explain what is meant by good grooming and relate it to personal hygiene
- discuss good grooming practices, in groups
- discuss the importance of good grooming, in groups
- demonstrate good grooming practices
- write short messages on good grooming and tag them in and around the classroom, in groups
- explain what is meant by food hygiene
- outline appropriate food hygiene practices
- watch a video on good food hygiene practices and discuss, in groups.

Duration

Teachers can teach this topic in four periods or two double periods.

3. Resources

- Learner's Book
- Poster paper
- Personal protection equipment (PPE)
- Personal hygiene equipment (nail brushes, toothbrush, soap, face cloths, sanitiser, face masks)
- Pictures that illustrate food hygiene practices
- Videos that show how food can be contaminated
- Real objects such as basins, washing soap, water for washing hands, dish cloths

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
6	1.4	Question 1: Video on good food hygiene practices, look at YouTube

5. Teaching methodology

5.1 Preparation

The teacher should:

- do research about personal and food hygiene and related hygiene practices
- collect and prepare teaching and learning resources that are relevant to lessons, for example prepare charts or pictures and collect objects
- download videos that are suitable to support the lesson.

5.2 Teaching strategies

Brainstorming, discussion (groups and whole class), group work, demonstration, pair work, thought shower

5.3 Relevant background knowledge

Learners have some general knowledge about personal and food hygiene. Some learners always wash their hands before they eat food. All learners should brush their teeth in the morning and before going to bed, and wash their hands after they go to the toilet or before they eat.

6. Suggested homework

List five things we do that can lead to cross-contamination.

7. Assessment

7.1 Assessment questions

1. What is food hygiene?
2. What is cross-contamination? Give examples using videos.
3. Give eight examples of things you can do to avoid cross-contamination.
4. How will you ensure that the food laboratory is always clean during cooking? State five measures you will take to achieve this.

5. Identify and discuss in groups how the food laboratory can be kept clean after cooking.

Answers

1. Food hygiene practices are the conditions and measures we take to ensure the safety of food, from preparation to consumption.
2. Cross-contamination is the process of germs passing from one surface or object to another, for example using a dirty dishcloth on a clean cutting board.
3. The following measures should be in place to avoid cross-contamination (any eight):
 - Never smoke or eat in any kitchen areas.
 - Do not drink or eat from a container that will be used by others.
 - Always wash hands with warm water and soap before preparing any food.
 - Wash hands after handling raw meat, poultry, fish or egg products before touching any food.
 - Do not sneeze or cough near food.
 - Do not wipe hands on a dish towel after touching raw meat, poultry or fish.
 - Do not wipe hands on an apron after touching raw meat, poultry or fish.
 - Put personal clothes and bags in a separate area away from cooking areas.
 - Always wash hands after taking a break or visiting the toilet.
 - Cover loose hair with a cap, net or chef's hat to prevent hair particles from entering the food.
4. The food laboratory can be kept clean and you can ensure good hygiene during food preparation by doing the following (any five):
 - Wash fruits and vegetables well before eating.
 - Wash knives and other utensils used on raw meat, poultry or fish, before using them to cut or handle something else.
 - Cut up raw meat, poultry and fish in a separate place to other foods, for example have separate cutting boards.
 - Wash cutting boards separately from other dishes and utensils in hot, soapy water.
 - Keep dish towels and other cloths clean. Wash in hot water.
 - Wipe kitchen surfaces after every use. Use hot soapy water or a special cleaner.
 - Wash your hands before handling any food.
 - Tidy up while preparing food. Do not wait until you have finished cooking before you tidy up. This will help keep away flies during food preparation.
 - Drop refuse in the refuse bin while preparing food in order to keep your surroundings clean and neat.
 - Refuse bins used in the kitchen should have lids in order to keep away flies from the food laboratory.
5. The food laboratory can be kept clean after cooking through the following means:
 - Ensure all leftovers and raw food are stored away properly. No perishable food should be left outside; it should be refrigerated.
 - Ensure all food storage containers and cupboards with dry goods are shut tight.
 - Empty the kitchen waste bin and take the waste to a correct dumping spot. Wash and air the bin.
 - Change the fryer oil.
 - Check the temperature of the freezer and fridge.
 - Turn off all heaters, ovens and gas stoves.
 - Ensure any sharp kitchen tools are stored away. Do not leave sharp objects to soak in soapy water. They may not be noticed the next day, and cause injury.
 - Remove all dirty wash and drying cloths. They should be washed in warm water before being used again.

7.2 Reflective practice or diagnostic assessment exercises

1. How well were learners able to explain food hygiene?
2. Were learners able to explain cross-contamination and give examples using videos?
3. How well were learners able to give eight examples of things they can do to avoid cross-contamination?
4. Were learners able to discuss and provide at least five specific measures of how the food laboratory could be kept clean during cooking?
5. How well were learners able to identify and discuss in groups how the food laboratory could be kept clean after cooking?

8. Answers

ACTIVITY 1.1

LB page 2

Learners work on their own.

They discuss what is meant by good grooming and how it relates to personal hygiene.

ACTIVITY 1.2

LB page 3

Learners work in groups.

1. Learners' own discussion and demonstrations
2. Learners' own perceptions and ideas
3. Learners' answers will vary. Suggested answers:
A: messy; **B:** clumsy; **C:** charming; **D:** elegant; **E:** confident

ACTIVITY 1.3

LB page 4

Learners work in pairs.

1.

Picture	Good food hygiene practices	Poor food hygiene practices	Reasons	Explain in sentence(s)
A	Washing hands		To remove dirt from fingers and avoid cross-contamination	Handwashing prevents illness by keeping hands clean and stopping germs from spreading.
B	Use a separate cutting board for meat and produce		To avoid cross-contamination	Bacteria left on a cutting board can pass from one food to another.

Picture	Good food hygiene practices	Poor food hygiene practices	Reasons	Explain in sentence(s)
C	Wearing cap and apron while working in the food laboratory		To prevent hair particles and dirt from clothing from contaminating food	Caps and aprons act as barriers, reducing the risk of cross-contamination in food preparation.
D	Washing vegetables		To remove dirt from the vegetables	Washing vegetables removes dirt and bacteria.
E	Cleaning and wiping sink after cooking		To keep the sink clean, hygienic and avoid bad odours	Wiping the sink after cooking keeps it clean and prevents odours.
F		Smoking in the food laboratory	The smoke contaminates the food being prepared in the food laboratory	Smoking contaminates food and alters the taste. Do not smoke in the food lab.
G		Leaving kitchen essentials and surfaces unwashed after cooking	It will become a breeding ground for germs	Unwashed surfaces and utensils become breeding grounds for bacteria. Clean up after cooking.
H		A child drinking milk or any beverage straight from a bottle in the fridge	Children might not consume everything in the bottle and may leave it outside the fridge. This can lead to food contamination, especially in dairy products.	Letting a child drink from fridge bottles is a bad hygiene practice. It encourages bad habits and spreads germs. Bacteria from their mouth can contaminate the product, making others sick.

2.

Poor hygiene practices	How to improve
1. Smoking in the food laboratory	Stop smoking, no smoking around food.
2. Leaving kitchen essentials and surfaces unwashed after cooking	Wash kitchen essentials and surfaces immediately after cooking. This will prevent the kitchen essentials and surfaces from becoming a breeding ground for germs.
3. A child drinking milk or beverage from a bottle in the fridge	Discourage children from drinking straight from bottles. Teach them to use a cup. This prevents food contamination. When children drink from bottles in the fridge, they may forget to return it to the fridge. This can cause food spoilage and cross-contamination.

3.

Good hygiene practices	How these practices prevent cross-contamination
Washing hands	Washing hands with soap removes dirt, bacteria and germs. When hands are clean and you touch food, no germ can contaminate the food. There will not be any transfer of dirt or germs from hands to food.
Use a separate cutting board for meat and produce	Cutting boards are porous and can harbour bacteria, even when washed. If you use the same cutting boards for meat as you do for produce you can transfer bacteria from the one to the other.
Wearing cap and apron while working in the food laboratory	Prevents the transfer of hair particles, dandruff and other dirt from entering and contaminating the food.
Washing vegetables	Prevents the transfer of dirt, chemical residue, maggots, sand particles and bacteria from entering the food.
Cleaning and wiping sink after cooking	Prevents the transfer of germs from the sink to dishes and food during food preparation.

ACTIVITY 1.4

LB page 6

Learners work in groups.

1. Learners watch a video on the topic of good food hygiene practices twice in a group. Learners make notes of any new insights they gained and share them with the rest of the group.
2. Learners use the new insights to add to the rules in the two lists on pages 4 and 6 of the Learner's Book in groups. Learners compare their group lists with other groups in the class.
3. It will be wise to wear a face mask while working in a food laboratory when you have a cold and you are coughing and sneezing. This will prevent air droplets which may contain germs when you cough or sneeze from entering and contaminating the food.
4. Three safe actions to be followed after the task shown in the photo has been completed:
 - Cook the meat immediately after cutting, or bag it and place in the freezer to prevent food contamination and spoilage.
 - Wash and rinse the knife before cutting other food to prevent cross-contamination.
 - Wash the cutting board and rinse thoroughly immediately after use before using it again to prevent cross-contamination.
5. Learners role-play any food hygiene measure.
 - a) Learners work in pairs and guess what each partner is acting out in turns.
 - b) Learners discuss each role play and what was or was not done correctly.

Teachers can use the rubric on page 135 of this Facilitator's Guide to assess learners' work.

6. Learners demonstrate food hygiene practices to each other in groups. Learners observe closely and say what they think was demonstrated correctly.
7. Discuss how these food items should be kept in the refrigerator:
 - a) Leftover canned foods: Pour or empty the can into a sealed bag or plastic container with a lid.
 - b) Fruit and vegetables: Wash fruits and vegetables. Store them in the fridge drawer in the bottom of the fridge.
 - c) Raw meat, poultry and fish: Wash them, divide and bag them according to the quantities that will be used at a time. Store them in the freezer.

Learners work in groups.

1. Learners look at the photos in the Learner's Book in groups.

- a) Tasks that must be done in this restaurant kitchen before they can close for the night are outlined in the table below.

Photo	Task	Reason
A	Washing	Wash kitchen essentials, surfaces, cloths (caps, overalls, aprons, dish cloths) after work to prevent cross-contamination.
	Storage	Wrap or bag and store leftover foods in the fridge and freezer to prevent food spoilage.
	Sweeping	Sweep the kitchen and collect the rubbish to prevent insects and rodents from invading.
	Emptying of dustbin	Throw rubbish away after the day's work and do not leave the rubbish in the kitchen bin overnight. This will prevent insects and rodents from invading.
B	Switch off gas or cooker	To avoid waste and fire outbreak
	Sweeping	To maintain a clean environment and avoid cross-contamination
	Cleaning	Clean the grid after cooking/grilling to remove food particles and prevent cross-contamination. Food particles left on the grid may go bad. When new food is placed on the grid, the bacteria may be transferred, leading to cross-contamination.
	Washing	Wash oven gloves after use to prevent cross-contamination.
	Scrubbing	Scrub floors after cooking to remove oil and other substances that might have spilled during food preparation. This prevents bad odours and contamination by bacteria.
	Storage	Wrap or bag and store leftover foods in the fridge and freezer to prevent food spoilage.

- b) The teacher can guide learners to add more tasks to their list, including details not shown in the photos such as safe storage/disposal of cooking oil.
2. Learners present their list of tasks to the rest of the class. The teacher can guide learners to explain their ideas logically, using full sentences.
3. Learners compare their group's list with those of other groups. Learners add to their list especially those details that they might have missed.

Linking Topics 1.1 and 1.2: Personal hygiene and safety

Questions

1. How does practising good grooming (washing hands, wearing clean clothes) relate to food hygiene in a laboratory setting?
2. Why is it important to keep the food laboratory clean and hygienic?
3. Imagine you see a classmate using a Bunsen burner without safety goggles. What is the appropriate action to take according to personal safety procedures?
4. How can maintaining a clean food laboratory environment contribute to a safe working environment?
5. Think about the concept of personal protective equipment (PPE). Give an example of PPE used in both food hygiene and workshop safety.

Answers

1. Practising good grooming helps prevent the spread of bacteria and germs which can contaminate food during preparation in the laboratory.
2. Maintaining a clean and hygienic food laboratory prevents the growth of bacteria and other microorganisms that can cause foodborne illnesses.
3. You should politely but firmly inform your classmate about the safety goggles requirement and remind them of the importance of following safety procedures to prevent accidents.
4. A clean laboratory environment reduces the risk of slipping, tripping, or contamination of food with foreign objects.
5. Gloves are an example of PPE used in both food hygiene and workshop safety. In food hygiene, gloves protect hands from contamination and in workshops, gloves protect hands from cuts and abrasions.

Teacher guidance for open-ended questions

- Question 5: Encourage students to think broadly about PPE. They may consider items such as hairnets, aprons, safety glasses, or dust masks depending on the specific context of food hygiene and workshop activities.
- Ask follow-up questions to explore the reasons behind their chosen PPE examples. For instance, why are gloves important in food hygiene?

This activity helps students see the connection between personal hygiene and food hygiene practices (Topic 1.1) and the importance of maintaining a safe working environment (Topic 1.2). By keeping themselves and their surroundings clean, students are actively contributing to a safe learning environment in the food laboratory.

Topic 1.2 Personal, workshop and food laboratory safety

Content standard

- B9.1.2.1: Demonstrate skills that relate to personal, workshop and laboratory safety

Indicators

- B9.1.2.1.1: Describe procedures for reporting accidents and unsafe practices in school and in the laboratory/workshop/site
- B9.1.2.1.2: Use appropriate personal protective equipment when working
- B9.1.2.1.3: Maintain safe working environments

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.1: Ability to combine information and ideas from several sources to reach a conclusion
 - CP 5.6: Demonstrate a thorough understanding of generalised concepts and facts specific to task or situation
 - CP 6.3: Identify important and appropriate alternatives
- **Communication and collaboration (CC)**
 - CC 8.2: Explain ideas in a clear order with relevant detail, using correct construction and structure of speech
 - CC 9.1: Demonstrate behaviour and skills of working towards group goals
 - CC 9.4: Help group work on relevant activities

1. Introduction

Accidents happen in the kitchen because we use sharp objects, electrical equipment and use water and other liquids that may spill or splash on the floor. At times we also work in a hurry and do not pay attention to potential dangers in the kitchen. In this topic, we will look at warning signs, unsafe personal behaviours and how to prevent accidents in the kitchen.

2. Learning expectations

Learners need to be able to:

- discuss the procedures for reporting accidents and unsafe practices in the laboratory/workshop/site
- identify the various personal protective equipment in groups
- discuss the importance of wearing personal protective equipment, in groups
- demonstrate the use of the personal protective equipment, in groups
- do project work: design and make personal protective equipment using compliant and resistant materials (fabrics) in groups
- explain what is meant by maintaining a safe working environment
- discuss the importance of keeping the working environment safe, in groups
- demonstrate safety practices at workplaces
- do project work: design posters to create awareness on the need to maintain a safe working environment, and post them around the school.

Duration

Teachers can teach this topic in four periods or two double periods.

3. Resources needed

- Learner's Book
- Poster paper
- Personal protection equipment (PPE)
- Safety clothes and equipment such as oven gloves, fire extinguisher etc.
- Pictures that illustrate safety practices in the food laboratory
- Videos on food safety practices
- Pictures of unsafe personal and food laboratory practices
- Videos of unsafe food laboratory practices
- Real objects such as gloves, pot holders, long dresses etc.

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
16	1.15	Find pictures on the internet for safety poster

5. Teaching methodology

5.1 Preparation

The teacher should:

- do research about personal workshop and food laboratory safety
- collect and prepare teaching and learning resources such as pictures that are relevant to lessons, for example prepare charts or pictures and collect objects
- download videos that are suitable to support the lesson.

5.2 Teaching strategies

Brainstorming, discussion, group work, demonstration, whole class discussion, pair work, thought showers, games

5.3 Relevant background knowledge

Learners should have some knowledge about personal and food laboratory safety. They should know how to use pot holders to remove hot saucepans from fire. Some learners have practice in switching off cookers after cooking and lighting matches before turning on gas cookers if they cook at home.

6. Suggested homework

List five unsafe practices that will not ensure food laboratory safety.

7. Assessment

7.1 Assessment questions

1. Identify four skills that relate to personal, workshop and food laboratory safety.
2. List any five signs of danger in the food laboratory.
3. What procedures should one follow to report accidents and unsafe practices in the food laboratory?
4. What details should be in the employee's report?
5. Whose responsibility is it to keep the food laboratory safe?
6. What are the roles of employers in keeping the environment safe for employees in the food laboratory?
7. Identify five unsafe practices in the food laboratory.

Answers

1. Skills that relate to personal, workshop and food laboratory safety are as follows (any four):
 - Taking safety precautions
 - Being aware of what the dangers are when one fails to adhere to safety precautions, for example, injury and in extreme cases death
 - Using common sense
 - Making responsible and safe choices
 - Paying attention at all times when working in the kitchen.
2. Signs or dangers that can be seen or encountered in the food laboratory are (any five):
 - frayed cords
 - gas smells
 - warning lights
 - defective electrical sockets
 - dirty floors
 - uncontrolled waste
 - broken equipment
 - poor lighting or ventilation.
3. The procedure that you should follow in reporting accidents and unsafe practices in the food laboratory is to report it to the supervisor. Where an accident leads to a serious injury, or even death, the government authorities have to be informed.
4. Employees should report on the following:
 - Details of what happened
 - Type of injuries caused.
5. It is the responsibility of both the employer and employee to keep the food laboratory safe.
6. The roles of employers in keeping the environment safe for employees in the food laboratory are:
 - making sure that machinery and equipment are in good condition
 - ensuring that safety procedures are followed by workers
 - making sure that workers are trained in the use of machinery and equipment
 - ensuring that workers have adequate personal protective equipment (PPE) and clothing
 - ensuring a well-lit work environment
 - making sure that the workplace is well ventilated.

7. Some unsafe practices exhibited by employees are (any five):
- not storing items safely, particularly heavy and bulky items
 - dressing unsafely, for example wearing flammable or synthetic fabrics, or flimsy sandals or high heels
 - not using the right tool for the job
 - allowing clutter on work surfaces in the food laboratory
 - rushing while completing tasks in the food laboratory
 - getting distracted, for example using their phones while working
 - running in a food laboratory
 - throwing tools to each other in the food laboratory
 - carrying a knife with its sharp end pointing upwards
 - using wet or thin cloths instead of potholders to remove pots and pans from the heat in the food laboratory
 - spilling hot oil or liquids on the floor in the food laboratory
 - leaving flames unattended in the food laboratory.

7.2 Reflective practice or diagnostic assessment exercises

1. How well were learners able to identify four skills that relate to personal, workshop and food laboratory safety?
2. Were learners able to list five signs or dangers in the food laboratory?
3. How well did learners outline the procedures one needs to follow to report accidents and unsafe practices in the food laboratory?
4. Were learners able to outline the details of the employee's report?
5. Did learners indicate whose responsibility it is to keep the food laboratory safe?
6. How well were learners able to discuss the roles of employers in keeping the environment safe for employees in the food laboratory?
7. Were learners able to identify five unsafe practices exhibited by employees in the food laboratory?

8. Answers

ACTIVITY 1.6

LB page 9

Learners work in groups.

The teacher can relate a story from their community and take learners through the questions as a guide. Answers will differ. Listen to each group's story and help them to answer the questions. This will help them to develop their critical-thinking abilities.

ACTIVITY 1.7

LB page 9

Learners work on their own.

The teacher can provide guidelines for learners to help them with their research. For example:

1. Name(s) of hazards you fear.
2. Describe the hazard(s) you fear at work.
3. What can you do to reduce the chances of injury?

ACTIVITY 1.8

LB page 10

Learners work in groups.

1. **A:** Leaving food unattended on flames and food catching fire on the cooker.
B: Leaving banana peels on the floor and someone stepping on it and potentially slipping.
C: Leaving tripping hazards in the walkway and person is not looking where they are going.
D: Working carelessly with a sharp knife resulting in a cutting injury.
2. Yes. Because safety rules are not being observed by workers in the food laboratory.
3. **A:** carelessness, ignorance, hurriedness
B: carelessness
C: carelessness, hurriedness
D: carelessness

ACTIVITY 1.9

LB page 11

Learners work in groups.

1. The order:
 - Check that there is no immediate risk of danger. If there is, call the emergency line (999), especially in the case of a fire outbreak.
 - Report to the class teacher
 - Headmaster/mistress
 - Contact the school sick bay for first aid
 - Clinic/hospital
 - Contact parents
2. Learners brainstorm unsafe situations and draw up a report.
Teachers can use the rubric, *Writing a paragraph/report* on page 135 of this Facilitator's Guide to assess learners' reports.
3. Safety measures:
 - People are wearing face masks to avoid transmitting/catching COVID-19.
 - There is a traffic policeman guiding learners across the road.
 - Some learners are crossing the road with a parent

ACTIVITY 1.10

LB page 12

Learners work in pairs.

1. **A:** goggles, ear protectors, safety boots, gloves, dust mask
B: surgical mask
C: thimble
D: ear plugs
E: surgical gloves
2. Learners' own ideas about the different kinds of protection offered between PPE and safety equipment. Here is a guide:

Protective gear	What it does
Non-slip footwear	The shoes help prevent a person from slipping and/or falling.
Strong, sturdy shoes	The shoes protect a person's feet from heavy or sharp objects that fall.
Heat-resistant clothing	Helps prevent burn injuries if a fire breaks out or boiling liquids spill.
Eye protection	Gives protection against chemicals, flying splinters or open flames.
Face mask	Prevents the spread of germs when coughing, sneezing or talking.
Hair nets	Prevents hair or dirt from dropping into the food or becoming snagged in equipment.
Aprons	Prevent spills on cloths or burns from hot foods and liquids.
Gloves	Protect our hands against injuries and from chemicals.

ACTIVITY 1.11

LB page 13

Learners work on their own.

They write two half-page reports on PPE.

Teachers can use the rubric, *Writing a paragraph/report* on page 135 in this Facilitator's Guide to assess learners' answers.

ACTIVITY 1.12

PRACTICAL: Make a face mask

LB page 13

Learners work on their own. This activity may be given as homework.

Teachers can use the rubric, *Sewing preparation/demonstration* on page 133 in this Facilitator's Guide to assess learners' work.

ACTIVITY 1.13

LB page 14

Learners work on their own.

1. Learners' answers will vary.
2. Possible answers:
 - Doors are open for ventilation.
 - Factory is well-lit.
 - Workers are socially distanced.
 - Workers are wearing PPE: gloves, masks, hair caps.

ACTIVITY 1.14

LB page 16

Learners work in groups.

1. They discuss safety procedures.
2. They demonstrate safety practices.

Learners work in groups.

Learners can use sheets of A4 paper to create their posters.

Teachers can use the rubric, *Creating a poster* on page 133 in this Facilitator's Guide to assess learners' work.

Linking Topics 1.2 and 1.3: Workshop safety and environmental health

Questions

1. Imagine you are working in a workshop and notice a puddle of oil on the floor. What is a potential safety hazard associated with this situation?
2. How can a safe working environment in a workshop contribute to a healthy environment overall?
3. What is the connection between poor sanitation and accidents in a workshop or laboratory setting?
4. Clean energy sources like Liquefied Petroleum Gas (LPG) are considered safer for indoor cooking. Why might this be the case compared to traditional cookstoves?
5. Think about the concept of "improved cookstoves" discussed in Clean Energy. Suggest a benefit of using improved cookstoves beyond personal health benefits.

Answers

1. A puddle of oil on the floor creates a slipping hazard, which could lead to a fall and potential injury.
2. A safe working environment reduces the risk of accidents and injuries, leading to a healthier environment for everyone working in the workshop.
3. Poor sanitation, such as overflowing bins or dirty water, can attract insects and rodents which can spread diseases and create tripping hazards, increasing the risk of accidents.

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider the link between a clean workspace and focus. Discuss how a cluttered or dirty environment can be distracting and potentially lead to mistakes while working.
- Question 5: Guide students to think about the environmental benefits of improved cookstoves. They might consider reduced smoke emissions and potentially improved air quality.

This activity helps students see the connection between maintaining a safe workshop environment (Topic 1.2) and the broader concept of environmental health (Topic 1.3). By practising safe workshop habits, students contribute to a healthy work environment for themselves and others. Furthermore, the discussion on clean energy sources allows them to connect workshop safety with environmental benefits beyond the workshop itself.

Topic 1.3 Environmental health

Content standard

- B9.1.3.1 Demonstrate understanding and practice of environmental health in the school/home
- B9.1.3.2 Demonstrate understanding of clean energy, and Improved Cookstoves (ICS) and their accompanying fuels

Indicators

- B9.1.3.1.1: Discuss the causes and prevention of poor sanitation in the school/home/community/workshop/site/laboratory
- B9.1.3.2.1: Discuss what is meant by clean energy and improved cookstoves and fuels
- B9.1.3.2.2: Discuss the benefits of improved cookstoves and fuels

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 6.1: Ability to effectively define goals towards solving a problem
- **Creativity and Innovation (CI)**
 - CI 5.1: Examine alternatives when creating new things
 - CP 5.2: Analyse and make a distinct judgement about viewpoints expressed in an argument
 - CP 6.4: Ability to identify important and appropriate criteria and use them to evaluate available alternatives
- **Communication and collaboration (CC)**
 - CC 8.1: Speak clearly and explain ideas
- **Cultural identity and global citizenship (CG)**
 - CG 5.1: Show a strong sense of belongingness to one's culture

1. Introduction

Clean energy

Human beings have an influence on the environment. This can either be positive or negative. In this topic, we will look at how human activities are destroying the environment and how these activities can be changed so as to sustain the environment and health of individuals and families.

Environmental health

Environmental health is mostly concerned with clean water, sanitation, disease control, hygiene, clean air, and waste management. In this sub-section, we will be focusing on the causes and prevention of poor sanitation in the school/home/community/workshop/site/laboratory. We will also look at what is meant by clean energy and improved cookstoves and fuels. Then, finally, we will take a look at the benefits of improved cookstoves and fuels.

2. Learning expectations

Learners need to be able to:

- discuss the causes of poor sanitation in the home, school, community, workshop/site/laboratory
- discuss ways of preventing poor sanitation in school and home
- undertake a project on the need for people to keep the school and community clean
- undertake a project in recycling of waste, in groups.

Duration

Clean energy

Teachers can teach this topic in four periods or two double periods.

Environmental health

Teachers can teach this topic in two periods or one double period.

3. Resources needed

- Learner's Book
- Poster paper
- Recycling containers
- Samples of clean stoves
- Pictures of different cookstoves
- Cardboards, flip charts, colour markers

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
22	1.19	Find pictures on the internet for safety poster

5. Teaching methodology

5.1 Preparation

Clean energy

The teacher should:

- do research about improved cookstoves
- collect and prepare teaching and learning resources such as pictures that are relevant to lessons, for example prepare food on traditional and improved cookstoves
- download videos that are suitable to support the lesson.

Environmental health

The teacher should:

- read and do research on environmental health
- get teaching and learning resources ready (by preparing some charts, PowerPoint presentations and getting the realia, artefacts/workpieces and materials, videos)
- do research on how to use clean cookstoves and fuels
- look on the internet for further information with regards to the exemplars in Career Technology.

5.2 Teaching strategies

Brainstorming, discussion, group work, whole class discussion, pair work, question and answer method

5.3 Relevant background knowledge

Clean energy

Learners use different cookstoves at home to prepare food. Some of the cookstoves are traditional or improved. Learners use different fuels for the various cookstoves.

Environmental health

Learners in their classrooms and homes are exposed to poor sanitation. They have noticed that whenever it rains, the waste that is disposed into gutters and rivers has increased over some time causing flooding. Learners use charcoal and coal pots at home, some also use gas burners and others use firewood for the preparation of food and other activities that involve fire for both home and industrial purposes.

6. Suggested homework

Clean energy

Visit five houses in your neighbourhood and identify the kind of cookstoves and fuel used in the home.

Environmental health

1. You live in a community where whenever it rains, the community is flooded and much waste remains after the flood. Since this is a major problem in your area, discuss the causes, effects and ways of prevention this. Try and plan a campaign to educate residents in your community based on your discoveries.
2. Global warming has become a major international concern. You live with a family that uses firewood for cooking and heating. Suggest how you could educate your parents on the environmental effects of using firewood to cook and suggest to them other clean means that can be used to cook besides the use of firewood.

7. Assessment

7.1 Assessment questions

Clean energy

1. How do humans harm the environment?
2. Why is it harmful to burn wood as fuel?
3. What is your understanding of the term **clean energy**.
4. Give another name for clean energy.
5. Give an example of one behaviour change that can help to sustain our environment.
6. Mention one alternative cookstove to traditional charcoal cookstoves.
7. List three fuels used by improved cookstoves.
8. Why do the fuels that are used for improved cookstoves reduce the impact of cooking on environmental health?
9. Identify and discuss the benefits of improved cookstoves.

Environmental health

1. List the six environmental health concern areas in schools and homes.
2. Explain the term **sanitation**.
3. Give three examples of poor sanitation.
4. List six diseases that can be transmitted as the result of poor sanitation.

5. List four causes of poor sanitation.
6. Give five effects of poor sanitation.
7. State ways that poor sanitation can be prevented.
8. What is the major cause of environmental pollution and why?
9. List three natural ways to generate energy.
10. Copy and complete the table below.

Traditional cookstove	Traditional fuel	Improved cookstoves	Improved fuels
Charcoal burner			
Fire			
Wood pellet			
Charcoal briquette			

11. In Ghana, which institution has been formed to spearhead the use of clean cookstoves and fuels and when was the institution established?
12. What is the aim of this institution?
13. State five benefits of using improved cookstoves and fuels.
14. Define the term **clean energy**.

Answers

Clean energy

1. Humans harm the environment by burning wood as fuel.
2. Burning wood as fuel is harmful because of the following reasons:
 - Wood fires release smoke which pollutes the air we breathe.
 - Excessive collection of firewood leads to deforestation due to too many trees being chopped down. This can add to global warming (global warming is the long-term heating of Earth's climate).
3. Clean energy is made from resources that nature will continue to replace, like wind, water and sunshine.
4. Another name for clean energy is green power.
5. One way of changing our behaviour is to create and use clean energy.
6. An alternative cookstove to traditional charcoal cookstoves is improved cookstoves.
7. Three fuels used by improved cookstoves are:
 - less traditional fuel
 - methane
 - biomass.
8. Fuels used by improved cookstoves reduce the impact of cooking on environmental health because of the following reasons:
 - They are more fuel-efficient.
 - They are safer.
 - They give off less emissions or zero emissions.
9. Benefits of improved cookstove are as follows:
 - **Improved environmental health:** Improved cookstoves' fuels have much lower carbon emissions than wood, and some have zero emissions. This is important for reducing air pollution.
 - **Improved human health:** Improved cookstoves reduce exposure to dangerous air pollution. This particularly improves the health of the cooks, who usually are women and children.

- **Saves time or money:** Improved cookstoves use less fuel than traditional stoves, which brings down the cost of fuel for households who buy wood and charcoal. This reduces costs in the family budget. For households who fetch their own wood, the improved cookstoves save time and effort.
- **Slows deforestation:** By reducing the demand for wood, improved cookstoves can help to protect forests.
- **Local economy:** The production of local stoves, for example Gyapa Stoves, provides an income to Ghana businesses. It also provides employment to those who make the local stoves.

Environmental health

1. The six environmental health concern areas in schools and homes are:
 - clean water
 - sanitation
 - disease control
 - hygiene
 - clean air
 - waste management.
2. Sanitation means how a community or a country gets rid of human urine and faeces, also called sewage.
3. Three examples of poor sanitation are:
 - When people living in a certain area or community do not have access to safe and clean drinking water.
 - When there is a poor sewage working system in a town, community, city or country.
 - When people do not have access to a latrine and live in a dirty environment.
4. Six diseases that can be transmitted as a result of poor sanitation are:
 - cholera
 - diarrhoea
 - dysentery
 - hepatitis A
 - typhoid
 - polio.
5. Four causes of poor sanitation are:
 - Poorly maintained, broken sewage systems
 - Inadequate sewage systems for the number of people using them. This includes not having toilets or latrines, or not enough of them.
 - Littering and improper disposal of waste. People discard garbage indiscriminately on the street. When there is a heavy downpour, the waste material clogs the sewage system pipes. This is made worse by the lack of proper waste disposal systems, including not having enough bins or removal services.
 - Indiscriminate defecation, which adds to pollution and poor sanitary conditions.
6. Five effects of poor sanitation are:
 - A major negative effect of poor sanitation is the health risk. Direct contact with human waste holds the hazard of bacterial infection. Diseases such as cholera, diarrhoea, dysentery, hepatitis A, typhoid and polio are common in areas where there is poor sanitation. Diarrhoea, which contributes to stunted growth, is also common.
 - In the absence of toilets or latrines, people practise open defecation. This pollutes the environment and harms species in our water bodies.
 - Poor sanitation also adversely affects the local economy. A setting with poor waste management is unattractive to tourists and investors.
 - Maintaining sewage and waste removal systems is expensive. Sometimes local governments do not have the money to do what is necessary.
 - In rural areas, a lack of piped water and other resources, such as the materials needed to build a sewage system, is an obstacle.

7. Ways that poor sanitation can be prevented are:
 - Reduce dumped waste in streets.
 - Avoid open defecation, especially in water.
 - Encourage proper waste disposal by having more bins in public spaces. This can reduce the waste on the streets, which clogs up sewage systems.
 - Use platforms like newspapers, radio or television to inform community members of the hazards of improper waste disposal and open defecation.
 - Clean-up exercises to pick up litter could make people aware of the waste problem. This could change behaviour for the good and reduce litter.
8. The major cause of environmental pollution is burning wood as fuel. This has reduced environmental health because it has led to global warming.
9. Three natural ways to generate energy are:
 - wind
 - water
 - sunshine.

10.

Traditional cookstove	Traditional fuel	Improved cookstoves	Improved fuels
Charcoal burner	Charcoal	Gyapa style	Charcoal
Fire	Firewood	Gas burner	Gas
Wood pellet	Wood	Biomass pellet	Pellet
Charcoal briquette	Charcoal	Biomass briquette	Biomass

11. In Ghana, the Ghana Alliance for Clean Cookstoves and Fuels (GHACCO) is the institution in charge of spearheading the use of clean cookstoves and fuels and was formed in 2013.
12. The aim of this institution is to ensure that clean cooking becomes a major solution to the challenges posed by climate change, the environment, health and harmful effects of Household Air Pollution (HAP).
13. Five benefits of using improved cookstoves and fuels are:
 - **Improved environmental health:** Improved cookstoves' fuels have much lower carbon emissions than wood, and some have zero emissions. This is important for reducing air pollution.
 - **Improved human health:** Improved cookstoves reduce exposure to dangerous air pollution. This particularly improves the health of the cooks, who usually are women and children.
 - **Saves time or money:** Improved cookstoves use less fuel than traditional stoves, which brings down the cost of fuel for households who buy wood and charcoal. For households who fetch their own wood, the improved cookstoves save time and effort.
 - **Slows deforestation:** By reducing the demand for wood, improved cookstoves can help to protect forests.
 - **Local economy:** The production of local stoves, for example Gyapa Stoves, provides an income to Ghana businesses. It also provides employment to those who make the local stoves.
14. Clean energy is energy produced through means that do not pollute the atmosphere.

7.2 Reflective practice or diagnostic assessment exercises

Clean energy

1. How well did learners explain how humans harm the environment?
2. Were learners able to explain why it is harmful to burn wood as fuel?

3. How well did learners explain clean energy?
4. Were learners able to give another name for clean energy?
5. Were learners able to name one behaviour change that could help sustain the environment?
6. Were learners able to mention one alternative cookstove to traditional charcoal cookstoves?
7. How well were learners able to identify three fuels used by improved cookstoves?
8. How well did learners explain why the fuels that are used for improved cookstoves reduce the impact of cooking on environmental health?
9. Were learners able to identify and discuss the benefits of improved cookstoves?

Environmental health

1. Were learners able to discuss the causes of poor sanitation in the home, school, community, workshop/site/laboratory?
2. Were learners able to discuss ways of preventing poor sanitation in school and at home?
3. Were learners able to undertake a project on the need for people to keep the school and community clean?
4. Were learners able to undertake a group waste-recycling project?
5. Were learners able to explain what is meant by clean energy?
6. Were learners able to identify improved cookstoves and fuels?
7. Were learners able to watch pictures and videos on improved cookstoves and fuels and traditional cookstoves and fuels, and compare them?
8. Were learners able to discuss what happens when clean energy is used?
9. Were learners able to search and present in class, the various improved cookstoves and fuels using ICT tools and other sources?
10. Were learners able to brainstorm the benefits of improved cookstoves and fuels, in groups and present in class?
11. Were learners able to demonstrate the uses of improved cookstoves, fuels and traditional stoves?
12. Did learners, in groups, plan and organise a campaign to educate the school and the community on the use and benefits of improved cookstoves?

8. Answers

ACTIVITY 1.16

LB page 19

Learners work in groups.

1. Learners have a group discussion on the quality of sanitation at school.
2. They discuss poor sanitation in other schools.
3. Learners plan and undertake a clean-up project in the school or community. Teachers can use the rubric, *Creating a poster* on page 133 of this Facilitator's Guide to assess learners' flyers.

ACTIVITY 1.17

PROJECT: SCHOOL RECYCLING PLAN

LB page 19

Learners work in groups.

Learners work out a recycling plan for their school.

Place four containers labelled paper, glass, metal and plastic in every classroom.

Have a prize ready for the class that fills their containers first. Find out where you can take the recycling. Invite an expert from the District Assembly or the community to assist with the recycling project.

ACTIVITY 1.18

LB page 22

Learners work in groups.

1. a)

Similarities between traditional and improved cookstoves

Traditional cookstoves	Improved cookstoves
Made of metal	Made of metal
Uses fuel	Uses fuel

b)

Differences between traditional and improved cookstoves

Traditional cookstoves	Improved cookstoves
Not very fuel efficient	More fuel-efficient
Not very safe	Safer
Give off more smoke.	Give off less emissions or zero emissions
Some of them are not easily regulated	Easy to regulate
They use more traditional fuel such as charcoal and firewood	They use less traditional fuel, methane and biomass

2. Clean energy is fuel-efficient, meaning less fuel is used – thereby saving costs. It heats up quickly, so saves time. There are fewer or zero emissions, so the air is cleaner. This will prevent lung complications caused by smoke particles and promote good health among people who use it. Fewer trees are cut down for fuel, so this will further reduce deforestation and even global warming. Traditional charcoal cookstoves do the opposite. They cause deforestation, make the environment dirty, are time-consuming to use and are expensive to run.

ACTIVITY 1.19

LB page 23

Learners work in groups.

1. a) **Personal health:** Improved cookstoves reduce exposure to dangerous air pollution. This particularly improves the health of the cooks, who usually are women and children.
- b) **Environmental health:** Improved cookstoves' fuels have much lower carbon emissions than wood, and some have zero emissions. This is important for reducing air pollution.
- c) **Family budgets:** Improved cookstoves use less fuel than traditional stoves, which brings down the cost of fuel for households who buy wood and charcoal. This reduces costs in the family budget. For households who fetch their own wood, the improved cookstoves save time and effort.
- d) **The time women and children have for other things:** Improved cookstoves are faster than traditional cookstoves. This saves time and promote effective use of time. Women and children have enough time to attend to other things such as having time for their family, friends, school work and play time.
- e) **Safety:** Improved cookstoves are safer since they give off less emissions or zero emissions. This will help avoid air pollution, lung, heart and other diseases. Open fires are also dangerous.

2. The teacher demonstrates the use of the two cooking methods in a safe manner.

3.

A	B
Traditional cookstove	Improved cookstove
Difficult to regulate	Easy to regulate
Uses firewood as a source of firewood	Uses biomass as a source of fuel
Gives off smoke	Does not give off smoke

ACTIVITY 1.20

PRACTICAL: PLAN AN EDUCATION CAMPAIGN LB page 23

Learners work in groups.

Learners plan a campaign to educate the school and community on the use and benefits of improved cookstoves. They can make posters, flyers or present a radio advertisement using some of the research gathered for Activity 1.19.

Teachers can use the rubric, *PowerPoint presentation/oral* on page 134 or *Creating a poster* on page 133 of this Facilitator's Guide to assess learners' presentations.

Learners work on their own.

1. B 2. C 3. C (3 × 1)

4. Three things that need to be done at the end of a working day in a kitchen:

- Sweep the kitchen and empty dustbins.
- Wash all dish cloths in the kitchen.
- Wash all dishes, wipe or dry them and put them away in their appropriate places. (3)

5. Keeping our bodies clean is called personal hygiene. It includes washing our hands regularly, bathing or showering, brushing our teeth and cutting our nails.

Grooming focuses on appearance and the impression we make on others. It shows others that you care about how you look, beyond being healthy and clean.

Personal grooming skills include the following:

- keeping hair in a neat and attractive style, which could include combing or brushing it regularly, depending on the style
- filing and trimming nails
- keeping teeth clean
- wearing clean clothes and shoes
- choosing neat, well-fitting clothes. (4)

6. (6)

Type of accident	Possible cause	Prevention
Burns	Removing a pan/pot from fire/cooker without pot holder(s).	Use a pot holder when removing hot items from the fire.
Falls	Leaving spills or splashes on the floor. Reaching for higher-placed items without a platform or ladder.	Immediately wipe or mop spillages on the floor. Use platforms or ladders to reach high items.

7. Poor sanitation reasons (any three):

- Poorly maintained, broken sewage systems.
- Inadequate sewage systems for the number of people using them. This includes not having toilets or latrines, or not enough of them.
- Littering and improper disposal of waste. People discard garbage indiscriminately on the street. With heavy rain, waste material can clog sewage system pipes. Lack of proper waste disposal systems (bins, removal services) worsens it.
- Indiscriminate defecation, which adds to pollution and poor sanitary conditions. (3)

8. A: It can cause disease such as typhoid and dysentery.

B: Rubbish piles up and contributes to pollution.

C: A growing population increases the strain on the sanitation systems. (3)

9. A: False. They use less fuel. (1)

B: True (1)

C: False. Cookstoves use different types of fuel. (1)

D: True (1)

E: True (1)

F: False. Using cookstoves means burning wood which contributes to deforestation. (1)

10. Employers and employees are responsible for keeping the food laboratory safe. If accidents occur employees must report them to supervisors or employers. Accidents that can lead to a serious injury or death, must be reported to government authorities. The report must include details of what happened and injuries. (2)

Total: 30 marks

Module 2 Materials for production

Topic 2.1 Compliant materials

Content standard

- B9.2.1.1: Demonstrate skills in selecting compliant materials for making products and artefacts

Indicators

- B9.2.1.1.1: Discuss the factors that influence the selection of compliant materials

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.2: Analyse and make distinct judgement about viewpoints expressed in an argument
- **Creativity and innovation (CI)**
 - CI 6.2: Ability to reflect on approaches to creative tasks and evaluate the effectiveness of tools used
- **Communication and collaboration (CC)**
 - CC 8.2: Explain ideas in a clear order with relevant details, using correct construction and structure of speech

1. Introduction

This topic deals with materials used in production and focuses specifically on compliant materials and how they are made. Learners will study the properties and functions of compliant materials and learn how to select the correct material for the task at hand. They will consolidate this knowledge by designing and making an artefact from compliant materials.

2. Learning expectations

Learners need to be able to:

- review their knowledge on the properties of compliant materials and safe practices when working with tools/equipment
- discuss the factors that influence the selection of compliant materials
- demonstrate the processes involved in working with compliant materials
- make artefacts from compliant materials
- display artefacts and appraise in groups.

Duration

Teachers can teach this topic in six periods or three double periods.

3. Resources needed

- Learner's Book
- Different types of compliant materials such as paper, cardboard, card, fabric (such as linen) and textiles (woven, knitted, knotted items)
- Different types of non-compliant materials such as items made from wood, glass, stone, steel, metal, or iron

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
29	2.3	Question 2: Look for images to get ideas of an artefact to make

5. Teaching methodology

The teacher should:

- read and research information on compliant materials
- collect and prepare teaching and learning resources that are relevant to lessons, for example prepare charts or pictures and collect objects, as well as videos
- do research on how compliant materials are manufactured, especially paper making
- look for more information on the internet.

5.2 Teaching strategies

Brainstorming, discussion, group work, individual work, research

5.3 Relevant background knowledge

From Basic 7 and 8, learners should know:

- what the properties of a material are
- the properties that differentiate compliant from resistant materials
- how to consider the properties of materials before selecting a material to work with.

This is revised on page 26 of the Learner's Book.

6. Suggested homework

1. Learners will be making an artefact using compliant materials. If there is not enough time in class, allocate this as homework to complete.
2. Learners can design a card game using compliant materials, such as "Guess what I am", using either a description or a tactile example (learners guessing have to close their eyes for this one). They need to get creative when it comes to making the cards! They should each produce about 10 cards and swap them around in class to play.

7. Assessment

7.1 Assessment questions

1. List the four main properties of compliant materials.
2. Give three ways in which we can assess a material to see which function it is most suitable for.
3. Outline the four basic steps when making an artefact from compliant material.

Answers

1. Easy to shape, can be crumpled or flattened by hand, materials are lightweight, flexible
2. Any three of the following:
 - Is the material hard or soft? If it is hard, it won't be comfortable to wear.
 - Is it strong or weak? If it is weak, it can't be used to make furniture.
 - Is it flexible or stiff? If it is flexible, it can easily be formed into a shape we want.
 - Can it absorb moisture? If it can, we can use it to make cleaning materials.
 - Is the material light or heavy? If light, it can be used for packaging.
3. See the example on page 28 of the Learner's Book.

7.2 Reflective practice or diagnostic assessment exercises

1. Can learners list the four main properties of compliant materials?
2. Do learners understand how to assess a material to see which function it is most suitable for?
3. Can learners list and explain the four basic steps when make an artefact from compliant material?

8. Answers

ACTIVITY 2.1

LB page 26

Learners work in groups.

1. B, C and D are made from compliant materials.

ACTIVITY 2.2

LB page 27

Learners work in groups.

1.

a)	playhouse for a toddler	solid white board
b)	table decorations	construction paper
c)	a gift bag	medium-weight wrapping paper
d)	a soft toy	felt fabric
e)	birthday card	corrugated card
2. Learners explain their choices in their own words. Accept all reasonable answers (they could deviate from the above if well supported). Here are some suggested answers:
 - a) Solid white board will keep its shape and allow the building of walls and a roof that will not bend easily but can still be cut and folded.
 - b) Construction paper will keep the shape of the decorations.
 - c) Medium-weight wrapping paper won't tear easily so will take the weight of various gifts.
 - d) Felt fabric is soft to touch and will not hurt the person playing with the soft toy.
 - e) Corrugated card will stand upright and not warp when painted, which is suitable for a greeting card.

ACTIVITY 2.3

PRACTICAL: MAKE ARTEFACTS FROM COMPLIANT MATERIALS

LB page 29

Learners work on their own.

They can either use an example found on the internet or design an artefact of their own.

Learners have to:

- sketch their design

- write the steps on how to produce the artefact
- gather their materials and tools
- make the artefact.

Give the learners about one week (including a weekend) to complete the artefact. Create a space in the classroom to create a gallery where learners can observe their classmates' work and appraise their own work. They answer these questions:

- How effectively did I use the tools and material?
- Will I approach the task differently next time? If yes, how would I change my approach?

Teachers can use the rubric, *Demonstration artefacts/tools* on page 132 of this Facilitator's Guide to assess learners' work.

Linking Topics 2.1 and 2.2: Compliant and resistant materials selection

Questions

1. Imagine you are designing a phone case. What are factors you would consider when choosing a material for the case?
2. You have decided to make a cutting board for the kitchen. Would you classify this as a product requiring a compliant or resistant material? Why?
3. Why might the skills of the designer be a factor when selecting a material for a product?
4. Considering safety, think of any differences in how you might handle compliant materials compared to resistant materials.
5. Think about the concept of "resistant materials." Give an example of a resistant material that might require specific tools for safe use. Explain why.

Answers

1. Factors to consider when choosing a material for a phone case include protecting the phone from drops (resistant), being lightweight and comfortable to hold (compliant), and having a stylish appearance (both compliant and resistant can be stylish).
2. A cutting board requires a resistant material. It needs to be strong enough to withstand cutting and chopping actions without being damaged.
3. The skills of the designer can influence material selection because some materials may require specific skills to work with effectively. For instance, a beginner designer might choose a simpler material to work with compared to a more experienced designer who can handle a more challenging material.

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider the designer's experience level and comfort with different materials. Some materials may require specialised tools or techniques that a beginner designer might not be familiar with.
- Question 5: Guide students towards considering the hardness and potential for injury when working with resistant materials. Examples could include metal sheets requiring shears or metal cutters, or wood requiring saws for safe handling and cutting. Discuss the importance of using the appropriate tools to minimise the risk of accidents.

This activity helps students see the connection between selecting compliant materials (Topic 2.1) and resistant materials (Topic 2.2) based on the product's function. By considering factors like purpose, availability, and designer skills, they can make informed decisions about the best material for the job. The discussion on safety highlights the importance of handling different material types appropriately.

Topic 2.2 Resistant materials

Content standard

- B9.2.2.1: Demonstrate skills in selecting resistant materials for making products/artefacts

Indicators

- B9.2.2.1.1: Discuss the factors that influence the selection of resistant materials
- B9.2.2.1.2: Discuss the reasons why resistant materials require particular techniques and tools for their safe handling and use

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.6: Demonstrate a thorough understanding of a generalised concept and facts specific to task or situation
- **Creativity and innovation (CI)**
 - CI 6.3: Ability to select the most effective creative tools for working
- **Communication and collaboration (CC)**
 - CC 8.1: Speak clearly and explain ideas
 - CC 8.2: Explain ideas in a clear order with relevant details, using correct construction and structure of speech

1. Introduction

Many of the objects we use in our everyday lives are made from resistant materials, such as plastic, wood, metal, ceramics and glass. This topic deals with why we would select a specific resistant material to complete a task, and learners will practise the processes to work safely with these materials.

2. Learning expectations

Learners need to be able to:

- review the knowledge on properties of resistant materials and safe practices of working with tools/equipment
- discuss the factors that influence the selection of resistant materials
- demonstrate the processes involved in working with resistant materials
- explain why specific tools are used to work on specific resistant materials
- relate the correct safety precautions to the appropriate process in working with resistant materials when making an artefact.

Duration

Teachers can teach this topic in eight periods or four double periods.

3. Resources needed

- Learner's Book
- Specimen pieces of resistant materials such as plywood, balsawood, pine, mahogany, copper, plastic, aluminium, nylon, iron, steel
- Artefacts made from types of resistant materials such as electrical plug covers, carrier bags, cling wrap, drinking bottles, electrical switch covers, engine car parts, food storage containers, saucepan handles, water cans, wire insulation, coins

- Different types of tools if possible (see Learner's Book pages 34 and 35 for ideas)
- Videos on how the types of resistant materials are manufactured and used
- PowerPoint specimen charts on all types of resistant materials

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
30	2.4	Possible research (not requested in Learner's Book) in case learners cannot remember the content

5. Teaching methodology

5.1 Preparation

The teacher should:

- read and research information on resistant materials
- collect and prepare teaching and learning resources that are relevant to lessons, for example prepare charts or pictures and collect objects, as well as videos
- research the physical and working properties of resistant materials and how they affect what they are used for
- look for more information on the internet.

5.2 Teaching strategies

Brainstorming, discussion (group and whole class), group work

5.3 Relevant background knowledge

Learners should remember what they learnt in Basic 7 and Basic 8. Read through the content on page 30 of the Learner's Book and check their knowledge with Activity 2.4.

6. Suggested homework

The practical Activity 2.6 is suitable for homework. Give learners enough time and use this activity as a formal term project. Make sure that the working groups formed are available to work together outside of school hours, that is they live close to each other.

7. Assessment

7.1 Assessment questions

1. Explain what is meant by resistant materials.
2. Give three factors that should influence your selection of materials.

3. Match the property of resistant material to its description.

Property	What it means
Density	How well it can withstand being dented, scratched or cut
Fusibility	Whether it can be stretched and returned to its original shape
Strength	How well it keeps its form when carrying a load
Hardness	How easily it will bend or take on a new shape without breaking
Toughness	How solid a material is
Ductility	How easily it will fuse or melt with another material
Elasticity	How well it keeps its form when a force is applied to it
Malleability	Whether it can be stretched permanently

4. Which two important factors can affect the availability of material?
5. List any three factors that would affect our choice of tool or technique.
6. List and discuss any four correct safety precautions to follow.

Answers

1. Resistant materials are materials that are not pliable or flexible and cannot be easily compressed with bare hands (plastic, wood, metal, ceramics, and glass).
2. The most important considerations are:
- the purpose and function of the product
 - the availability of material
 - the skills of the designer.

3.

Property	What it means
Density	How solid a material is
Fusibility	How easily it will fuse or melt with another material
Strength	How well it keeps its form when carrying a load
Hardness	How well it can withstand being dented, scratched or cut
Toughness	How well it keeps its form when a force is applied to it
Ductility	Whether it can be stretched permanently
Elasticity	Whether it can be stretched and returned to its original shape
Malleability	How easily it will bend or take on a new shape without breaking

4. Cost, environmental factors
5. Any three factors from the following:
- How hard or soft the material is
 - How sharp the material is, especially at its edges
 - Whether the material can be handled with bare hands
 - How hot the material will become while handled
 - Whether there is an electrical current.
6. See the list on page 36 of the Learner's Book.

7.2 Reflective practice or diagnostic assessment exercises

1. Can learners explain what is meant by resistant materials.
2. Do learners know the three factors that influence their selection of materials?
3. Can learners identify the properties of each resistant material?
4. Can learners list two important factors that affect the availability of material?
5. Can learners list the factors that would affect their choice of tool or technique?
6. Can learners list and discuss the correct safety precautions to follow when using tools?

8. Answers

ACTIVITY 2.4

LB page 30

Learners work in groups.

1. a) Learners brainstorm and then record the properties of each category of resistant material.

Resistant material	Physical property 1	Physical property 2	Working property
i) metal	Hard	Cannot bend	Strong, heavy
ii) thermosetting plastic	Rigid once set	Does not conduct electricity	Light, rust-resistant
iii) wood	Retains shape	Does not conduct electricity	Easy to cut

- b) Metal is strong and can carry heavy loads. It cannot be changed easily with tools and can be used for shape memory alloys. It can also be made rust-free when mixed in an alloy. Thermosetting plastic can be moulded into a shape and keep it, no matter how much heat or water is added. This is suitable for plumbing work and kitchen and electrical appliances. Wood is strong and aesthetic, and can be relatively easily moulded and cut. However, if untreated, it cannot be used outdoors as it absorbs moisture and rots. It is a versatile material that can be used in construction, decoration, households, and equipment, as it does not conduct electricity.
- c) Learners discuss suitable objects or artefacts they can make from the above categories. They should explain their ideas logically, using full sentences. If you want to use this as an assessment oral, you can use the rubric, *PowerPoint presentation/oral* on page 134 of this Facilitator's Guide to assess learners' work.

ACTIVITY 2.5

LB page 32

Learners work on their own.

1. a)

Thermoplastics	Thermosetting plastics
Carrier bags Clingwrap Drinking bottles Food storage containers Wire insulation	Electrical plug covers Electrical switch cover Engine car parts Saucepan handles Watering cans

- b) Thermoplastics are flexible plastics that can be softened and hardened through different processes like heating or cooling.
Thermosetting plastics becomes irreversibly rigid once heated and set.
These definitions should help guide the learners to allocate the items correctly.

2.

Type of wood	Product
a) balsa (a light hardwood)	a model aeroplane
b) pine, an easy-to-work-with softwood	a cheap kitchen stool
c) wooden boards	house ceilings
d) mahogany (dense and moisture resistant)	boat decking
e) plywood	the bottom of cabinet drawers

3. a) To produce **cable wires (inside)** we use copper because it conducts heat.
b) To produce **coins** we use alloy metals because it can withstand rust.
c) To produce **gutters** we use plastic because it is lightweight and weather-resistant.
d) To produce **kitchen foil** we use aluminium because it conducts heat.
e) To produce **kitchen pots** we use steel because it conducts heat.
f) To produce **garden tools** we use iron because it can be sharpened.
g) To produce **tracksuit pants** we use nylon because it can withstand everyday wear.
h) To produce **cable wire insulation** we use plastic because it does not conduct heat.

ACTIVITY 2.6

PRACTICAL: SELECT RESISTANT MATERIALS AND MAKE A PRODUCT

LB page 33

Learners work in groups. They follow the instructions for this practical activity in their Learner's Book. Teachers can use the rubric, *Demonstration artefacts/tools* on page 132 of this Facilitator's Guide to assess learners' work.

ACTIVITY 2.7

LB page 34

Learners work in pairs.

- Each type of hammer is made to best suit its use. For example, peen hammers are used to work with metal while a claw hammer is mainly used in woodworking (accept other reasonable answers).
- Learners' own answers

Teachers can use the rubric, *Demonstration artefacts/tools* on page 132 of this Facilitator's Guide to assess learners' work.

ACTIVITY 2.8

LB page 35

Learners work in groups.

- The teacher should demonstrate the use of these tools (or use videos). Use the correct techniques. Ensure learners are able to answer the questions after the demonstration.

Tool	Resistant material it can be used on	Effect on material	Techniques for using the tool
Mallet	Wood	Light tapping leaves no dent	Light tapping on a chisel to knock pieces of wood together

Tool	Resistant material it can be used on	Effect on material	Techniques for using the tool
Plane	Wood	Smoothing wood	Pushing and pulling with applied pressure
Saw	Wood	Cutting	Mostly a hand motion of pushing and pulling the saw over the material
Clamp	Wood, metal, plastics	Hold something in place	Place material in correct position and tighten clamp firmly
Screwdriver	Wood, metal, bricks, plastics	Fastening or loosening screws	Handheld or electric, fastening by turning clockwise or loosening by turning anti-clockwise
Drill	Wood, metal, bricks, plastics	Creates holes for nails and screws	Electricity or battery-driven and handheld will use different techniques

2. Refer to notes on page 35 of the Learner's Book.

ACTIVITY 2.9

LB page 37

Learners work in groups.

1.

	Resistant material	Tool used	Technique applied	Safety measures taken
A	Wood	Sawing bench	Pushing the wood through the saw	Ear and eye protection, gloves, hair tied back, no loose clothing, hold tool correctly, use two hands, work away from the body and focus
B	Marble	Mallet and chisel	Light tapping with mallet while holding chisel in place	No safety goggles necessary for eye protection, but user holds the tool correctly, uses two hands, works away from the body (direction) and focuses
C	Wood	Saw, clamp	Push and pull sawing	The user could wear safety goggles for eye protection as a precaution but holds the tool correctly, uses two hands, works away from the body (direction) and focuses
D	Metal	Wooden handle	Pouring and lifting	Gloves, apron, face shield, helmet, wooden handle that doesn't conduct heat and the user holds the tool correctly, uses two hands, works away from the body and focuses
E	Bricks	Drill	Two hands holding	Dust mask, gloves, ear protectors, hair tied back, covering jacket and the user holds the tool correctly, uses two hands, works away from the body and focuses

	Resistant material	Tool used	Technique applied	Safety measures taken
F	Wood	Chisel	Gentle pressure applied	Gloves and the user holds the tool correctly, uses two hands, works away from the body and focuses

2. Learners role-play the different situations shown in Question 1. They explain what they are doing and why. Teachers can use the rubric, *Role play* on page 135 of this Facilitator's Guide to assess learners' work. As a class, discuss ways in which the safety in each situation can be improved.

Linking Topics 2.2 and 2.3: Resistant materials and smart innovations

Questions

1. Imagine you are tasked with designing a bridge. What properties would the material for the bridge need to possess? Would you classify this as a resistant material? Why?
2. What are the potential advantages of using smart materials in product design compared to traditional, resistant materials?
3. Name a modern material that is both resistant and smart. Explain your reasoning.
4. When working with resistant materials, safety is paramount. How might the tools and techniques used for resistant materials differ from those used for smart materials?
5. Consider the concept of "smart materials." Brainstorm ideas for products or artefacts that could benefit from using smart materials to solve environmental problems.

Answers

1. A bridge material would need to be strong, durable, and resistant to weight and weather conditions. Yes, this would be classified as a resistant material.
2. Smart materials can offer additional functionalities beyond just being resistant. For instance, they might be self-cleaning, self-healing, or adaptable to changing environments.
3. A possible example is self-healing concrete. While concrete is a strong and resistant material, it can crack over time. Self-healing concrete incorporates microcapsules that release a healing agent when cracks appear, making it both resistant and smart.

Teacher guidance for open-ended questions

- Question 3: Discuss materials with combined properties, e.g., self-healing polymers, solar-powered fabrics, or temperature-regulating textiles. Discuss how these materials offer additional benefits beyond durability.
- Question 5: Provide solutions that address environmental concerns, e.g., biodegradable packaging materials, pollution-detecting sensors, or self-cleaning surfaces. Discuss how smart materials can provide solutions for a sustainable future.

This activity helps students see the connection between resistant materials (Topic 2.2) and the potential of smart and modern materials (Topic 2.3). By considering the specific needs of a product, they can explore how material properties can solve problems. The discussion on tools and techniques highlights the evolving nature of material technology and its impact on design and safety practices.

Topic 2.3 Smart and modern materials

Content standard

- B9.2.3.1: Demonstrate understanding of using smart and modern materials for making products/artefacts

Indicators

- B9.2.3.1.1: Discuss reasons for using smart and modern materials for making products/artefacts
- B9.2.3.1.2: Demonstrate techniques for making prototypes/projects to solve problems in the environment using smart and modern materials

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.1: Ability to combine information and idea from several sources to reach a conclusion
 - CP 5.2: Analyse and make distinct judgement about viewpoints expressed in an argument
 - CP6.4: Ability to identify important and appropriate criteria and use them to evaluate available alternatives
 - CP 6.5: Ability to select alternatives that adequately meet selected criteria
- **Creativity and innovation (CI)**
 - CI5.1: Examine alternatives in creating new things

1. Introduction

In Basic 7 and Basic 8, learners learnt about smart and modern materials, their properties and how they have improved our lives. In this topic, learners will find out more about the properties and uses of smart and modern materials. They will look at modern materials such as Nomex and Kevlar, as well as smart materials such as temperature-sensitive material and luminous material. Learners then make an artefact out of a smart or modern material.

2. Learning expectations

Learners need to be able to:

- review their knowledge about smart and modern materials and their properties
- compare uses of smart and modern, and compliant/resistant materials for production, and present in a table
- identify problems in the community and use smart/modern materials to make a product to solve the problem
- search for inventions and techniques on smart/modern material products
- demonstrate the processes involved in making the prototypes/projects using smart/modern materials
- make artefact/products using smart/modern materials
- display artefacts/products for appraisal.

Duration

Teachers can teach this topic in four periods or two double periods.

3. Resources needed

- Learner's Book
- Examples of smart materials such as a heat-reactive mug or temperature patch, nappies that change colour when they are wet, the luminous hands of a wristwatch, a fire detector
- Examples of modern materials such as oven gloves, heat-resistant material, modified starch used in foods, reflective vest

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
43	2.11	Online research for inspiration to make the prototype

5. Teaching methodology

The teacher should:

- read and research information on smart materials and modern materials
- collect and prepare teaching and learning resources (videos on smart materials and modern materials will help learners visualise how they work, if examples are not available to show the class)
- do research on how smart materials and modern materials are manufactured
- look for more information on the internet.

5.1 Teaching strategies

Brainstorming, discussion, group work, pair work, demonstration

5.2 Relevant background knowledge

Learners would have learnt about smart and modern materials in Basic 7 and Basic 8. Use the content on page 38 of the Learner's Book to recap.

6. Suggested homework

Activity 2.11 Making a prototype should take up their homework time, as there is quite a lot to do, both practical and theoretical.

7. Assessment

7.1 Assessment questions

1. Describe the differences and similarities between smart and modern materials.
2. Give four examples of modern materials and their uses.
3. Give three examples of smart materials and their uses.

Answers

1. See section 2.3.1 on page 38 of the Learner's Book.
2. See content on pages 38 and 39 of the Learner's Book.
3. See content on pages 40 and 41 of the Learner's Book.

7.2 Reflective practice or diagnostic assessment exercises

1. Can learners define smart materials and modern materials, and explain the differences?
2. Can learners give examples of modern and smart materials and how we use them to improve our lives?
3. Do learners understand how their properties make smart and modern materials different?
4. Can learners describe the effects of temperature, light and moisture on smart materials?

8. Answers

ACTIVITY 2.10

LB page 42

Learners work in groups.

1. Modern materials are specifically designed to accomplish specific tasks. Groups discuss the definition and class and list some examples of modern materials. There are examples on pages 38 and 39 of the Learner's Book but encourage learners to come up with other examples as well.
2. For examples of smart and modern materials that can help to protect people, refer to the Learner's Book page 39. Accept all other reasonable answers as well.
3. a) Suggested answers, but accept all correct answers:
 - i) heat: baby feeding spoons, mugs that show pictures when heated
 - ii) light: glow in the dark stickers, luminous hands on a clock, tinted glasses
 - iii) water: nappies that have a colour indicator when wetb)-c) Learners' own answers

ACTIVITY 2.11

PRACTICAL: MAKE A PROTOTYPE OF AN ARTEFACT MADE OF SMART AND MODERN MATERIAL

LB page 43

Learners work in pairs. (If the class is too big or prototype is too complicated, you can group pairs together to complete this project.)

Make sure the learners understand the steps in the design process. If necessary, copy the pages from the Basic 8 textbook to remind them. This project will take several weeks as a lot of research is required. Warn learners against copying something directly from the book or internet – they can use some concepts from other designs, but the prototype must be their innovative invention.

Teachers can use the rubric, *Demonstration artefacts/tools* on page 132 of this Facilitator's Guide to assess learners' work.

Linking Topics 2.3 and 2.4: Smart materials and food choices

Questions

1. Imagine a future scenario where food packaging utilises smart materials. Think of the potential benefits of using smart packaging for food products.
2. How might an understanding of food quality be helpful when selecting food for meal preparation?
3. Consider the needs of different family members. How might the food requirements of an adolescent differ from those of an elderly family member?
4. Smart materials can sometimes incorporate sensors. Brainstorm an example of a smart food container that utilises a sensor to benefit the consumer.
5. Think about the concept of “smart materials” in a broader context. Imagine any applications of smart materials beyond food or packaging that could improve our daily lives in Ghana.

Answers

1. Smart packaging could indicate spoilage through colour change, extend shelf life by regulating temperature, or even provide information on the nutritional content.
2. Understanding food quality allows for selecting fresh, nutritious ingredients that contribute to a healthy meal.
3. Adolescents typically require more calories and protein for growth and development, while elderly family members might need softer textures or foods easier to digest.

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider factors like metabolism, activity levels, and specific dietary needs. Adolescents might require more energy-dense foods, while elderly family members might benefit from easily digestible options rich in vitamins and minerals.
- Question 4: Guide students towards sensor applications that address food safety or convenience. Examples could include containers that detect harmful bacteria growth or indicate when food reaches the optimal temperature for consumption.
- Question 5: Broaden the discussion beyond food. Students might suggest smart clothing that regulates body temperature, self-repairing building materials, or solar-powered devices for rural communities. The focus should be on how smart materials can address specific challenges or improve daily life in Ghana.

This activity helps students see the connection between smart and modern materials (Topic 2.3) and the practical application of material selection in food choices (Topic 2.4). By considering the benefits of smart materials, they can explore how innovation can impact areas like food safety, convenience, and health awareness. The discussion on food selection reinforces the importance of understanding food quality for preparing nutritious meals for different family members.

Topic 2.4 Food commodities (animal and plant sources)

Content standard

- B9.2.4.1: Demonstrate skills in selecting food commodities in meal preparation
- B9.2.4.2: Demonstrate skills in planning meals for various members of the family

Indicators

- B9.2.4.1.1: Discuss how to select food commodities used for meal preparation
- B9.2.4.2.1: Discuss the basic food requirements for different members of the family

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP6.4: Ability to identify important and appropriate criteria and use them to evaluate available alternatives
 - CP 6.5: Ability to select alternative(s) that adequately meet selected criteria
- **Creativity and innovation (CI)**
 - CI5.1: Examine alternative(s) in creating new things
- **Communication and collaboration (CC)**
 - CC 8.1: Speak clearly and explain ideas
 - CC 8.2: Explain ideas in a clear order and relevant details, using correct construction and structure of speech

1. Introduction

The study of food commodities emphasises the importance of a balanced diet. Learners will learn how to select good-quality food commodities and preserve their quality. They will also plan meals for different family members based on their preferences.

2. Learning expectations

Learners need to be able to:

- revise the classification of food commodities
- describe the qualities to look out for when buying food commodities, and present in a table
- identify the different members of the family and their basic food requirements
- review lesson on factors to consider when planning meals in B7.5.3.1.1
- plan a meal for a member of the family
- display plan for appraisal.

Duration

Teachers can teach this topic in two periods or one double period.

3. Resources needed

- Learner's Book
- Charts covering different food commodities

- Posters about the different nutritional requirements for people of different ages and at different stages such as babies, children, teenagers, sportspeople, the elderly, the sick, pregnant/breastfeeding people
- Realia (various food items)
- Videos on procedures on food commodities
- Foods preserved in different ways such as smoked, bottled, canned, dried

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, and flash drives when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
53	2.18	Find pictures of food on the internet for posters

5. Teaching methodology

5.1 Preparation

The teacher should:

- read and do research about food commodities and dietary requirements
- read other books in relation to food commodities to provide additional information
- prepare and collect teaching and learning resources that are relevant to lessons about food requirements, for example prepare posters and collect photos
- prepare and collect teaching and learning resources related to choosing foods correctly, with examples of healthy food and unhealthy food and good and bad quality food
- download videos that are suitable to support and illustrate the lessons.

Create a board game such as a snakes and ladders board, but instead of snakes and ladders, use pictures of contaminated food versus fresh food. A possible rule is if you land on contaminated food, miss a turn, if you land on fresh food, throw again. There are blocks between that don't have pictures where you can move along as usual.

For counters, learners can use buttons, erasers, seeds or bottle tops.

When you land on a picture, describe what you see and whether you should or shouldn't buy it.

5.2 Teaching strategies

Brainstorming, discussion (group and whole class), group work, demonstration, pair work, concept map, role play, games

5.3 Relevant background knowledge

Learners have quite a lot of knowledge about food commodities, both from their own experiences and from Basic 7 and 8 classes. Some learners prepare food at home and they use food items or ingredients when they prepare food. Other learners watch and help their parents use ingredients to prepare food at home.

Learners should also be able to recognise the quality of food.

Ask learners if they have any people with special dietary needs in their families and ask what they eat. Share this with the class.

6. Suggested homework

Activity 2.20 is perfect for homework. You can expand this activity where groups create a meal plan for each family in their group. The group member will create the meal plan for their own family but will share the information for, say, the elderly or a toddler.

7. Assessment

7.1 Assessment questions

1. Explain the following terms:
 - a) Food
 - b) Food commodities
2. How many sources of food commodities do we have? List them.
3. Give 20 examples of food commodities.
4. Classify the food commodities under the two main food sources.
5. Choose two examples of animal products and two examples of plant products. Explain what qualities you would look for when selecting these products.
6. List the three groups of nutrients.
7. Describe how the three groups of nutrients should be portioned on a balanced plate of food. Give the benefits of each nutrient portion as well.
8. Discuss the food requirements for any three types of family members. List the types of food and give reasons why this is necessary.

Answers

1.
 - a) Food is anything solid or liquid, cooked or uncooked which when eaten and digested will give us energy, make us grow and protect us against diseases.
 - b) Food commodities are the food items and ingredients we use to prepare our food.
2. Two: plant source and animal source
3. Examples of food commodities are cassava, okro, orange, beans, kontomire, ayoyo, spinach, yam, eggs, cheese, milk, snails, crab, beef, pork, mutton, rabbit, grasscutter, guinea fowl, chicken, dandelion, garden eggs, onions, wheat, sausage, shrimps, oysters, yoghurt, herrings, anchovy, tuna, mud fish, tilapia, mango, banana, apple, cabbage, tomatoes, maize, millet, sorghum, rice.
- 4.

Food commodities	
Plant source	Animal source
kontomire	eggs
cassava	cheese
orange	milk
okro	snails
beans	crab
ayoyo	beef
spinach	pork
yam	mutton
dandelion	rabbit
garden eggs	grasscutter

Food commodities

Plant source	Animal source
onions	guinea fowl
wheat	chicken
rice	sausage
sorghum	shrimps
millet	oysters
maize	yoghurt
tomatoes	herrings
cabbage	anchovy
apple	tuna
banana	mud fish
mango	tilapia

5. See Learner's Book pages 46 and 47 – any two examples.
6. Three groups of nutrients are:
 - body-building
 - energy-giving
 - protective.
7. How they should be portioned and benefits:
 - *Half* of the plate is filled with vegetables and fruit. These are the kinds of food that protect us from disease.
 - *One quarter* of the plate is filled with proteins. These are body-building foods that help our muscles and bones stay strong.
 - *One quarter* of the plate is filled with energy-giving foods, which are also called starches or carbohydrates. These foods provide us with the fuel we need to move around, use our brains and perform daily tasks. All food provides energy, but the food in this group provides the most energy.
8. See Learner's Book pages 49 to 53 – any three.

7.2 Reflective practice or diagnostic assessment exercises

1. Were the learners able to explain the food and food commodities correctly?
2. Were learners able to identify and list the two main sources of food commodities?
3. Were learners able to give 20 examples of food commodities and classify them correctly?
4. Will learners be able to select plant and animal products to ensure they get the best quality?
5. Do learners understand what nutrients are, why we need them and in what our daily intake of each one should be?
6. Do learners know how to cater for each different type of family member group?

8. Answers

ACTIVITY 2.12

LB page 44

Learners work in groups.

Plant		Animal	
cassava	yam	pork	beef
okro	orange	eggs	mutton
onions	beans	chicken	cheese
kontomire	ayoyo	rabbit	milk
wheat	spinach	grasscutter	tilapia
palm fruit	cacao	guineafowl	crab
garden eggs			

2. Learners add their own food items to the list.
3. Learners' own answers

ACTIVITY 2.13

LB page 45

Learners work in pairs.

All these answers will depend on learners' preferences and shopping destinations.

ACTIVITY 2.14

LB page 47

Learners work in pairs.

1. Learners role-play buying from each other at the market, following the instructions in the Learner's Book. They can either imagine the products or use real ones as props. Teachers can use the rubric, *Demonstration artefacts/tools* on page 132 of this Facilitator's Guide to assess learners' work.
2. Suggested answers could be the way the food is preserved (bottled, canned, precooked, salted, dried, smoked), using airtight sealed packaging, keeping food in a cooler box, preparing food fresh as it is ordered, keeping out of direct sunlight. Record all suggestions on the board for learners to copy down.

ACTIVITY 2.15

LB page 49

Learners work in pairs.

1. Learners' own suggestions on how to make these meals more balanced. Accept any reasonable answer.
2. Learners' own drawings. Teachers can use the rubric, *Drawings* on page 134 of this Facilitator's Guide to assess learners' work.
3. Learners' own ideas, suggestions could include diseases such as scurvy and night blindness.
4. Learners' own ideas, suggestions could include diseases such as heart disease and obesity.

ACTIVITY 2.16

LB page 50

Learners work in pairs.

1. Learners' own answers
2. Learners' own answers, based on the information given on pages 50–53 of the Learner's Book.
3. Learners' own answers. Encourage learners to find the flaws (if any) in their daily diets and work out a plan to adjust this.

ACTIVITY 2.17

LB page 51

Learners work on their own.

1. Suitable dishes are ones that are not spicy, soft and easy to chew, can be eaten using the hands and will not cause the toddler to choke. B and C are typically the most preferred for toddlers, but the other two could be candidates if they were not spiced and didn't have small pieces.
2. Fruit contains natural sugars that don't damage your teeth. It also provides the nutrients, vitamins and minerals your body needs. The fibre in fruit also makes you feel full. Chocolate contains no nutrients and spikes your sugar levels so that you feel energised for a short while, then drop and feel terribly tired. (It's a fake energy level.)

ACTIVITY 2.18

LB page 53

Learners work in groups of five.

Refer to the Suggested Homework in this topic as well.

Learners work in groups to create their presentation.

If the format of the activity in the Learner's Book is adhered to, the presentation can be in the form of a PowerPoint presentation or a poster as well. For example, they could draw a plate of food with all the correct foods, or paste pictures that are drawn, cut from magazines or printed from the internet.

Teachers can use the appropriate rubric based on the presentation format chosen for example poster, PowerPoint presentation or oral.

REVISION ANSWERS

(Learner's Book page 54)

1. B (1)
2. C (1)
3. B (1)
4. C (1)
5. Refer to the Learner's Book pages 34–35. (3)
6. We can cut ourselves when using sharp tools, or injure ourselves when we apply force and the tool slips. We can get seriously burned when working with heated materials and open flames. (3)
7. Thermochromic materials change colour when they come into contact with heat. Photochromic materials change colour when they come into contact with light. (4)
8. Refer to the Learner's Book page 39. (3)
9. (7)

Quality indicator	Food
a) firm, bruise-free and yellow	bananas
b) bright and clear, not cloudy and sunken	fish (eyes)
c) crisp and free from wilting, browning	root vegetables
d) not bulging, dented or rusty	canned food
e) odour-free	meat
f) free from dry, white patches	frozen food
g) pink colour	poultry and pork

10. a) toddler *akasa*
- b) invalid *agidi*
- c) pregnant woman baked tilapia (6)

Learners give their own reasons for their choices. Accept any reasonable answers.

Total: 30 marks

Module 3 Tools, equipment and processes

Topic 3.1 Measuring and marking out

Content standard

- B9.3.1.1: Demonstrate understanding of measuring and marking-out tools and equipment

Indicators

- B9.3.1.1.1: Discuss tools and equipment used for measuring and marking out
- B9.3.1.1.2: Demonstrate how to use the tools and equipment for measuring and marking out

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.5: Effectively evaluate the success of solutions they have used to attempt to solve a complex problem
 - CP 5.6: Demonstrate a thorough understanding of a generalised concept and facts specific to task or situation
 - CP 6.4: Ability to identify important and appropriate criteria and use them to evaluate available alternatives
 - CP 6.5: Ability to select alternatives that adequately meet selected criteria
- **Creativity and innovation (CI)**
 - CI 5.7: Putting forward constructive comments, ideas, explanations and new ways of doing things
 - CI 6.1: Exhibit strong memory, intuitive, thinking and respond appropriately

1. Introduction

Artefacts

In order to make artefacts accurately, learners must learn how to use basic measuring and marking-out and setting-out tools accurately. They must learn how to maintain artefacts in order to prolong their lifespan. The focus of this topic is on identifying and classifying the types of measuring and marking-out tools and equipment that are used in different trades, the uses, care and maintenance of tools and why it is necessary to measure and mark out or set out.

Sewing

Good sewing tools make sewing easier and help a person to complete a sewing project or task. We consider:

- identifying types of tools and equipment for measuring and marking out
- classifying the use(s) of tools and equipment for measuring and cutting out
- caring and maintaining for measuring and marking-out tools and equipment.

This topic will identify and classify measuring and marking-out tools, and look at how to care for and maintain measuring and marking-out tools.

Food production

Measuring and marking are very important in the food laboratory as we have seen earlier. It helps to ensure accuracy. In this topic, we will revise and look at more examples.

2. Learning expectations

Learners need to be able to:

- identify tools and equipment used for measuring and marking out in the following trade areas:
 - building site
 - wood workshop
 - metal/plastic workshop
- classify measuring and marking-out tools and equipment under the following areas:
 - building
 - woodwork
 - metalwork/plastic
- demonstrate how to use measuring and marking-out tools and equipment for making artefacts/products in the following areas:
 - food laboratory (kitchen)
 - sewing
 - building
 - woodwork
 - metalwork/plastic
- select and use appropriate measuring and marking-out tools to make the following products:
 - wooden chair
 - sheet metal funnel
 - setting out a wall
 - dresses – use knowledge of taking body measurements to make dresses/blouses
 - meals – use knowledge of portion control to prepare meals for two people
- prepare a chart showing the activities and the appropriate tools used
- display charts in class for appraisal
- demonstrate how to care for and maintain measuring and marking-out tools used for making artefacts/products.

Duration

Teachers can teach this topic in eight periods or four double periods.

3. Resources

- Learner's Book
- Charts of measuring and marking or setting-out tools and equipment
- Real-life objects (measuring and marking or setting-out tools and equipment)
- A4 sheets of paper, flip charts and cardboard
- Specimen workpieces or artefacts and materials
- Videos about procedures for measuring and marking out in all trade areas
- Poster paper
- Personal protection equipment (PPE)
- Samples of measuring and marking-out tools
- Pictures of different measuring and marking-out tools
- Charts on measuring and marking-out tools and equipment in the sewing centre
- Real objects (measuring and marking-out tools and equipment)
- A4 sheets of paper, flip charts and cardboard

- Specimen of dress/blouse/shirt
- Brown paper
- Videos about procedures for measuring and marking out for making a dress/blouse/shirt

4. Using ICT (where relevant)

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

5. Teaching methodology

5.1 Preparation

Artefacts

The teacher should:

- read and research information about measuring and marking or setting-out tools and equipment
- research methods for measuring and marking or setting out of workpieces
- collect and prepare teaching and learning resources (charts, PowerPoint presentations, artefacts or workpieces and materials, and videos)
- look for additional information on the internet.

Sewing

The teacher should:

- read and research information about measuring and marking or setting-out tools and equipment
- research methods for measuring and marking out when making a dress/blouse/shirt
- collect and prepare teaching and learning resources (charts, PowerPoint presentations, specimens, and videos)
- look for additional information on the internet.

Food production

The teacher should:

- do research on measuring and marking-out tools
- collect and prepare teaching and learning resources such as pictures that are relevant to lessons, for example prepare a chart on measuring and marking-out tools.

5.2 Teaching strategies

Brainstorming, discussion, group work, whole class discussion, pair work

5.3 Relevant background knowledge

Making artefacts

Learners have some knowledge of measuring and marking/setting-out tools from use at home.

Sewing

Learners have some knowledge of measurements and marking out.

Learners have taken their own body measurements to make garments for themselves. They have seen seamstresses/tailors use measuring and marking-out tools to take measurements.

Food production

Learners use different measuring and marking-out tools in the kitchen at home.

6. Suggested homework

Below are suggestions for additional activities for homework.

Artefacts

1. Make a freehand sketch of each measuring and marking or setting-out tool or piece of equipment. Label two parts on each tool.
- | | |
|----------------------------------|------------------|
| a) Inside callipers | e) Line and pins |
| b) Outside callipers | f) Cutting gauge |
| c) Gauge box | g) Spirit level |
| d) Centre punch with angle point | |

Sewing

Using your own body measurements, mark out a pattern for a dress/blouse/shirt on brown paper.

Food production

List two local measuring tools.

7. Assessment

7.1 Assessment questions

Artefacts

1. State one use of the following measuring and marking/setting-out tools:
- | | |
|----------------------|---------------------------|
| a) Inside callipers | f) Cutting gauge |
| b) Outside callipers | g) Profile board and pegs |
| c) Gauge box | h) Spirit level |
| d) Centre punch | i) Straight edge |
| e) Line and pins | |
2. List two measuring and marking or setting-out tools and pieces of equipment by completing a copy of the table below.

Trade area	Two measuring tools or pieces of equipment	Two marking/setting-out tools or pieces of equipment
Building site		
Wood workshop		
Metal/plastic workshop		

3. Select the measuring and marking or setting-out tools and pieces of equipment that are used in each workshop.

inside callipers	line and pins	spirit level
outside callipers	cutting gauge	chalk sticks
gauge box	profile board	scriber
centre punch	steel ruler	straight edge

- a) Building site
b) Wood workshop
c) Metal or plastic workshop

4. List two measuring and two marking-out tools to make the following products:
- Wooden chair
 - Sheet metal funnel
 - Setting out walls

Answers

1.
 - Inside callipers are used to measure inside dimensions, such as the inside diameter of a plastic or metal tube.
 - Outside callipers are used for measuring outside dimensions, such as the outside diameter of a tube or a piece of bar stock.
 - A gauge box is used to measure volumes of clay, sand, cement, stone and lime for making mortar and concrete mixtures.
 - A centre punch is used for marking centres where a hole is to be drilled. The mark provides a starting point for the drill to prevent it from skidding over the surface.
 - Line and pins are used when setting out, to show the main outline of a building. It is used to ensure a wall is built straight.
 - A cutting gauge is used for cutting lines into solid wood surfaces in preparation for veneering or inlaying.
 - A profile board and pegs are used to set out foundations of structures on the ground.
 - A spirit level is used to indicate how parallel (level) a surface is relative to the earth.
 - A straight edge is used for checking straight lines on building sites and in metal workshops, as well as flatness. It is also used for levelling concrete.

2.

Trade area	Two measuring tools or pieces of equipment	Two marking/setting-out tools or pieces of equipment
Building site	Surveyor's tape, head pan, gauge box	Profile board and pegs, chalk sticks
Wood workshop	Steel ruler, tape measure	Marking knife, pencil
Metal/plastic workshop	Tape measure, steel ruler	Scriber, pair of dividers,

3.
 - Building site:** spirit level, chalk sticks, spirit level, gauge box, line and pins, profile board, straight edge
 - Wood workshop:** steel ruler, cutting gauge, straight edge
 - Metal or plastic workshop:** scriber, steel ruler, inside callipers, outside callipers, centre punch, straight edge

4.

Products	Two measuring tools	Two marking-out tools
a) Wooden chair	Tape measure, steel ruler	Marking gauge, marking knife
b) Sheet metal funnel	Steel ruler, tape measure,	Scriber, pair of dividers,
c) Setting out walls	Steel ruler, surveyor's tape	Straight edge, chalk sticks

7.2 Reflective practice or diagnostic assessment exercises

1. How well are learners able to identify and classify measuring and marking or setting-out tools and equipment?
2. How well did learners demonstrate how to use measuring and marking or setting-out tools and equipment?
3. How well are learners able to state the uses of different measuring and marking or setting-out tools and equipment that are used in a building site, wood workshop and metal or plastic workshop?
4. How well are learners able to identify real-life objects or pictures of tools and equipment used for measuring and marking or setting out in each trade area:
 - **Building site:** tape measure, builder's square, head pan, straight edge
 - **Wood workshop:** tape measure, folding ruler, try square, marking knife
 - **Metal workshop:** tape measure, steel ruler, compass
5. How well are learners able to sketch and label the parts of measuring and marking-out tools and equipment?
6. How well did learners understand the teacher's demonstration of how to use the measuring and marking-out tools and equipment?
7. How much help did learners need to demonstrate how to use measuring and marking and setting-out tools and equipment?
8. How many learners took part in a class discussion about how to care for tools and equipment that are used at home?
9. How well do learners understand the cleaning agents or materials we use to clean and maintain tools and equipment based on the materials from which tools are made?
10. How well did learners understand the teacher's demonstration about how to care for measuring and marking-out tools and equipment depending on the material from which they are made?
11. How much help did learners need when they demonstrated caring for measuring and marking-out tools and equipment depending on the materials from which they are made?

7.1 Assessment questions

Sewing

1. List two measuring and two marking-out tools found in the sewing centre.
2. Give one use of the following measuring and marking-out tools:
 - a) tailor's chalk
 - b) yard or metre ruler
3. Write down two reasons for using measuring and marking-out tools and equipment found in the sewing centre.
4. Name the tool you should use to measure a full piece of fabric.
5. Give two reasons why it is necessary to measure lengths when sewing.
6. Give two reasons why it is important to measure lengths accurately.
7. Name two marking-out tools you can use in a sewing workshop.
8. Why do we use marking-out tools in a sewing workshop?

Answers

1. **Measuring tools:** tape measure, yard or metre ruler
Marking-out tools: pencil, tailor's chalk
2. **a)** Tailor's chalk is used to draw lines on fabric before you cut it.
b) Yard or metre ruler is used to check hems and draw long lines.
3. We use measuring and marking-out tools to measure accurately, avoid waste and to achieve desired results.
4. A yard stick or a metre ruler
5. Measuring lengths helps ensure that a garment will fit as intended, which could mean tightly or loosely. Measuring lengths prevents wasting fabric.
6. When tailors take accurate measurements, they will know exactly how much material to use. Accurate measurements will ensure that fabric pieces that must be sewn together are the correct lengths.
7. Pencil, tailor's chalk
8. We use marking-out tools to draw lines on fabric before we cut it.

7.2 Reflective practice or diagnostic assessment

1. How well are learners able to identify and classify measuring and marking or setting-out tools and equipment?
2. How well did learners demonstrate how to use measuring and marking-out tools and equipment?
3. How well are learners able to state the uses of different measuring and marking-out tools and equipment that are used in a sewing workshop or laboratory?
4. How well do learners understand the importance of measuring and marking out?
5. How well are learners able to identify real-life objects or pictures of tools and equipment used for measuring and marking out in the sewing centre?
6. How well are learners able to sketch and label the parts of measuring and marking-out tools and equipment?

7.1 Assessment questions

Food production

1. What key points will you consider before measuring and marking out correctly?
2. How will you care for and maintain measuring and marking-out tools?
3. How will you clean measuring and marking-out tools?
4. How will you maintain measuring and marking-out tools?

Answers

1. Some key points to measuring and marking out correctly are as follows:
 - Read the numbers correctly in recipes or instructions. For example, we need to remember the difference between millimetres and centimetres, and that 10 mm equals 1 cm. We also need to take note whether recipe ingredients are expressed in imperial measurements or metric, and convert to match our measurement tools. For instance, a pint is half a litre or two cups.
 - Choose the correct tool for the task and the material. For this, we need to know and understand the nature of our tools and their purpose.
 - Use tools correctly and accurately. For this, we also need to know and understand the nature of our tools and how they should be used.

- Make sure the tool is in good working order. Inaccurate measurements will occur when using broken tools or over-used tools, for example a ruler with scuffed ends or a blunt pencil or marking knife.
- Check our own measurements and marking-out work carefully to ensure it is accurate.

PLEASE NOTE: In the food laboratory, it is important to measure the food ingredients correctly:

- Never measure over the mixing bowl containing the other ingredients. You may accidentally tip the measuring tool or overpour the ingredients and the excess could fall into the mixture.
 - If you do not have two sets of measuring cups or spoons that can be used separately for the dry and liquid ingredients, measure the dry ingredients first and then use the measuring cups and spoons for the liquid ingredients.
 - If a food recipe provides a volume and weight measurement, measure the ingredient by weight for the most accurate quantity.
2. Measuring and marking-out tools can be cared for and maintained by following these general rules:
 - Clean tools after each use before you return them to storage.
 - Avoid dropping tools. It can bend or crack them, affecting their accuracy. Pencil points and chalk will break, and so will delicate tools.
 - Avoid leaving tools in contact with dirt or oil for long periods.
 - Put tools away after use.
 - Store the tools in places where they are safe from getting bent or damaged in other ways. Separate shelves and racks are good, and so is a pegboard.
 - Keep metal tools dry to avoid rust.
 - Oil the moving parts in metal tools regularly.
 - Keep fold-up rulers folded up when not in use, retract metal tape measures and roll-up tape measures. Unfold or use only the length of ruler needed at a time.
 3. Measuring and marking-out tools can be cleaned in the following ways:
 - Dirty tools can be washed in some soapy water to clean away grime and dry thoroughly afterwards to avoid rusting or corrosion.
 - Dust after use with a clean soft, non-abrasive cloth.
 - Wipe tools down with a rag or old towel to be sure they are free of grease and grime before you put them into their proper places. Wipe down the handles too.
 - Wash wooden tools with a brush or sponge by scrubbing along the grain.
 4. Measuring and marking-out tools can be maintained by doing the following:
 - Oil metal parts of measuring and marking-out tools after cleaning to prevent them from rusting. We also use an all-purpose oil to lubricate the moving or adjustable parts. Wipe away any excess with a rag before storing. The rag must be clean and free from dust or sand particles.
 - We can buff out any signs of rust with steel wool, taking care not to make scratches. There are also anti-corrosion products for sale.
 - Broken or loose parts must be fixed straightaway. Loose blades can be dangerous. Loose angles and joints can lead to inaccurate measurements.
 - Keep the marking points of marking-out tools sharp.

7.2 Reflective practice or diagnostic assessment exercises

1. How well did learners discuss key points to consider when measuring and marking out?
2. Were learners able to explain how to care for and maintain measuring and marking-out tools correctly?
3. How well did learners explain how to clean measuring and marking-out tools?
4. Did learners discuss how measuring and marking-out tools can be maintained correctly?

8. Answers

ACTIVITY 3.1

LB page 56

Learners work in pairs.

- Display the tools and equipment for identification as shown on pages 57–60.
 - Learners name the tool and where it is used.
 - They check each other's answers by looking at the text.
 - If they didn't recognise a tool from the picture, they read the information in the table.
- Learners classify the tools according to where they are used by completing the table.

Building site	Wood workshop	Metal/plastic workshop
tape measure, head pan, gauge box, level, surveyor's tape, chalk sticks, line and pins, straight edge, board and pegs	pencil, steel ruler, try square, centre punch, marking gauge, cutting gauge, marking knife	pair of dividers, internal and outside callipers, scribe

ACTIVITY 3.2

LB page 61

Learners work in pairs.

- It is important to be precise and avoid wastage of materials.
 - There could be leakage and a shortage of materials.
 - It may not fit or not fit well.
 - You may have too much or too little, and the rice will not cook properly.
 - The bookshelf may not be stable and fall over or not fit the space.
 - The wall may be weak or the incorrect size.
- Learners show the difference between measuring and marking a length of wood.
- Learners may list different tools.
 - plastic soap dish:** steel ruler, dividers, scribe
 - wooden ornament:** pencil, steel ruler, centre punch, marking knife
 - felt toy:** tape measure, chalk
- Teacher leads the discussion and allow the learners to demonstrate the difference between the tape measure or ruler when used:
 - taking body measurements:** sewing tape measure
 - measuring a short piece of wood:** ruler or metal tape measure
 - measuring a doorframe height:** metal tape measure
 - measuring where to cut a plastic sheet:** metal tape measure
 - Demonstrate how to use a tape measure and ruler and allow learners to practise.
- Olonka* is a local measuring tool. One *olonka* of maize yields one bowl or *olonka*.

ACTIVITY 3.3

LB page 63

Learners work in groups of eleven.

- The teacher supplies listed tools or equipment on page 62 to each group member.
 - Allow each group member to read through the tips for his or her assigned tool by referring to the information on pages 57–60. Learners do the assigned tasks under 3, 4, 5, 6, 7 and 8.
- Use the rubric, *Demonstration: artefacts/tools* on page 132 of this Guide to assess presentations.

ACTIVITY 3.4

LB page 63

Learners work in pairs.

- Measuring cup (dry ingredients):** Spoon the ingredients into the cup, enough to heap over the top of the measuring cup. Do not shake, tap, or pack the ingredient into the cup. Using the back edge of a knife or another straight-edged object, level the ingredient. Run the straight edge along the rim of the cup or spoon to push the excess ingredient off.
Measuring cup (liquid ingredients): Do not fill past the full measure mark, which is a small distance from the rim of the cup. When checking to see if the ingredient is at the desired level, let the measuring cup sit on a flat, level surface and bend down to view the measurement at eye level. Do not hold the cup up to eye level because the cup may not be level when viewing and it may result in an inaccurate reading.
- Steel ruler:** Carbon steel metal, used to measure lengths of wood, plastic, concrete and metal, up to 300 mm.
Steel tape: Flexible steel, used to take internal and external measurements up to 10 m.
- A:** Fabric; **B:** Wood
 - A:** tailor's chalk, pencil; **B:** Wing compasses or pair of dividers
 - There are other alternative tools one could use such as a tracing wheel on fabric or marking gauge on wood. Let learners explain and demonstrate their answer.

ACTIVITY 3.5

LB page 64

Learners work in groups.

- The teacher leads the discussion on the appropriate measuring and marking-out tools for producing the items listed in the activity.
- Learners complete the chart with correct answers and provide sketches/pictures.

Place of work	Measuring tools	Marking-out tools
Wooden chair	tape measure, steel ruler	marking gauge, marking knife
Sheet metal funnel	steel ruler, tape measure,	scriber, pair of dividers
Setting out walls	steel ruler, surveyor's tape	straight edge, chalk sticks
Dress	tape measure	tailor's chalk, tracing wheel, pins
Meal for two	measuring cup, scale	knife

- Learners display charts in class for appraisal.

ACTIVITY 3.6

LB page 67

Learners work on their own.

- pins
 - steel ruler
 - tape measure
 - head pan and gauge box
 - tailor's chalk
- Learners compare the two storage spaces and discuss advantages and disadvantages
- Building site:** Calibrations on measuring tools fade, surveyor's tape tear easily.
 - Food laboratory:** Measuring jug can crack and leak.
 - Sewing workshop:** Tape measure can crack if folded incorrectly.

Learners work in groups.

1. The teacher allocates one measuring and marking-out tool to each group member research.
2. Group members share ideas on how to care for and maintain the tools.
3. Learners in groups prepare and demonstrate how to clean and maintain the tool.
4. Learners return to original group and do presentations.
5. Each learner demonstrates to the original group how to: a) clean it b) maintain it c) store it.
6. Learners discuss the demonstrations conducted in group. Learners demonstrate correct care.

Use the rubric, *Demonstration: artefacts/tools* on page 132 of this Guide to assess presentations.

Linking Topics 3.1 and 3.2: Measuring and marking to cutting and shaping

Questions

1. What measuring and marking tools do you need to cut wood to build a wooden stool?
2. Why is it important to measure and mark accurately before cutting materials in a project?
3. Name the different tools for cutting and shaping a wooden table, a shirt, and a meal.
4. How does the care for a measuring tool differ from the care for a cutting tool?
5. Think about the concept of “measuring and marking out.” Brainstorm situations in daily life, beyond woodworking or sewing, where accurate measuring and marking might be important.

Answers

1. Possible measuring and marking tools: ruler, tape measure, square, and pencil.
2. Accurate measuring and marking ensure the final product has the correct dimensions and components fit together properly. Cutting mistakes can waste materials and require starting over.
3.
 - Wooden table: saw, chisel, sandpaper
 - Shirt: scissors, fabric shears, rotary cutter
 - Meal: knife, chopping board, measuring cups/spoons

Teacher guidance for open-ended questions

- Question 3: Consider the specific materials being cut and shaped: saws for cutting; chisels for shaping; scissors for cutting; knives for chopping; cups/spoons for measuring.
- Question 4: Discuss the different functions of measuring and cutting tools. Measuring tools require protection to maintain accuracy, while cutting tools need sharpening or lubrication.
- Question 5: Broaden the discussion beyond craft activities. Students might suggest measuring for clothing size, measuring ingredients for baking, or measuring distances for construction projects. Focus on the importance of accurate measurement.

This activity connects measuring and marking out (Topic 3.1) and the subsequent cutting and shaping processes (Topic 3.2). By understanding the importance of accurate measurement and marking, learners can appreciate its role across different disciplines. The discussion on tool care reinforces the importance of proper maintenance practices.

Topic 3.2 Cutting and shaping

Content standard

- B9.3.2.1: Demonstrate the understanding of cutting/shaping tools and equipment used for making artefacts/products

Indicators

- B9.3.2.1.1: Discuss tools and equipment used for cutting and shaping
- B9.3.2.1.2: Demonstrate how to use shaping and cutting tools and equipment for producing artefacts/products

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.5: Effectively evaluate the success of solutions used in an attempt to solve a complex problem
 - CP 5.6: Demonstrate a thorough understanding of a generalised concept and facts specific to task or situation
 - CP 6.4: Ability to identify important and appropriate criteria and use them to evaluate available alternatives
- **Creativity and innovation (CI)**
 - CI 6.2: Ability to reflect on approaches to creative task and evaluate the effectiveness of tools used
- **Communication and collaboration (CC)**
 - CC 8.2: Explain ideas in a clear order with relevant details, using correct construction and structure of speech

1. Introduction

Artefacts

Cutting and shaping tools used properly result in a smooth, straight cutting line or clean shape. Learners must know how to use cutting and shaping tools efficiently. After marking out measurements for an artefact, workers prepare for production in the cutting and shaping stage. This topic teaches learners to identify cutting and shaping tools, use them in a skilled way, and how to care for and maintain the tools.

Sewing

Good sewing tools make it easy to sew and helps an individual to complete a sewing project or task quickly and efficiently. Learners will:

- identify types of tools and equipment for cutting/shaping in the sewing centre
- demonstrate how to care for and maintain cutting and shaping tools used for production.

This topic will identify cutting and shaping tools and equipment used for sewing.

Food production

Cutting and shaping also apply in the food laboratory. During cooking we cut or grate ingredients. We also shape, especially when we are decorating a cake. In this topic, we will revise the various tools that are used for these activities and how to care for and maintain them.

2. Learning expectations

Learners need to be able to:

- identify tools and equipment for cutting and shaping in the following trade areas:
 - building site
 - wood workshop
 - metal/plastic workshop
- select appropriate cutting and shaping tools for making the following products:
 - wooden tables
 - bricks/blocks
 - meals
 - bottle opener
 - dresses (shirts/blouses)
- write the procedure/steps involved in making the products
- prepare a chart showing the activities and the appropriate tools used
- display charts for appraisal
- demonstrate how to use cutting and shaping tools and equipment for making products, in groups
- write the procedure/steps involved in making the products, and discuss in class
- exhibit products for appraisal
- demonstrate how to care for and maintain cutting and shaping tools and equipment used in the following trade workplaces:
 - food laboratory (kitchen)
 - wood workshop
 - sewing workshop/laboratory
 - metal/plastic workshop.
 - building site

Duration

Teachers can teach this topic in eight periods or four double periods.

3. Resources needed

- Learner's Book
- Charts about artefacts
- Charts with information about cutting and shaping tools and equipment
- Real objects (cutting and shaping tools and equipment)
- A4 sheets of paper, flip charts and pieces of cardboard
- Specimen workpieces or artefacts and materials
- Videos about procedures for cutting and shaping wooden cabinets, sheet metal dustbins
- Cutting and shaping tools (hacksaws, saws, mallet, smoothing plane etc.)
- Poster paper
- Personal protection equipment (PPE)
- Samples of sewing cutting and shaping tools
- Pictures of different sewing centre cutting and shaping tools
- Charts on cutting and shaping tools and equipment in the sewing centre
- Specimen of dress/shirt
- Brown paper
- Fabric/material
- Videos about the procedures for cutting and shaping a dress/shirt

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
–	Homework	Use an MS WordPad to draw a tool

5. Teaching methodology

Artefacts

5.1 Preparation

The teacher should:

- read and research information about cutting and shaping tools and equipment
- collect and prepare teaching and learning resources (preparing charts, PowerPoint presentations and find real-life objects, artefacts or workpieces and materials, videos)
- do research about how to cut or shape workpieces.

5.2 Teaching strategies

Role play, brainstorming, discussion (groups and whole class), group work, demonstration, pair work, thought showers

5.3 Relevant background knowledge

Learners have seen woodworkers, metalworkers and block or brick layers cutting before they join and assemble parts in their workplaces.

Sewing

5.1 Preparation

The teacher should:

- read and research information about cutting and shaping tools and equipment
- research and practise how to cut and shape a dress/shirt using cutting and shaping tools
- collect and prepare teaching and learning resources (charts, PowerPoint presentations, specimens, and videos)
- look for additional information on the internet.

5.2 Teaching strategies

Discussion (group and whole class), group work, pair work

5.3 Relevant background knowledge

Learners have some knowledge about cutting and shaping. They have seen dressmakers/tailors cutting and shaping articles using cutting and shaping tools.

Food production

5.1 Preparation

The teacher should:

- do research about cutting and shaping tools
- collect and prepare teaching and learning resources such as pictures that are relevant to lessons, for example prepare a chart on cutting and shaping tools.

5.2 Teaching strategies

Role play, brainstorming, discussion (groups and whole class), group work, demonstration, pair work, thought showers

5.3 Relevant background knowledge

Learners use different cutting and shaping tools when preparing food.

6. Suggested homework

Below are suggestions for additional activities for homework.

Artefacts

1. Draw a freehand sketch of each tool and label its parts. If possible, use an MS WordPad.
 - a) Wooden mallet
 - b) Plastic mallet
 - c) Smoothing jack plane
 - d) Smoothing wooden plane
 - e) Mortise chisel
 - f) Ball pein hammer
 - g) Cross pein hammer
 - h) Flat file
 - i) Square file
 - j) Brick
 - l) Block
2. Use pencil and paper or an MS WordPad to sketch three possible design ideas for the following products: a) wooden table, b) sheet metal dustbin, c) bottle opener, d) wooden cabinet. Select one.
3. Prepare a cutting list for your selected choice of wooden table, sheet metal dustbin, bottle opener or wooden cabinet.

Sewing

Learners have seen dressmakers/tailors use cutting and shaping tools in the sewing workshop. Use the appropriate cutting and shaping tools to make a pattern for a shirt/dress on brown paper and cut it out.

Food production

List five cutting and two shaping tools you have and use at home.

7. Assessment

Artefacts

7.1 Assessment questions

1. Complete the table below

Cutting and shaping tools/equipment	One use of cutting and shaping tool/equipment	One way to care and maintain the cutting and shaping tool/equipment
Mallet		
Square file		
Flat file		
Cross pein hammer		
Ball pein hammer		
Mortise chisel		
Jack plane		
Tamping rod		
Brick hammer		
Drill bits		

Answers

Cutting and shaping tools/equipment	One use of cutting and shaping tool/equipment	One way to care and maintain the cutting and shaping tool/equipment
Mallet	Strike woodworking chisels; knock wooden pieces together	Should not be used on cutting edges of cutting/shaping tools.
Square file	Enlarge square or rectangular slot; file flat surfaces	File should be kept in file tool rack. Filings or chips on files should be removed to avoid pinning.
Flat file	General purpose filing of flat surfaces; sharpen cutlasses and hoes	Never use file without a handle, clean the teeth as soon as it becomes pinned.
Cross pein hammer	Used as a chisel to remove rivet heads; stretch or bend metal	The head should be cleaned and oiled after use; store in a tool rack.
Ball pein hammer	Drive, shape, and break applications	The head should be cleaned and oiled after use; store in a tool rack.
Mortise chisel	"Chop out" mortise and tenon joints (chiselling)	Ensure cutting edge is kept sharp.
Jack plane	Shape wood by applying force to move the cutting blade over the wood surface; flatten and smooth a rough piece of timber	Clean the tool after use, oil the metal parts, sharpen the tool before use.
Tamping rod	Consolidate mortar and concrete	Clean the tool after use.
Brick hammer	Split bricks or break small pieces off of rocks; cut stone, brick and concrete, without a chisel	The head should be cleaned and oiled after use; store in a tool rack.
Drill bits	Used in woodworking, metalworking, construction and plastics manufacturing	Should be kept in its container after use.

7.2 Reflective practice or diagnostic assessment exercises

1. How well were learners able to describe how to cut/saw wood before assembling the parts?
2. How well were learners able to describe how to cut/saw metal before assembling the parts?
3. Could learners list six tools that can be used to cut or shape wooden table, bottle opener, and sheet metal dustbin?
4. Could learner's sketch and label parts of the cutting and shaping tools using pencil and paper or MS WordPad?
5. How well could learners explain how to use tools for cutting and shaping?
6. Could learners group all the tools according to their uses?
7. Could they explain how to use a tamping rod?
8. Did learners know which tools to use for which functions?
9. How well did learners explain how to clean and care for the different tools?
10. Could learners come up with possible solutions/plans of artefacts for production?

Sewing

7.1 Assessment questions

1. Name the tool used to cut pieces of fabric.
2. Give two reasons why it is necessary to use cutting tools when sewing.
3. Name two cutting out tools you can use in a sewing workshop.
4. Why do we use shaping tools in a sewing workshop?

Answers

1. A pair of scissors
2. Cutting tools help to cut out pieces of fabric into desired pieces for stitching. It also helps to cut off pieces of thread from sewn articles.
3. Fabric shears/scissors, curved scissors
4. Shaping tools are used to draw out lines or curves for easy cutting and stitching.

7.2 Reflective practice or diagnostic assessment exercises

1. How well are learners able to identify and classify cutting and shaping tools?
2. How well did learners select appropriate cutting and shaping tools for making shirts?
3. How well were learners able to write the procedure/steps involved in making shirt/dress?
4. How well did learners understand how to use cutting and shaping tools and equipment for making dresses/shirts in their groups?
5. How well are learners able to identify real-life objects or pictures of tools and equipment used for cutting and shaping in the sewing centre?
6. How well are learners able to demonstrate how to care for and maintain cutting and shaping tools used for making artefacts/products in the sewing workshop/laboratory – dust, wipe, oil tool.

Food production

7.1 Assessment questions

1. Give two reasons you will always keep your cutting tools, especially knives, sharp.
2. How do we care for and maintain cutting and shaping tools?

Answers

1. I will always keep my cutting tools, especially knives, sharp because:
 - blunt cutting tools will lead to inaccurate work
 - they can be dangerous to the user.
2. Care and maintenance:
 - Wash, clean and sterilise tools after every use.
 - All blades should be sharpened when they become blunt or dull.
 - Keep all tools and equipment packed away after use.
 - Avoid leaving steel tools in water for longer than necessary. It can lead to rust.
 - Oil the metal parts of tools to avoid rusting.
 - Oil the wood parts of tools to avoid cracking.

7.2 Reflective practice or diagnostic assessment exercises

1. Can learners give two reasons to keep cutting tools, especially knives, sharp correctly?
2. How well did learners discuss how to care for and maintain cutting and shaping tools?

8. Answers

ACTIVITY 3.8

LB page 68

Learners work in pairs.

1. Learners look at the tools and equipment used for cutting and shaping as shown in the Learner's Book, name it and its uses.
2. Learners classify the tools according to where they are used by completing the table.

Building site	Wood workshop	Metal/plastic workshop
mould box, brick hammer, hammer, drill, drill bits	saw, handsaw, hacksaw, mallet, smoothing plane, chisel, mortise chisel, file, drill, drill bits, jack plane	junior hacksaw, file, drill, drill bits

ACTIVITY 3.9

LB page 73

Learners work on their own.

1. **a)–b)** Refer to pages 72–73 of the Learner's Book. They will need a hand saw and a jack plane.
2. The learners' steps should be similar to the example on pages 72–73 of the Learner's Book.

ACTIVITY 3.10

LB page 75

Learners work on their own.

1. **a)–b)** Refer to pages 74–75 of the Learner's Book. They will need a mould box.
2. The learners' steps should be similar to the example on pages 74–75 of the Learner's Book.

ACTIVITY 3.11

LB page 77

Learners work on their own.

1. Correct cutting tools:
a) paper scissors **b)** curved scissors **c)** fabric shears
2. The learners' steps should be similar to the example on pages 76–77 of the Learner's Book.

ACTIVITY 3.12

LB page 79

Learners work on their own.

1.

Cutting tool	Used for	Shaping tool	Used for
Knife	Cutting food vegetables and other items during food preparation	Muffin pans	For shaping cakes and pastries

Cutting tool	Used for	Shaping tool	Used for
Grater	Grating vegetables	Muffin or cupcake liners/ paper cups	For shaping cupcakes
Peeler	Peeling vegetables		

- The learners' steps should be similar to the example on pages 78–79 of the Learner's book.

ACTIVITY 3.13

LB page 80

Learners work on their own.

- a)–b)** Refer to page 80 of the Learner's Book. They will need a dot punch, junior hacksaw, file and twist drill.
- The learners' steps should be similar to the example on page 80 of the Learner's Book.

ACTIVITY 3.14

LB page 81

Learners work in groups.

Learners copy the chart in the Learner's Book and complete it with more examples of cutting and shaping tools. Learners follow all the instructions as prescribed in the activities and provide all the answers at group level and for a whole class discussion.

- Other possible examples of cutting and shaping tools:
 - French curves
 - Rotary cutter
 - Discuss the additional examples in your groups:
 - French curves: shaping tool
 - Rotary cutter: cutting tool

Explain why they are cutting or shaping tools, and what they are used for.

 - French curves: This shaping tool comes in a variety of curves, see example below.
 - Rotary cutter: This cutting tool is used for straight cuts in one or more fabric areas, see example below.
 - Learners put your examples in the correct blocks. They can add drawings to the chart.



French curves



Rotary cutter

- Discuss the use of different types of:
 - Knives:** There are many types of knives for various purposes: meat cleavers for chopping meat, paring knives for chopping vegetables, bread knives for cutting bread etc.
 - Scissors:** Fabric shears: These are used to cut pattern pieces and other large fabric. Curved scissors: This is used for snipping threads while sewing. The curved shape allows for trimming threads close to the fabric.

iii) **Files:** The cut of the file refers to how fine its teeth are. They come in many different shapes, sizes and types, such as a flat file or a square file.

b) i) A junior hacksaw is used for cutting through metal pipes or plastic tubing, also for making curved cuts in these materials. It is also used for precise cutting and neat finishes. The bottle opener is a small job requiring precise cutting.

ii) A knife was used to slice the yam and not a vegetable peeler as a knife is the correct tool for cutting the yam.

5. a)

Cutting tools	Safety precautions	Shaping tools	Safety precautions
Knife	Make sure it is well sharpened. Wash separately to other utensils.	Muffin pans	Do not overfill. Use oven gloves when removing them from the oven.
Peeler	Sharp	Muffin or cupcake liners/paper cups	Place carefully in the tins and do not overfill.
Grater	Take care not to grate your fingers by mistake.		

6. Learners' own answers

ACTIVITY 3.15

LB page 82

Learners work in groups of six.

Allow learners to prepare demonstrations on how to use cutting and shaping tools for production of the artefacts specified. Learners work in groups and follow the activity instructions.

The teacher may guide learners by demonstrating the shaping of biscuits, fruits and vegetables.

4. Tools will differ depending on the artefact chosen.

Teachers can use the rubric, *Demonstration: artefacts/tools* or *Food preparation/demonstration* on page 132 in this Facilitator's Guide to assess learners' work.

ACTIVITY 3.16

LB page 83

Learners work on their own.

1. a) B b) C c) A d) D

2. Learners demonstrate to each other that they understand how to handle a saw.

Teachers can use the rubric, *Demonstration: artefacts/tools* on page 132 in this Facilitator's Guide to assess learners' work.

ACTIVITY 3.17

LB page 85

Learners work in pairs.

1. Guide learners to discuss ways on how to care for and maintain cutting and shaping tools and equipment used for making artefacts in the following trade areas:

a) building site

b) wood workshop

c) metal/plastic workshop

d) food laboratory

e) sewing workshop

See the content in the Learner's Book on pages 84–85 on how to care for and maintain cutting and shaping tools and equipment.

2. Choose one example from each category and demonstrate how to care for and maintain the tools. Learners then demonstrate it to each other.

Teachers can use the rubric, *Demonstration: artefacts/tools* on page 132 in this Facilitator's Guide to assess learners' work.

Linking Topics 3.2 and 3.3: Cutting and shaping to joining and assembly

Questions

1. Imagine you have finished cutting all the wooden pieces for a birdhouse. What is the next step in the process before painting or decorating it?
2. Why might the tools used for joining materials differ depending on the workshop environment (wood, metal, sewing)?
3. Consider the example of "making meals" provided in both cutting and shaping and joining and assembling. Identify any methods used to join or assemble food items.
4. How might the way you care for and maintain a joining tool differ from how you care for and maintain a cutting tool?
5. Think about the concept of "joining and assembling." Brainstorm examples from daily life, beyond the provided workshop environments, where joining and assembling techniques are used.

Answers

1. The next step would be joining the pre-cut wooden pieces together to assemble the birdhouse.
2. Woodworking might use glue and clamps, metalworking might use welding or rivets, and sewing uses thread and needles for joining materials. Each workshop requires tools specific to the material properties.
3. Examples of joining or assembling food include layering a sandwich, rolling sushi, or constructing a layered dessert.

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider different food preparation methods. They might mention layering ingredients in a dish, skewering food items for grilling, or using moulds to shape food.
- Question 4: Guide students towards the specific functions of joining and cutting tools. Cutting tools require a sharp edge for clean cuts, while joining tools might need lubrication or cleaning to function properly.
- Question 5: Broaden the discussion beyond craft activities. Students might suggest assembling furniture, building with Lego blocks, or putting together a jigsaw puzzle. The focus should be on the concept of connecting different parts to create a whole.

This activity helps students see the connection between cutting and shaping (Topic 3.2) and the subsequent joining and assembly processes (Topic 3.3). By understanding that cutting prepares the materials and joining creates the final structure, they can appreciate the sequential nature of these steps in product creation. The discussion on tool care reinforces the importance of proper maintenance practices for different types of tools used in Career Technology.

Topic 3.3 Joining and assembling

Content standard

- B9.3.3.1: Demonstrate understanding of materials, tools and equipment used for joining and assembling artefacts/products

Indicators

- B9.3.3.1.1: Discuss joining and assembling materials, tools and equipment used for making artefacts/products
- B9.3.3.1.2: Demonstrate appropriate skills in the use of joining and assembling tools and equipment for making artefacts/products

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.6: Demonstrate a thorough understanding of a generalised concept and facts to task or situation
 - CP 6.3: Identify important and appropriate alternatives
 - CP 6.5: Ability to select alternative(s) that adequately meet selected criteria
- **Creativity and innovation (CI)**
 - CI 6.3: Ability to select the most effective creative tools for work and give reasons for the choice

1. Introduction

Artefacts

Joining and assembling materials is an important part of the production process in manufacturing. Different parts are used for different products. These parts are assembled and fastened using rivets, seaming, clamping, soldering, brazing, welding and by using adhesives. Choosing the correct method to join parts can ensure that a product is structurally and economically sound. The many factors that influence these choices include production economics and mechanical properties such as strength, vibration damping and durability, corrosion or erosion resistance, as well as the ability to correct defects.

The focus of this topic is to equip learners with the knowledge they need to be able to detect, describe, and use the appropriate skills to join and assemble materials using the correct tools and equipment.

Sewing

Joining and assembling materials, tools and equipment are important in the sewing centre. Good sewing tools make it easy to sew. This topic identifies the joining and assembling tools and equipment people need for sewing production. Sewing is the skill of putting together objects with the help of stitches. It can also be said to be the art of joining two or more pieces of fabric together using stitches.

Food production

We join and assemble ingredients in the food laboratory. Substances such as corn starch, gluten, tapioca, gelatine, egg white and milk are used to join ingredients.

These substances are called food binders because they thicken, help keep the shape of food items, and give food a smoother and more appealing texture. In this topic, we are going to identify tools and ingredients (materials) that can be used join and assemble food items.

2. Learning expectations

Learners need to be able to:

- identify tools and equipment used for joining and assembling products in the making the following trade areas:
 - building site
 - wood workshop
 - metal/plastic workshop
 - food laboratory
 - sewing workshop
- classify the joining and assembling tools and equipment under:
 - food laboratory (kitchen)
 - sewing laboratory/workshop
 - building site
 - wood workshop
 - metal/plastic workshop
- demonstrate how to use materials, tools and equipment for making products/artefacts in joining and assembling products/artefacts
- demonstrate how to care for and maintain joining and assembling tools and equipment used for making artefacts/products, in groups.

Duration

Teachers can teach this topic in eight periods or four double periods.

3. Resources needed

- Learner's Book
- Charts that show artefacts that have been joined and assembled
- Charts with information about joining and assembling materials, tools and equipment
- Joining and assembling materials, tools and equipment
- A4 sheets of paper, flip charts and cardboards
- Specimen workpieces or artefacts and materials
- Charts with information about cutting or shaping tools
- Cutting or shaping tools
- Pictures that show joining and assembling materials
- Videos about procedures that are used when using binders to join and assemble food
- Poster paper
- Personal protection equipment (PPE)
- Samples of joining and assembling tools
- Pictures of different joining and assembling tools
- Charts on joining and assembling tools and equipment in the sewing centre
- Real objects (joining and assembling tools and equipment)
- Videos about procedures for joining and assembling sewing artefacts

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
–	Homework	Sketch a fastener using MS WordPad

5. Teaching methodology

Artefacts

5.1 Preparation

The teacher should:

- read and research information about joining and assembling materials, tools and equipment
- collect and prepare teaching and learning resources (charts, PowerPoint presentations, artefacts or workpieces and materials, videos)
- do research about how to join and assemble workpieces.

5.2 Teaching strategies

Role play, brainstorming, discussion (groups and whole class), group work, demonstration, pair work, thought showers

5.3 Relevant background knowledge

Learners know how to join and assemble tables and chairs using nails, glues, screws, rivets.

Sewing

5.1 Preparation

The teacher should:

- read and research information about joining and assembling tools and equipment
- research and practise how to use materials, tools and equipment for making products /artefacts in joining and assembling products
- collect and prepare teaching and learning resources (charts, PowerPoint presentations, and videos)
- look for additional information on the internet.

5.2 Teaching strategies

Discussion (group and whole class), group work, pair work

5.3 Relevant background knowledge

Learners have seen dressmakers/tailors use joining and assembling tools in the sewing workshop.

Food production

5.1 Preparation

The teacher should:

- do research about joining and assembling tools
- collect and prepare teaching and learning resources such as pictures that are relevant to lessons, for example, prepare chart on joining and assembling tools.

5.2 Teaching strategies

Role play, brainstorming, discussion (groups and whole class), group work, demonstration, pair work, thought showers

5.3 Relevant background knowledge

Learners use different cutting and shaping tools when preparing food.

6. Suggested homework

Below are suggestions for additional activities for homework.

Artefacts

1. Sketch in three-dimension, a three-course block wall in a stretcher bond. Length: four full blocks.
2. List three tools which would be used to set out and mark out the position of the wall in question 1.
3. Re-arrange the following steps to be followed in laying the first course of a three-course block wall in question 1:
 - Lay end block
 - Fill mortar joints
 - Set out and mark the position of wall
 - Spread mortar evenly
 - Plumb and check alignment of wall
 - Gauge end blocks
 - Lay remaining blocks
4. Make a freehand sketch of each fastener and label the parts. If possible, use an MS WordPad to complete your drawings.
 - a) a screw
 - b) a nail
 - c) a rivet
 - d) a bolt and a nut

Sewing

How do you care for and maintain joining and assembling tools and equipment used for making artefacts/products?

Food production

List five cutting and two shaping tools you have and use at home.

7. Assessment

Artefacts

7.1 Assessment questions

1. Complete the table below.

Trade areas	Two tools and equipment for joining and assembling products
Building site	
Wood workshop	
Metal/plastic workshop	

2. Explain the following terms: a) bonding; b) dry bonding
3. Complete the table below.

Materials to be joined	One adhesive material
Odum to Odum	
Formica to Wawa	
Veneer to Odum	

4. Complete the table below.

Products	Two materials to make the artefact	Two joining and assembling tools
A wooden bookshelf		
Metal scoop		
Bonding a wall		

Answers

1.

Trade areas	Two tools and equipment for joining and assembling products
Building site	Trowel, spirit level, brick hammer
Wood workshop	Screwdriver, G-clamp, sash clamps, wooden mallet
Metal/plastic workshop	Screwdriver, G-clamp

2. a) Bonding is arrangement of blocks/bricks in a pattern avoiding vertical continuous joints.
b) Dry bonding is the arrangement of blocks/bricks in a pattern without mortar.

3.

Materials to be joined	One adhesive material
Odum to Odum	White glue/PVA glue
Formica to Wawa	Contact glue
Veneer to Odum	Contact glue

4.

Products	Two materials to make the artefact	Two joining and assembling tools
A wooden bookshelf	Plywood, Odum, mahogany	Wooden mallet, screwdriver, sash clamp
Metal scoop	Mild steel, aluminium, galvanised steel	Plastic mallet, folding bars,
Bonding a wall	Mortar, cement	Trowel, spirit level, brick hammer

7.2 Reflective practice or diagnostic assessment exercises

1. How well were learners able to identify joining and assembling materials, tools and equipment used for woodwork, metal work, plastic and building?
2. How useful was information learners found using ICT about joining and assembling materials, tools and equipment?
3. Were learners able to sketch or make an album of joining and assembling materials, tools and equipment?
4. Were learners able to display their sketches or albums for appraisal?
5. How effective was your demonstration of the appropriate techniques to use when joining and assembling materials and tools for sewing and crocheting, food production, wood products, metal products, plastic products and building?
6. How well were learners able to demonstrate the appropriate techniques for joining and assembling materials and tools for sewing and crocheting, food production, wood products, metal products, plastic products and building?

Sewing

7.1 Assessment questions

1. Name two tools used in joining and assembling articles in the sewing centre.
2. State two uses of fabric glue as used in the sewing centre.

Answers

1. A pencil, pen, tailor's chalk, fabric glue
2. Uses (any two):
 - adding decorations, such as appliqués
 - creating a clean and neat seam
 - to keep a fabric part in place temporarily before sewing, for example a pocket
 - when a garment has to be repaired in a very short space of time.

7.2 Reflective practice or diagnostic assessment exercises

1. How well are learners able to identify tools and equipment used for joining and assembling in the sewing workshop/laboratory?
2. How well did learners classify the joining and assembling tools and equipment in the sewing workshop?
3. How well are learners able to demonstrate how to use materials, tools and equipment for making products/artefacts in joining and assembling products/artefacts?
4. How well are learners able to demonstrate how to care for and maintain joining and assembling tools and equipment used for making artefacts/products in the sewing centre?

Food preparation

7.1 Assessment questions

1. Give two uses of oats.
2. List the ingredients you will use for meatballs.
3. Prepare meatballs.
4. Prepare and serve cabbage *fufu*.
5. What is used as a binder in cabbage *fufu*?
6. Identify the main ingredients used for sugar glue.
7. Why is not advisable to keep sugar glue in the refrigerator for than a day?

Answers

- Oats can be used as a binder, e.g. meat balls.
 - Oats can also used as a thickener, e.g. stews and soups.
- Ingredients for making meatballs are:
 - minced meat
 - uncooked oats
 - finely chopped onion
 - canned tomato juice or milk
 - egg
 - minced garlic
 - salt
 - black pepper.
- The teacher guides learners on how to prepare meatballs in groups.
- The teacher guides learners on how to prepare and serve cabbage *fufu* in groups.
- Oats flour
- The main ingredients for making sugar glue are sugar and egg white.
- It is not advisable to keep sugar glue in the refrigerator for more than a day because the egg will separate, and a layer of water will form.

7.2 Reflective practice or diagnostic assessment exercises

- Were learners able to give two uses of oats correctly?
- How well were learners able to list the ingredients used for meatballs?
- Were learners able to prepare meatballs correctly?
- How well did they prepare and serve cabbage *fufu* using the right ingredients?
- How well did they mention the binder in cabbage *fufu*?
- Were learners able to identify the main ingredients used for sugar glue correctly?
- How well were learners able to suggest the reason for not keeping sugar glue in the refrigerator for than a day?

8. Answers

ACTIVITY 3.18

LB page 86

Learners work in pairs.

- ball pein hammer, bolt, cement, claw hammer, float, F-clamp, G-clamp, glue, rubber mallet, wooden mallet, nail, nuts, rivets, riveting set, sash clamp, screw, screwdriver, soldering iron, trowel, vice
- Learners to classify the tools according to where they are used completing the table.

Building site	Wood workshop	Metal/plastic workshop
cement, float, trowel	claw hammer, F-clamp, G-clamp, glue, rubber mallet, wooden mallet, nail	ball pein hammer, bolt, nail, nuts, rivets, riveting set, sash clamp, screw, screwdriver, soldering iron, vice

ACTIVITY 3.19

LB page 88

Learners work in pairs.

- rivet:** as a fastener to make permanent joints between metal materials, and between metal and other materials

- **bolt:** as a threaded fastener when you need extra holding strength; the thread on the external surface has to be connected with a nut
 - **nail:** as a common fastener for wood; consists of a long and narrow piece of solid metal with a pointed tip and flattened head
 - **screw:** as a mechanical fastener with threaded shaft
2. F-clamp to hold bigger parts of the workpiece together while gluing, has a bigger opening than a G-clamp; G-clamp to hold small parts of the workpiece together while gluing.
 3. Learners demonstrate to each other how to use a soldering iron.

ACTIVITY 3.20

LB page 92

Learners work in groups.

1. Learners discuss the different types of glue and how they would use them to make the different artefacts.
2. Learners discuss and describe one assembly tool or piece of equipment and prepare a poster.

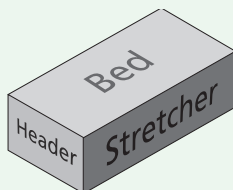
Teachers can use the rubric, *Creating a poster* on page 133 in this Facilitator's Guide to assess learners' work.

ACTIVITY 3.21

LB page 95

Learners work on their own.

1. B The pattern used to arrange the bricks in the wall.
2. C The horizontal rows of bricks in a wall.
- 3.



4. Let learners provide the correct label for each of the circles in the diagram on the right.
 - **Green oval:** stretcher
 - **Red circle:** header
 - **Yellow circle:** vertical join
5. The bricks are laid on top of one another to build up the wall. The joins are filled with mortar. The vertical joins in a wall are never lined up. That would make it weak.
6. Learners write about and sketch: Flemish bond, stretcher bond and English bond. Use the content on pages 93–94 of the Learner's Book.

Teachers can use the rubric, *Drawings* on page 134 in this Facilitator's Guide to assess learners' work.

ACTIVITY 3.22

PRACTICAL: BUILD A WALL

LB page 95

Learners work in groups.

The teacher demonstrates to learners how to bond and allow the learners in groups to practise by following the activity instructions. They will not use real mortar and may use wooden bricks to demonstrate the building technique.

Learners work in pairs.

1. The teacher allows learners to pick one joining and assembling tool used in each of the following trade areas: a) building site b) wood workshop c) metal/plastic workshop d) food laboratory (toothpick/kebab stick for stacking cakes in tiers) e) sewing workshop. The teacher demonstrates to learners and they practise how to clean the tool.
2. The teacher leads discussion on the care that needs to be taken when handling and storing: a) glue b) needles c) nails

Linking Topics 3.3. and 3.4: Joining techniques and kitchen essentials

Questions

1. Imagine you are tasked with preparing a traditional Ghanaian dish, waakye. Identify any joining or assembly techniques used in the preparation process.
2. Why might the selection of kitchen essentials consider factors like space and intended use?
3. Consider the example of “joining and assembling a metal scoop” from topic 3.3. Brainstorm joining techniques potentially used for creating a metal scoop.
4. How might labour-saving kitchen essentials be helpful in food preparation? Give an example.
5. Think about the concept of “kitchen essentials.” Beyond joining tools, identify other essential kitchen tools that might require specific selection criteria like money available and durability.

Answers

1. Possible joining or assembly techniques in waakye preparation include layering rice and beans, wrapping ingredients in banana leaves, or securing a folded piece of meat with skewers.
2. Limited space might necessitate choosing smaller or multipurpose kitchen tools. Intended use could influence the selection of a manual whisk versus an electric mixer.
3. Possible joining techniques for a metal scoop include welding, riveting, or soldering, depending on the desired strength and design.

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider the specific parts of the scoop and their connection points. Welding might be used for a strong, permanent joint, while rivets or soldering could offer a more decorative or semi-permanent solution.
- Question 4: Guide students towards the concept of efficiency and reduced effort. An example could be using a food processor to chop vegetables instead of manually chopping with a knife.
- Question 5: Broaden the discussion beyond joining tools. Students might suggest pots and pans, knives, cutting boards, or measuring cups/spoons. The focus should be on considering factors like budget, material quality, and potential for long-lasting use when selecting kitchen essentials.

This activity helps students see the connection between joining and assembling techniques (Topic 3.3) and the practical application of these skills in a familiar context like the kitchen (Topic 3.4). By understanding that joining techniques are used beyond metal workshops, they can appreciate their wider application in creating functional tools and preparing food. The discussion on kitchen essentials reinforces the importance of considering practicalities and budget constraints when selecting tools for everyday use.

Topic 3.4 Kitchen essentials

Content standard

- B9.3.4.1: Demonstrate skills of selecting and purchasing kitchen essentials and understanding and skills in the choice of basic kitchen essentials

Indicators

- B9.3.4.1.1: Select and purchase suitable kitchen essentials to meet specific needs
- B9.3.4.1.2: Demonstrate understanding of using mechanical or labour-saving kitchen essentials

Core competencies

- **Creativity and innovation (CI)**
 - CI 5.4: Ability to visualise alternatives, see possibilities, and identify problems and challenges
- **Communication and collaboration (CC)**
 - CC 8.1: Speak clearly and explain ideas
 - CC 8.2: Explain ideas in a clear order with relevant details, using correct construction and structure of speech

1. Introduction

Kitchen essentials are very important in the food laboratory. In this topic, we will discuss the process of selecting and purchasing kitchen essentials.

2. Learning expectations

Learners need to be able to:

- discuss factors to consider in the selection and purchasing of kitchen essentials
- explain what is meant by mechanical or labour-saving kitchen essentials and give examples
- discuss the advantages and disadvantages of using mechanical or labour-saving kitchen essentials
- in groups, undertake research and present on the types of mechanical or labour-saving kitchen essentials used in the school, home and community for appraisal.

Duration

Teachers can teach this topic in eight periods or four double periods.

3. Resources needed

- Learner's Book
- Poster paper
- Personal protection equipment (PPE)
- Samples of kitchen essentials
- Pictures of different kitchen essentials

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
109	3.29	Question 3: Do internet research on labour-saving appliances

5. Teaching methodology

5.1 Preparation

The teacher should:

- do research about points to consider when purchasing kitchen essentials
- collect and prepare teaching and learning resources such as pictures that are relevant to lessons, for example, prepare chart on points to consider when purchasing kitchen essentials.

5.2 Teaching strategies:

Role play, brainstorm, discuss (groups and class), group work, demonstrate, pair work, thought showers

5.3 Relevant background knowledge

Learners or their parents buy and use different kitchen essentials. Hence, they consider certain factors before purchasing them.

6. Suggested homework

Below are suggestions for additional activities for homework. Learners can find out from their parents what they considered before buying certain kitchen essentials for their kitchen at home.

7. Assessment

7.1 Assessment questions

1. Identify and discuss four factors you will consider when buying kitchen essentials.
2. Why are some kitchen essentials called labour-saving essentials?
3. Give six examples of labour-saving kitchen essentials.
4. Give five advantages of labour-saving devices.
5. Give five disadvantages of labour-saving devices.

Answers

Some of the factors to consider when buying kitchen essentials are:

1. **a) Money available:** The price of kitchen essentials vary. Quality, brands, and trends all play a role. The budget is important, especially for new kitchens. Prioritise buying essential items before buying nice-to-have items.
b) Space for storage: Kitchen tools and equipment have to be kept safe and dry to ensure lifespan and efficiency. They must be easily reachable, especially in busy kitchens. Only essential items should be bought to avoid cluttering.
c) Intended purpose and use: Buy kitchen equipment based on the menu (deep fryers for fried foods, blenders for healthy foods). Every tool should serve a purpose.
d) Availability of spare parts and durability: For mechanical equipment, buy durable brands that have readily available parts. It saves money in the long run.
2. Some kitchen essentials are called labour-saving kitchen essentials because they take away some of the work and effort needed to get the job done.
3. Some examples of labour-saving devices are meat slicers, mixers, stick blenders, food processors, mincers, grinders, juicers, rice cookers, air fryers, microwaves, pressure cookers and ice-cream machines and bread machines.

Answers

4. Advantages of labour-saving devices are:

- Families can spend less time in their kitchens, and have more time for other work or for leisure activities. This is especially helpful to families where all the caregivers go out to do a job and they have little time for domestic tasks.
- Catering or restaurant businesses can serve customers faster and more efficiently.
- Catering or restaurant businesses can generate more income by producing more dishes.
- By reducing the workload in the kitchen, catering or restaurant businesses can cut expenses.
- By reducing the effort it takes to prepare food, it becomes easier, more comfortable and more enjoyable to families and people to work in kitchens. It is less tiring.
- It improves the quality of work in the food laboratory. Some labour-saving appliances can do more precise and thorough work than humans can.
- Food is touched less by hand, which improves sanitation in the kitchen.

5. Disadvantages of labour-saving devices are:

- They can be expensive. The more complicated the machine is, the higher the price.
- They mostly rely on electricity. Where or when there is no electricity, they cannot be used.
- They need to be used with care and skill, and accidents can occur if not used properly.
- When parts break, the equipment becomes useless.
- Faulty equipment can cause accidents, such as electrical shock or fire.
- Doing some work by hand teaches valuable skills and endurance. When there are machines available to do the work, this might not happen.

7.2 Reflective practice or diagnostic assessment exercises

1. How well did learners identify and discuss four factors to be considered when buying kitchen essentials?
2. How well did learners explain why some kitchen essentials are called labour-saving essentials?
3. Were learners able to give six correct examples of labour-saving kitchen essentials?
4. Did learners give five correct advantages of labour-saving devices?
5. How well did learners give five disadvantages of labour-saving devices?

8. Answers

ACTIVITY 3.24

LB page 104

Learners work in pairs.

1. Ordering kitchen tools and equipment from most expensive to least expensive: fridge, stockpot, salad bowl, cutting board, kitchen knife, vegetable peeler
2. **a)** Learners' own answers. Suggested answer: Leave out the vegetable peeler. A kitchen knife can be used in place of the vegetable peeler.
b) Learners' own answers. Suggested answer: Buy the fridge, stockpot, salad bowl, cutting board and kitchen knife since they can be used for several tasks in the kitchen.

ACTIVITY 3.25

LB page 105

Learners work in groups.

1. B: This uses space efficiently, the items can be reached easily and are in a drawer. This means they are covered to prevent dust from settling on them. In coastal areas, the items will not be subject to sea air that can speed up corrosion.

2. a) A, C, D, B
- b) We need a separate storage space for sharp tools because of the following reasons:
 - For safety, so that you do not cut yourself reaching for an item in a cluttered draw.
 - Separate storage prevents them from ruining their sharp edge.

ACTIVITY 3.26

LB page 106

Learners work in groups.

1. a) A: Has a fridge for chilling and storage purposes. Has place where food can be served and eaten. Has cabinets for storing small items such as serving dishes, knives, spoons etc.
B: Has enough space. Has a bigger fridge for storage and a washing area for washing dishes. It has a rice cooker for cooking rice.
C: Has a small working area. Looks congested. Has a washing area and cabinets for storage.
- b) The smallest kitchen is C. It has the essentials needed for working in a small space.
2. Learners' answers will vary.

ACTIVITY 3.27

LB page 106

Learners work on their own.

The teacher can guide the learners in this activity. Answers will differ from one learner to another.

ACTIVITY 3.28

LB page 107

Learners work in pairs.

1.

Photo	What you think the appliance or tool is used for	How it saves time or effort in the kitchen	Whether it works with electricity or not
A: vegetable slicer/mandolin	Slicing vegetables	No chopping by hand; size of vegetables is uniform; quick.	Does not work with electricity.
B: hand-held stick blender	Beats, blends and whisks quickly	Blends and mixes ingredients quickly.	Works with electricity.
C: egg slicer	Slicing egg	Slices egg into equal sizes; quick	Does not work with electricity.
D: meat slicer	Slicing meat	Quick; little effort	Works with electricity.
E: meat grinder	Mincing meat e.g. beef	Little effort	May work with or without electricity.
F: juice blender/liquidiser	Blending/liquidising fruit and vegetables to make smoothies/juice	Little effort	Works with electricity.
G: stand mixer	Mixing or making cake/bread/cookie dough; creaming butter & sugar; whisking egg whites	Efficient without much effort	Works with electricity.

3. Learners' answers will vary. Suggested answer: hand-held stick blender (is a very useful multi-tool), stand mixer, blender, meat grinder, meat slicer, vegetable slicer, egg slicer

Learners work in groups.

The teacher will guide learners to do this activity. Answers will vary. Learners can use the internet to do research. Teachers can use the rubric, *Creating a poster* on page 133 or *PowerPoint presentation/oral* on page 134 of this Facilitator's Guide to assess learners' work.

Linking Topics 3.4 and 3.5: Kitchen essentials and finishing techniques

Questions

1. Imagine you have prepared a delicious meal but want to present it attractively. Think of any ways to use kitchen essentials to improve the final presentation of your dish.
2. Why might selecting kitchen essentials consider factors like space and intended use?
3. Consider the example of applying finishes to resistant materials (Topic 3.5). Brainstorm examples of finishes used on kitchen essentials.
4. How might labour-saving kitchen essentials have both advantages and disadvantages? Discuss examples.
5. Think about the concept of "finishes and finishing". Beyond food presentation, identify everyday applications where finishing techniques are important.

Answers

1. Kitchen essentials like serving platters, decorative utensils, or even using moulds for shaping food can enhance presentation.
2. Limited space might necessitate choosing multi-functional tools or stackable storage solutions. Intended use could influence the selection of a specific type of knife for a particular task.
3. Examples of finishes on kitchen essentials include painted surfaces on cabinets, non-stick coatings on pans, or varnished wooden handles on utensils.

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider different types of finishes and their purposes. Paint provides a decorative layer, non-stick coatings make cleaning easier, and varnish protects wooden surfaces.
- Question 4: Guide students towards the balance between convenience and potential drawbacks. A food processor saves time chopping vegetables but requires electricity and cleaning. A blender can be helpful for smoothies but might not be suitable for all tasks.
- Question 5: Broaden the discussion beyond kitchen applications. Students might suggest applying paint to walls, varnishing furniture, or hemming the edges of clothing. The focus should be on the concept of using a finishing technique to improve the appearance, functionality, or durability of an object.

This activity helps students see the connection between selecting kitchen essentials (Topic 3.4) and the concept of finishes and finishing techniques (Topic 3.5). By understanding that presentation can be enhanced using tools and techniques, they can appreciate the importance of finishing touches in various contexts. The discussion on kitchen essentials reinforces the importance of considering practicality and purpose when selecting equipment, while the exploration of finishes broadens their understanding of how finishing techniques impact everyday objects.

Topic 3.5 Finishes and finishing

Content standard

- B9.3.5.1: Demonstrate understanding of application of finishes

Indicators

- B9.3.5.1.1: Demonstrate the techniques of applying finishes to resistant materials
- B9.3.5.1.2: Demonstrate basic skills and processes for finishing edges of articles in sewing

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.5: Effectively evaluate the success of solutions used in an attempt to solve a complex problem
 - CP 5.6: Demonstrate a thorough understanding of a generalised concept and facts specific to task or situation
 - CP 6.3: Identify important and appropriate alternatives
 - CP 6.4: Ability to identify important and appropriate criteria and use them to evaluate available alternatives

1. Introduction

Artefacts

Finishing is the last step when producing an artefact. It is a final surface treatment, usually a paint or varnish. The finish rounds off the look of the artefact, and gives it a layer of protection against the impact of water, abrasion and general use.

Sewing

Finishes and finishing provide neat and tidy raw edges for garments and articles that are made using woven fabrics. Learners need to know how to finish the edges of articles neatly and securely. Edge finishes in sewing can also make garments more attractive.

2. Learning expectations

Learners need to be able to:

- identify finishes and tools for finishing resistant materials
- identify materials used for preparing surfaces of wood, metal and walls
- prepare the surface to be finished by using glass paper for wood, emery cloth for metal, and filler for walls
- demonstrate the procedure for applying finishes to resistant materials, in groups
- demonstrate how to wash finishing tools after use
- demonstrate how to finish the edge of articles
- display specimens for appraisal.

Duration

Teachers can teach this topic in eight periods or four double periods.

3. Resources needed

- Learner's Book
- Charts on edges that have been finished
- Flip charts and cardboard
- Specimens of finishes
- Fabric/material
- Videos on procedures for finishes

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and videos when teaching this topic.

5. Teaching methodology

Artefacts

5.1 Preparation

The teacher should:

- read and research information about finishes and finishing that is applied to products.
- collect and prepare teaching and learning resources (prepare charts and collect real-life objects).

5.2 Teaching strategies

Discussion (group and whole class), group work, pair work

5.3 Relevant background knowledge

Learners have seen their parents or others applying finishes to products, doing DIY in the home, filling cracks, painting etc.

Sewing

5.1 Preparation

The facilitator should:

- read and research information about finishes and finishing given to articles
- research and practise how to apply finishes and finishing to articles
- collect and prepare teaching and learning resources (charts, PowerPoint presentations, specimens, and videos)
- look for additional information on the internet.

5.2 Teaching strategies

Discussion (group and whole class), group work, pair work

5.3 Relevant background knowledge

Learners wear garments that have finished edges.

6. Suggested homework

Below are suggestions for additional activities for homework.

Artefacts

Look for an article at home that needs some oil or varnish and apply it correctly.

Sewing

Cut three pieces of fabric/material 15 cm x 15cm each and finish the edges with scalloping, lacing, and blanket stitches.

7. Assessment

Artefacts

7.1 Assessment questions

Why do we apply finishes to artefacts?

Answer

The finish rounds off the look of the artefact, and gives it a layer of protection against the impact of water, abrasion and general use. It can also involve adding embellishments, such as a pretty handle to a wooden item, decorative stitches on clothing, or food garnishes which make a dish more attractive.

7.2 Reflective practice or diagnostic assessment exercises

Are learners able to understand why we apply finishes to artefacts?

Sewing

7.1 Assessment questions

1. Name three types of finishes given to sewn articles.
2. What is an edge finish in sewing?

Answers

1. Lacing, facing, scalloping, binding, hemming (any three)
2. They are treatments given to raw edges of sewn articles to make them secure.

7.2 Reflective practice or diagnostic assessment exercises

1. How well are learners able to identify finishes for sewn materials?
2. How well were learners able to demonstrate how to finish the edge of articles?
3. Were learners able to apply varnish or polish correctly to article?
4. How well are learners able to display specimens for appraisal?

8. Answers

ACTIVITY 3.30

LB page 111

Learners work on their own.

1. Varnish: Hard, transparent substance which is applied to wood to make it glossy.
Lacquer: Hard substance which is applied to wood to make it glossy and resistant to damage; can include colour.
Turpentine: Solvent for oil paints, made from tree gum.
Lacquer thinner: Dissolves the plastics in lacquer to thin it.
Acrylic paint: Water-based paint used for interior walls.
2.
 - a) True
 - b) True
 - c) False
 - d) False

ACTIVITY 3.31

LB page 115

Learners work in groups.

This is a practical demonstration exercise using role play.

Teachers can use the rubric, *Role play* on page 135 of this Facilitator's Guide to assess learners' work.

ACTIVITY 3.32

PRACTICAL: COMPLETE AN EDGE FINISH

LB page 120

Learners work on their own.

The choose two edging finishes and provide a sample to show the rest of the class.

The teacher will guide learners to do this activity. Answers will vary.

The learners' steps should be similar to the example on pages 118–119 of the Learner's Book.

Teachers can use the rubric, *Sewing preparation/demonstration* on page 133 of this Facilitator's Guide to assess learners' finished pieces.

REVISION

(Learner's Book page 121)

Learners work on their own.

1. B (4 × 1)
2. C (4 × 1)
3. C (3)
4. B (1)
5. a) profile board d) dividers (4 × 1)
6. a) B b) C c) A (3)
7. a) chisel b) plane c) file d) mallet (1)
8. a) True (4 × 1)
- b) False. There are different patterns and courses we can use. (1)
- c) True (1)
- d) False. We do not line up the vertical joints as this makes a wall weak. (1)
9. a) bolt b) screw c) rivet d) nail (4 × 1)
10. If your file glides over the workpiece without cutting the surface, you need to clean the file teeth. There is a special brush called a file card for this task. To use the card, run the wire bristles over the file parallel to the grooves of the file's teeth. (1)
- 11.

Photo	Name	Use
a)	Stick blender	Multiples uses: whisking, blending, beating ingredients
b)	Vegetable slicer/mandolin	Slicing vegetables.
c)	Mincer	Making minced meat

12. Money available; storage space; intended purposes/use; availability of spare parts; durability (any one). (1)
13. (2)

Differences: dry and liquid measuring tools in the food laboratory	
Dry	Liquid
Does not have spout.	Has a spout.
They are generally opaque.	They are mostly transparent.
They are not necessarily calibrated.	They are mostly calibrated.
Examples: calabash, measuring spoons and cups without spouts	Examples: measuring cup/mug and spoons with spouts

14. This is best used flat against the side and bottom edges. This ensures that measurements are marked from one consistent spot. Measure from the end of the ruler (baseline), not the 10 mm mark. (1)
15. Binding agents act as adhesives, joining ingredients of a dish with each other. By holding the ingredients together, food binders give finished dishes a smoother texture and help them keep their shape. Examples are egg white, oats flour and sugar glue. (4)
16. Any two:
 - **Brushes:** used to apply paint, as well as varnish and lacquer
 - **Roller:** provides thin, uniform and even coats, and is an ideal tool for painting large, smooth and well-prepared walls and ceilings.
 - **Spray cans:** come in a sealed, pressurised container and are released in an aerosol spray through a nozzle, when a valve button is depressed. (2)
17. Care for a sewing machine must include these points:
 - Change the needles regularly.
 - Oil the sewing machine regularly.
 - Always cover the sewing machine after use.
 - Service the sewing machine annually.
 - Dust the sewing machine after use. (2)
18. a) **varnish:** a hard, transparent substance which is applied to wood to make it glossy (3)
- b) **emulsion:** gives a hardwearing finish to interior walls and ceilings (3)
- c) **oil paint:** used on wood and exposed metal structures (3)
19. Types of finishes: hemming, binding, blanket stitching, facing, lacing and scalloping. All give neat edges and are decorative. (2)
20. Families can spend less time in their kitchens, with more time for other work or leisure activities. This is especially helpful if all the caregivers go to a job and have little time for domestic tasks. They can be expensive. Complicated machines are more expensive. (5)

Total: 50 marks

Module 4 Technology

Topic 4.1 Simple structures and mechanisms, electric and electronic systems

Content standard

- B9.4.1.1: Demonstrate knowledge of mechanisms in project construction

Indicators

- B9.4.1.1.1: Describe mechanisms used for making products/artefacts
- B9.4.1.1.2: Describe the features and principles of operations of mechanisms
- B9.4.1.1.3: Design and make simple school technology projects using two or more of the mechanisms

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.6: Demonstrate a thorough understanding of a generalised concept and facts specific to task or situation
 - CP 5.8: Identify and prove misconceptions about a generalised concept or fact specific to a task or situation
 - CP 6.3: Identify important and appropriate alternatives
 - CP 6.5: Ability to select alternative(s) that adequately meet selected criteria
- **Creativity and innovation (CI)**
 - CI 5.4: Ability to visualise alternatives, see possibilities, and identify problems and challenges
 - CI 6.3: Ability to select the most effective creative tools for work and give reasons for the choice
- **Communication and collaboration (CC)**
 - CC 8.1: Speak clearly and explain ideas
 - CC 8.2: Explain ideas in a clear order with relevant detail, using correct construction and structure of speech
 - CC 9.5: Appreciate the importance of including all team members in discussions and actively encourage contributions from them
- **Personal development and leadership (PL)**
 - PL 6.3: Ability to manage time effectively
- **Digital literacy (DL)**
 - DL 6.3: Use digital tools to create novel things

1. Introduction

This strand focuses predominantly on technology. You will cover the types of mechanisms present in everyday tools and machines, including what they consist of and how they function, for example pulleys, levers, screw mechanisms, gears and cams.

If the class is geared to do this, students will use ICT tools and other sources to explore different types of mechanisms, and will use diagrams and charts to demonstrate their understanding. They will design and make simple school technology projects using two or more of the mechanisms they studied.

2. Learning expectations

Learners need to be able to:

- explain what is meant by mechanisms
- explore different types of mechanisms using ICT tools and other sources
- identify artefacts in the environment that operate on mechanisms
- do research using different sources on how mechanisms operate, in groups
- write findings and present in class for discussion
- use charts, models or real objects to describe the features of the various types of mechanisms
- use simple diagrams to illustrate the operations of the various types of mechanisms
- discuss the advantages and disadvantages of the various types of mechanisms
- watch videos on the various types of mechanisms in operation and discuss in class
- identify simple school projects
- identify compliant and resistant materials, tools and equipment for making mock-ups/prototypes
- discuss the reasons for the choice of mechanisms for a particular job
- plan, design and prepare a folio of products/artefacts
- make the product/artefact following the appropriate procedure
- test the product for function and modifications
- write down observations and discuss in class, in groups.

Duration

Teachers can teach this topic in six periods or three double periods.

3. Resources needed

- Learner's Book
- Sticks 30 cm long
- Bricks or stones
- Pencils and books
- Videos showing the use of pulleys (e.g. <https://youtu.be/64HbQQWq5oM> or <https://youtu.be/9T7tGosXM58>)
- Examples of cranks or pulleys if possible, that learners can try out in the classroom
- Learners to collect materials to make an artefact

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
127	4.1	Question 1: Internet for research
131	4.4	YouTube links provided in the LB
135	4.6	Question 5: Online research on cranks
136	4.7	Question 1: YouTube links provided in the LB
137	4.8	Question 1: YouTube links provided in the LB
139		ICT resources listed in the LB

5. Teaching methodology

5.1 Preparation

The teacher should:

- read and research information on cranks, levers, pulleys, gears, cams, the materials used, the reasons for building them and what could possibly go wrong
- collect and prepare teaching and learning resources for example pictures of various cranks, levers, pulleys, gears, cams, and videos on how they are used
- if possible, bring examples of different tools and machines
- look for more information on the internet.

5.2 Teaching strategies

Brainstorming, discussion (groups and whole class), group work, demonstration, pair work

5.3 Relevant background knowledge

Learners have some knowledge of basic tools and machines and will be able to recognise what they are and how they function in a basic way.

6. Suggested homework

1. Look for three examples of the types of tools and machines described in this strand. Draw them and explain how they work and what they are used for.
2. Any of the practical activities can be given as homework.

7. Assessment

7.1 Assessment questions

1. Which simple mechanism consists of a rope, cable or chain that is looped over a wheel?
2. Briefly describe a lever.
3. Explain how a lever or pulley works by referring to input and output forces.
4. Give an example of a chain and sprocket system and explain how it works.
5. Which type of mechanism has toothed wheels fitting into each other?
6. What ancient type of mechanism is used to transport materials such as grains, coffee beans and building materials along a conveyor system?
7. How does a cam system work in a motor vehicle?

Answers

1. Pulley system
2. A lever is a rigid bar or rod that helps to move something up or down.
3. The effort we apply to move the load is called the input force, for example the push on a crowbar and the pull on the rope. The effort produced by the mechanism, moving the load, is called the output force, for example the upward push of a big stone using a stick and the upward movement of a bucket pulled up by a pulley.
4. A bicycle chain is a chain and sprocket system. As the rider pushes the pedals it turns sprocket A and the chain transfers the movement to sprocket B, which is attached to the wheels, which moves the bicycle forward as the wheels turn.

5. Gear system
6. Screw mechanism
7. In a car engine, the camshaft system controls the opening and closing of fuel valves. There are lobes (the cams) attached to the shaft that push against the valves to open them as the camshaft rotates.

7.2 Reflective practice or diagnostic assessment exercises

1. Are learners able to recognise and identify a mechanism when given a description?
2. Can learners describe a mechanism when given its name?
3. Can learners tell the difference between input and output forces and recognise them on a diagram?
4. Do learners know how a bicycle chain works and what this system is called?
5. Do learners know what can cause structural failure and how it happens?
6. Can learners explain how a cam system works, using a car engine as an example?

8. Answers

ACTIVITY 4.1

LB page 127

Learners work in groups.

Learners research a mechanism in the appliance they selected and present their findings to class.

Teachers can use the rubric, *Writing a paragraph/report* on page 135 or *PowerPoint presentation/oral* on page 134 of this Facilitator's Guide to assess learners' work.

ACTIVITY 4.2

PRACTICAL: USE A LEVER TO MOVE AN OBJECT

LB page 129

Learners work in pairs to make a lever to lift an object, following the instructions in the Learner's Book.

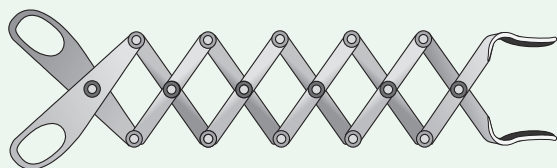
Teachers can use the rubric, *Demonstration: artefacts/tools* on page 132 or *Drawings* on page 134 of this Facilitator's Guide to assess learners' work.

ACTIVITY 4.3

LB page 130

Learners work in pairs.

They can either copy the diagram from the LB or you can give them an enlarged copy.



Teachers can use the rubric, *Drawings* on page 134 of this Facilitator's Guide to assess learners' work.

ACTIVITY 4.4

LB page 131

Learners work in groups.

1. To keep a better grip on the rope
2. We need more rope and more pulleys so that less effort is needed.
3. Accept any answers, but generally it refers to a pulling action.
4. If more pulleys and rope are added, or arrange it as a single movable pulley, or use multiple pulleys
5. Learners' own answers, a sample answer could be using an insufficient number of pulleys for the load weight.

ACTIVITY 4.5

LB page 133

Learners work on their own.

1. A sprocket is a steel or aluminium wheel with teeth or small spikes that fits into the links of a chain or into a track. A gear system is one of several toothed wheels that fit into the teeth. The chain connects two sprockets. One sprocket is the "driver" and the other is "driven". The driver is the gear that is connected to the power source. The other wheels are then driven. Learners include a diagram showing these and other differences. Teachers can use the rubric, *Drawings* on page 134 of this Facilitator's Guide to assess learners' work.
2.
 - a) Using an egg beater – turning handle
 - b) Driving a car – gear system
 - c) Riding a bicycle – pedals turning

ACTIVITY 4.6

LB page 135

Learners work in groups.

1.
 - a) Winch handle
 - b) The lever
 - c) The rotating shaft, it helps roll up the rope
 - d) In the middle
2. The pedals provide the input force as the feet push against them. The crankshaft is the centre cog that turns against the bicycle chain to move the wheels.
3. Learners research more examples of cranks being used, either in the past or in modern machines. They discuss what the output motion is in the examples, and to what parts the crank is attached. They create a chart and present it to the class. Teachers can use the rubric, *PowerPoint presentation/oral* on page 134 of this Facilitator's Guide to assess learners' work.

ACTIVITY 4.7

LB page 136

Learners work in groups.

1. Cams are not easily seen in everyday objects, because they are often used inside machines, such as sewing machines, car engines and mechanical toys. Their purpose is to turn rotating movement into up-and-down movement. Learners must identify these in their examples they find. Ask learners to provide the web links or include pictures in their answers so you can check that they have identified them correctly.
2.
 - a) Cams turn rotating movement into up-and-down movement. True
 - b) Cams are always round. False
 - c) Cams move up and down. False
 - d) Cams create additional movement by striking another part or object in a machine. True

ACTIVITY 4.8

LB page 137

Learners work in groups.

This is a practical activity where learners discuss what they see in the video and match it to the pictures in the LB. Walk around the class and check that all learners are participating.

You could reinforce this by handing out unlabelled diagrams and asking the learners to label them.

ACTIVITY 4.9

LB page 138

Learners work in groups.

1.

Name of mechanism	Parts of mechanism	Real-life examples
Pulley system	rope/cable and wheel	Construction crane
Chain and sprocket	wheel with teeth or small spikes and a chain	Bicycle chain
Gear system	two or more toothed wheels	Bicycle gears
Gears	toothed wheels that fit into a toothed rod or bar	Egg beater
Screw mechanism	a rotating threaded shaft	Harvest machines
Crank mechanism	a handle or arm attached to a rotating shaft	Boat winch
Cams	shapes attached to a rotating rod or shaft	Car engine
Lever	a rigid bar or rod	Wheelbarrow
Linkage	two or more levers, connected by pivots	Excavator/digger

2.
 - A: Bicycle uses brake levers, gear system and chain and sprocket system
 - B: Uses a gear system and a screw mechanism
 - C: Hoist crane uses a pulley system
3. Accept all correct answers that learners have added to those ideas already given.

Learners work in pairs to design and make a simple artefact, following the instructions in the Learner's Book.

Learners work on their own to evaluate their artefacts. They answer the questions in the Learner's Book and then demonstrate their artefact to the class.

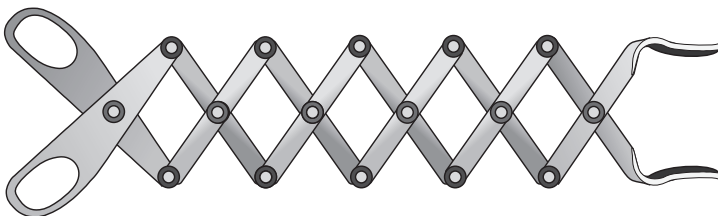
Teachers can use the rubric, *Demonstration: artefacts/tools* on page 132 or *Drawings* on page 134 of this Facilitator's Guide to assess learners' work.

REVISION ANSWERS

(Learner's Book page 141)

1. A (1)
2. B When force is applied to a mechanism, less effort is needed. (1)
3. B (1)
4. C (1)
5. Match each description with the correct mechanism in the box.
 - a) used to hoist heavy objects: pulley (1)
 - b) used to raise water from a lower to a higher level: screw mechanism (1)
 - c) used to turn a rotating shaft: lever (1)
 - d) uses distance to shift a heavy load: crank (1)
6. A: hammer: lever
B: wheelbarrow: lever
C: cutters: linkage (3)
7. a) wheel with teeth or small spikes: sprocket (1)
b) toothed wheels that fit into a toothed rod or bar: rack and pinion (1)
c) two or more levers, connected by pivots: linkage (1)
d) a rigid bar or rod: lever (1)
8. If more pulleys and rope are added, or arrange it as a single movable pulley, or use multiple pulleys (2)
9. A sprocket is a steel or aluminium wheel with teeth or small spikes that fits into the links of a chain or into a track. A gear system is one of several toothed wheels that fit into the teeth. (2)
10. Input motion is the effort put into the mechanism (turning the handle on an egg beater) while output motion is the movement that results (beaters rotate faster). (4)
11. Pedals work as a gear system.
Chain and sprocket, where toothed wheel has a bicycle chain fitted to it. (4)
12. a) bucket from well: crank mechanism – The water bucket is attached by a winch and the handle is turned to bring the bucket to the surface
b) egg beater: gears – Human force is used to turn the handle (input effort), which transfers the movement to the gears which lets the beaters rotate at a faster speed than that of the turning handle (output motion).
c) wheelbarrow: lever – When using a wheelbarrow, the load is between the effort and the fulcrum
d) scissors: linkage – The point where the levers are joined is the fulcrum for both levers. In each lever, the input effort becomes an output effort in an opposite direction, leading to the jaws of the pliers closing down or the scissor blades cutting. (4)

13.



14. Learners' own answers. Encourage innovative ideas. (3)
15. See pages 136 and 137 in the Learner's Book. (4)

Total: 40 marks

Topic 5.1 Communicating designs

Content standard

- B9.5.1.1: Demonstrate understanding of developing surfaces of objects for production/manufacturing
- B9.5.1.2: Demonstrate understanding of orthographic projections

Indicators

- B9.5.1.1.1: Describe prisms and pyramids and discuss the importance of developing them
- B9.5.1.1.2: Develop surfaces of pyramids using instruments
- B9.5.1.2.1: Describe the principles of orthographic projections
- B9.5.1.2.2: Draw objects in first and third angle orthographic projection

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.5: Effectively evaluate the success of solutions used to attempt to solve a complex problem
 - CP 5.7: Provide new insight into controversial situation or task
 - CP 6.4: Ability to identify important and appropriate criteria and use them to evaluate alternatives
 - CP 6.5: Ability to select alternative(s) that adequately meet selected criteria
- **Creativity and innovation (CI)**
 - CI 5.1: Examine alternatives in creating new things
 - CI 5.3: Identification of requirements of a given situation and justification of more than one creative tool that will be suitable
 - CI 6.2: Ability to reflect on approaches to creative tasks and evaluate the effectiveness of tools
 - CI 6.3: Ability to select the most effective creative tools for work and give reasons for the choice
- **Communication and collaboration (CC)**
 - CC 8.1: Speak clearly and explain ideas
 - CC 8.2: Explain the idea in a clear order with relevant details, using correct construction and structure of speech

1. Introduction

Graphic communication conveys instructions through drawing. Lines and shapes communicate instructions and specifications. Many designs are used across the world and so there are rules in graphic communication. This ensures designs work properly and are made as intended.

Topic 5.1 covers the characteristics of three-dimensional (3D) objects, the nature and purpose of surface developments and the principles of orthographic projections. Learners will make developments and draw projections. Topic 5.1 uses the term “development”. It is similar to a “net” that is used in Mathematics, but it has tabs for sticking the sides together.

2. Learning expectations

Learners need to be able to:

- identify types of prisms and pyramids

- sketch types of prisms and pyramids
- differentiate between prisms and pyramids
- discuss the importance of developing surfaces of objects before manufacturing them
- illustrate the techniques of developing prisms and pyramids using instruments
- develop surfaces of simple objects (cylinder, cone, square prism, square pyramid) to required dimensions
- cut out the shapes of developed surfaces leaving flaps for joining
- fold and join the cut-outs as expected to obtain the objects
- plan and mount an exhibition of the objects for appraisal
- explain what is meant by orthographic projection
- discuss the principles of orthographic projections for both first and third angle orthographic projections
- sketch the symbols for first and third angle orthographic projections
- discuss the importance of drawing orthographic projections of objects
- sketch objects in pictorial indicating the appropriate dimensions, and directions of the three views (front view, plan and end view)
- draw the three views to the given dimensions, at their respective positions using the appropriate projection lines
- indicate the dimensions on the views and label the views appropriately
- use the idea to prepare detailed drawings of artefacts to be made
- do project work: they go round the community, observe artefacts and draw four (4) artefacts in both first and third angle orthographic projections
- prepare a sketch album and present in class for appraisal.

Duration

Teachers can teach this topic in ten periods or five double periods.

3. Resources needed

- Learner's Book
- Cardboard
- Drawing materials such as graphite pencil, drawing paper, ruler, pair of compasses, set square, T-square, drawing board, square or dot paper
- Posters with different orthographical drawings in first and third angle view
- Old cereal boxes and similar items

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, and PowerPoint presentations when teaching this topic.

Activities that require ICT

Note: All drawings in this topic should be freehand.

Page in LB	Activity	ICT required
173	5.22	Question 2: Watch a YouTube video

5. Teaching methodology

5.1 Preparation

The facilitator should:

- read and research information on graphical design, illustrations and sketches
- collect and prepare resources (drawing equipment and tools, realia, sketches, videos, drawings)

- source recycled cardboard items to be cut open and used in development and design
- look for more information on the internet.

5.2 Teaching strategies

Brainstorming, discussion (groups and whole class), demonstration, pair work, drawing skills

5.3 Relevant background knowledge

Learners have a reasonable amount of knowledge about constructing drawings from Mathematics as well as from work covered in Basic 7 and 8, and should know how to use the drawing equipment.

6. Suggested homework

Some of the practical activities can be given as homework if time runs out in class.

For learners who need extension, give them different objects to find and draw from different angles.

7. Assessment

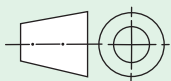
7.1 Assessment questions

1. Describe the similarities between prisms and pyramids.
2. Name any three prisms and describe their properties.
3. Name any two pyramids and describe their properties.
4. Why is developing the surface of an object so important?
5. Define orthographic projection.
6. Draw the symbols for first angle and third angle projections.

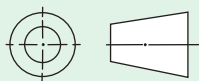
Answers

1. Both prisms and pyramids are solid 3D shapes that have flat sides and flat bases that meet in angles. Prisms and pyramids never have curved sides or edges, like those of cylinders and spheres.
2. See Learner's Book page 145.
3. See Learner's Book page 146.
4. Surface development shows all the surfaces that will make up an artefact in the correct dimension. Every line and angle shows the true length of the corresponding line on the surface of the finished object. It shows where the material has to be folded to form the finished artefact. Surface developments are used as a pattern or template to cut out material (e.g. sheet metal or cardboard). One surface development can produce many of the same objects (e.g. hundreds of pizza boxes, each used once).
5. Orthographic projections are 2D drawings of a 3D object showing different views of the same object. Most common views: front view, plan (top view), side view.

6.



First angle orthographic projection



Third angle orthographic projection

7.2 Reflective practice or diagnostic assessment exercises

1. Do learners understand the similarities and differences between prisms and pyramids?
2. Can learners name the prisms and describe their properties?
3. Can learners name the pyramids and describe their properties?
4. Do learners understand why developing the surface of an object is important?
5. Can learners define orthographic projection?
6. Can learners understand the symbols for first angle and third angle projections, draw them and explain what they mean?

8. Answers

ACTIVITY 5.1

LB page 147

Learners work on their own.

1. a) C b) A c) B d) E e) F f) G g) D h) H
2. A: rectangular prism B: cube C: triangular prism D: cylinder
3. Learners' own answers
4. Learners' own drawings. The base is square.
- 5.

Type of shape	Prisms	Pyramids
Bases	Two identical bases	One base
Side faces	Rectangular or square shape	Triangular shape

6. a)–b) A is a triangular pyramid and B is a triangular prism.
 The surface of a triangular pyramid is formed from four triangles: three triangular sides slant upwards from a triangular base.
 The surface of a triangular prism consists of two triangular bases placed parallel to each other. The edges of the triangular bases are connected to each other with three rectangular or square side faces.

ACTIVITY 5.2

LB page 148

Learners work in groups.

Using surface development helps manufacturers to:

- fold at proper places to form the desired shape of an object
- minimise waste of materials, by having the exact measurements and dimensions for every part of the surface that needs to be cut from the material
- duplicate multiple objects with the same dimensions (the development is a template)
- save labour and time spent on production, by having a template which can be reused.

ACTIVITY 5.3

PRACTICAL: MAKE A DEVELOPMENT USING AN EXISTING BOX

LB page 149

Learners work in pairs or groups.

They use an existing cardboard box to draw a template for a new box. They have a choice to create a new box too, if materials are available. Use the rubric, *Drawings* on page 134 or *Demonstration artefacts/tools* on page 132 of this Guide to assess learners.

ACTIVITY 5.4

PRACTICAL: DRAW THE DEVELOPMENT FOR A PYRAMID, USING A TEMPLATE

LB page 150

Learners work on their own.

They create a development for a square-based pyramid. Ensure drawings are neat and accurate – this is essential for a good design and final product. Use the rubric *Drawings* on page 134 of this Guide to assess learners.

ACTIVITY 5.5

PRACTICAL: DRAW DEVELOPMENTS TO MAKE MOCK-UPS OF OBJECTS

LB page 152

Learners work on their own.

1. a) D b) A c) B d) C
2. a) rectangular prism b) cube c) cylinder d) triangular prism
- 3.–5. Learners' own work. Use the rubric *Drawings* or *Demonstration artefacts/tools* on page 132 of this Guide to assess learners.

ACTIVITY 5.6

LB page 152

Learners work in groups.

This activity follows on from Activity 5.5. Each learner brings their own artefact and the best one is selected democratically. The learners all work together on the presentation and display. Adapt the rubric *PowerPoint presentation/oral* on page 134 of this Guide to assess learners.

ACTIVITY 5.7

LB page 153

Learners work in pairs.

Here are suggested answers. Accept all reasonable answers.

1. The chair has four legs, the height of the arms, the proportion of the front base portion
2. Isometric 3D drawing
3. Isometric 3D drawing, because it gives the most information in a single drawing.

ACTIVITY 5.8

LB page 154

Learners work in groups.

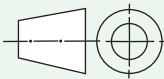
Learners discuss their answers and write their final opinions in class. Ask a few groups for their answers, write it on the board and then ask the class if any other groups have more to add. The information can be found on page 154 of the Learner's Book.

ACTIVITY 5.9

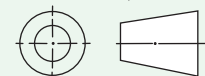
LB page 155

Learners work on their own.

1. First angle orthographic projection

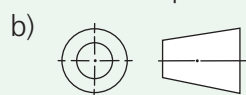
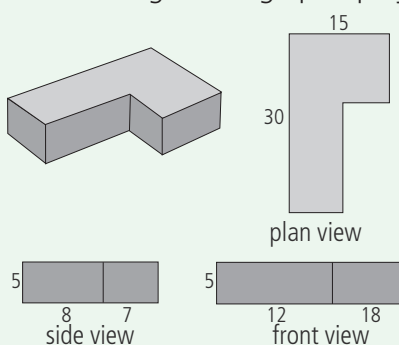


Third angle orthographic projection



2. Both use first angle orthographic projection because the plan is below the views.

3. a)



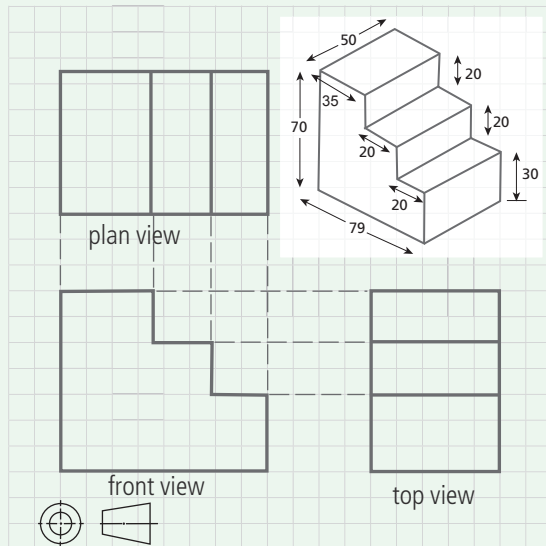
ACTIVITY 5.10

LB page 157

Learners work on their own.

1. Third angle – the symbol indicates this, and the plan is placed above the views.
- 2.–3 Learners copy the drawing from the LB and label it correctly and accurately. Check that the two drawings are aligned, as shown by the dotted lines. Learners do not have to draw the dotted lines.

Adapt the rubric *Drawings* on page 134 of this Guide to assess learners.



ACTIVITY 5.11

PRACTICAL: FIND ARTEFACTS IN THE COMMUNITY AND DRAW ORTHOGRAPHIC PROJECTIONS FOR THEM

LB page 157

Learners work in groups.

Learners find four artefacts for which they can identify views, as shown in the Learner's Book. For the four artefacts, draw three views: front, plan and side. They write the scale. They must draw each artefact in both first and third angle orthographic projections: eight completed orthographic projections in total. The work must be divided between group members. They must do one drawing per A4 sheet. The work is placed in an album for peer appraisal.

Adapt the rubric *Drawings* on page 134 of this Guide to assess learners.

Linking Topics 5.1 and 5.2: Design concepts and communication

Questions

1. Imagine you are tasked with designing a new type of cooking implements for Ghanaian cuisine. What initial user requirements would you consider?
2. Why might it be important to develop the surfaces of an object, like a cooking implement, before manufacturing it?
3. Consider the concept of "orthographic projections". Brainstorm any situations in daily life where understanding these projections might be helpful.

4. How can clarifying user requirements help in the design process?
5. Think about the concept of “communicating designs”. Beyond using drawings, identify any other ways to communicate design ideas.

Answers

1. Possible user requirements for a cooking implement include functionality for specific dishes, ease of use, affordability, and suitability for local cooking methods.
2. Developing the surfaces beforehand allows for checking functionality, identifying potential problems with assembly, and creating accurate production plans.
3. projections might be helpful when understanding furniture assembly instructions, following architectural plans, or visualising spatial arrangements.

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider practical applications. Understanding orthographic projections can help visualise how objects fit together in 3D space from a 2D representation, which is useful in construction, furniture assembly, or even interpreting technical diagrams.
- Question 4: Guide students towards the importance of understanding user needs. Clarifying requirements ensures the design addresses the intended purpose and solves a problem for the target user.
- Question 5: Broaden the discussion beyond technical drawings. Students might suggest using physical models, 3D printing prototypes, or even sketches and verbal descriptions to communicate design ideas. The focus should be on effectively conveying the design concept to others.

This activity helps students see the connection between design concepts (Topic 5.2) and the importance of clear communication (Topic 5.1). By understanding that user needs drive the design process, they can appreciate the role of developing surfaces and using orthographic projections to effectively communicate design ideas for production. The discussion on user requirements reinforces the importance of designing with a specific user in mind while exploring communication methods broadens their understanding of how design ideas are translated into reality.

Topic 5.2 Designing

Content standard

- B9.5.2.1: Demonstrate knowledge of designing

Indicators

- B9.5.2.1.1: Identify user requirements
- B9.5.2.1.2: Clarify user requirements
- B9.5.2.1.3: Generate ideas
- B9.5.2.1.4: Develop the selected solution

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.2: Analyse and make distinct judgement about viewpoints expressed in an argument
 - CP 5.5: Effectively evaluate the success of solutions used in an attempt to solve a complex problem
 - CP 5.7: Provide new insight into controversial situation or task
 - CP 6.4: Ability to identify important and appropriate criteria and use them to evaluate available alternatives
 - CP 6.5: Ability to select alternative(s) that adequately meet selected criteria
- **Creativity and innovation (CI)**
 - CI 5.1: Examine alternatives in creating new things
 - CI 5.3: Identification of requirements of a given situation and justification of more than one creative tool that will be suitable
 - CI 5.4: Ability to visualise alternatives, see possibilities, and identify problems and challenges
- **Communication and collaboration (CC)**
 - CC 5.2: Explain ideas in clear order with relevant details, using correct construction and structure of speech
 - CC 7.1: Identify words or sentences in context and use appropriately
 - CC 8.2: Explain ideas in a clear order with relevant details, using correct construction and structure of speech

1. Introduction

In this topic, learners will identify user requirements and will write a suitable design brief to indicate a solution to an identified problem. They will work on developing a problem analysis chart, and design specifications that meet the design brief. They will select a solution from these ideas that they will develop and follow the procedures for producing it.

2. Learning expectations

Learners need to be able to:

- explore several situations within the community
- discuss issues identified in the situations
- state main issues identified for discussion
- identify needs, wants and lacks within the environment which if not addressed can lead to problems
- discuss the challenges observed in the situations, in groups
- analyse the problems and state the extent to which they affect people's lives in the community

- write a report on the problem situation and write a suitable design brief to indicate solution to the problem
- analyse the problem graphically by developing problem analysis chart
- develop questions to address the analysis chart
- identify sources of getting information and conduct research for the design
- prepare a questionnaire and interview guide to conduct research for the design
- develop observation schedules, visit relevant places, and take appropriate photos linked to the problem and solution
- analyse the research and write a report
- study the research report and develop design specifications based on the analysis of the problem
- cross-check the specifications to ensure that all the design requirements are met
- study the specifications as a guide to generate at least three possible ideas using freehand
- write short notes to describe each of the ideas
- compare the ideas with the specifications to ensure that all requirements are met
- identify the best design that meets the specifications and select it for further consideration
- indicate the reasons for selecting a design for development
- examine the selected design to identify parts that need to be modified
- redesign the selected solution to obtain the final design.

Duration

Teachers can teach this topic in four periods or two double periods.

3. Resources needed

- Learner's Book
- Examples of any of the case studies, such as the MwangaBora lamp, Hippo Roller, Bamboo Bike, Lion Light (solar powered)
- Examples of flow diagrams
- Poster of basic designs

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
159–160	–	Watch videos on the internet
–	Homework	Research design briefs and solutions
162	5.14	Watch videos on the internet

5. Teaching methodology

5.1 Preparation

The facilitator should:

- read and research information about design briefs and any other interesting inventions in Africa that were invented out of necessity
- collect and prepare teaching and learning resources (videos on solving problems using a design brief)
- source yes/no flow diagrams
- do internet research for further information.

5.2 Teaching strategies

Brainstorming, group work, demonstration, whole class discussion, pair work

5.3 Relevant background knowledge

Learners worked with design briefs in Basic 7 and 8, so this is simply a “next level up” lesson.

6. Suggested homework

This is a useful link to suggested design briefs and problems: <https://technologystudent.com/designpro/problem1.htm>

7. Assessment

7.1 Assessment question

List the four main steps in creating a design solution.

Answers

1. Identify user requirements (*what must be done*).
2. Clarify user requirements (*how to do it*).
3. Generate different ideas for the same solution.
4. Develop the chosen solution.

7.2 Reflective practice or diagnostic assessment exercises

Do learners understand what a design brief is and how to use it to problem-solve?

8. Answers

ACTIVITY 5.12

LB page 161

Learners work in pairs.

Learners choose any one of the case studies on pages 158 to 160, excluding the Lion Lights case study and discuss these questions to the case study product to create a user statement:

1. Who is experiencing the problem? How many people, and where are they? What do they have and what do they not have?
2. What is the problem they are experiencing? Where and how does it happen? What are the challenges?
3. What are they thinking or feeling about the problem?
4. Why does it matter?
5. How might I address the problem with a design solution?
6. Who will use my product design?

They then compare your user requirement statements with other pairs in the class who chose the same design and work on improving their user requirement statement.

NOTE: Learners will work in the same groups for Activities 5.13, 5.14, 5.15 and 5.16. These activities can be done over 2–3 weeks as the term’s project. Use the rubrics as indicated in each activity or compile a single project rubric that incorporates all the relevant criteria.

ACTIVITY 5.13

LB page 161

Learners work in groups.

Each learner identifies a need, want or lack in the environment that could lead to a problem if not addressed.

1. Individually, they explore a problem and how it can be solved or changed.
2. They then discuss their ideas in their group.
3. The group chooses one challenge to work on. They analyse how it affects people's lives in the community.
4. They then brainstorm possible design solutions.
5. They decide on a solution that addresses the problem situation.
6. Finally, they write a short report on the selected situation, including a design brief that addresses:
 - Who is experiencing the problem?
 - What is the problem?
 - What design solution can solve the problem?

Use the rubric *Writing a paragraph/report* on page 135 of this Guide to assess learners.

ACTIVITY 5.14

LB page 162

Learners work in the same groups as before. They:

1. Identify sources of information and conduct research for the design.
2. Develop observation schedules for visiting the relevant places and make notes and take photos.
3. Collect pictures, take photographs, look at videos on the internet and find ideas in books.
4. Analyse the research and write a report.
5. Use the research report and write design specifications.
6. Cross-check the specifications to ensure that the design requirements are met.

Use the rubric *Writing a paragraph/report* on page 135 of this Guide to assess learners.

ACTIVITY 5.15

LB page 163

Learners work in the same groups as before. Learners:

1. Generate at least three design plans.
2. Study the specifications as a guide and use freehand sketches to show their design plan.
3. Or make models or prototypes of the ideas, without all the working parts.

Teachers can use the rubric, *Drawings* on page 134 of this Facilitator's Guide to assess learners' work.

ACTIVITY 5.16

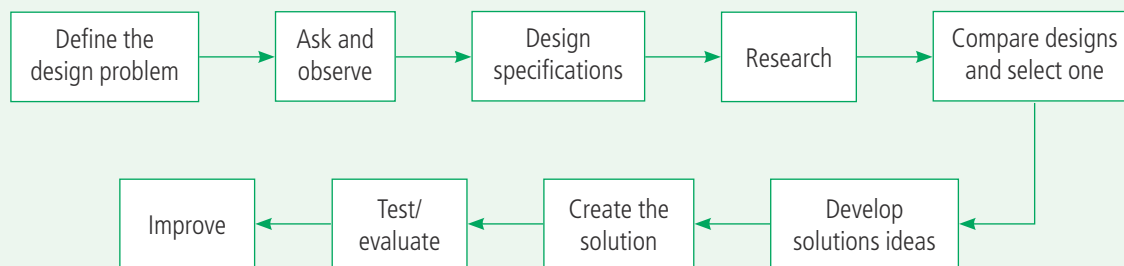
LB page 164

Learners work in the same groups as before. They:

1. Identify the design that they selected as the solution, giving reasons.
2. Create a model or prototype of the solution.
3. Examine the model or prototype for parts that need to be modified.
4. Redesign the selected solution to obtain the final design.
5. They should include:
 - a list of resources needed
 - working diagrams.

Use the rubric *Demonstration: artefacts/tool* on page 132 of this Guide to assess learners.

Learners work on their own.



Linking Topics 5.2 and 5.3: Design and planning

Questions

1. Imagine you finalised the design for your new Ghanaian cooking implement (from the previous activity). What steps might you take to plan for making it?
2. Why might identifying user requirements be important even after the initial design phase?
3. Consider the dry cooking methods provided (baking, grilling). Brainstorm examples of Ghanaian dishes that could be prepared using these methods.
4. How can planning a menu be helpful when preparing a meal?
5. Think about the concept of “planning for making artefacts and products”. Beyond using working drawings and cutting lists, identify any other planning steps that might be important.

Answers

1. Possible planning steps include creating a materials list, identifying construction techniques, and outlining assembly instructions.
2. User requirements might evolve during the design process. Clarifying them again ensures the final product meets the intended needs and functionality.
3. Examples of Ghanaian dishes for dry cooking methods include baking – dokun (plantain cake), and grilling – kelewele (spiced plantain fritters).

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider the specific cooking methods. Baking involves using an oven for dry heat cooking, while grilling involves direct heat exposure like over hot coals.
- Question 4: Guide students towards the benefits of menu planning. It helps ensure a balanced meal, avoids food waste, and streamlines the cooking process.
- Question 5: Broaden the discussion beyond technical documents. Students might suggest researching material properties, estimating production time, or considering safety precautions during construction. The focus should be on the various aspects that must be planned for successful artefact or product creation.

This activity helps students see the connection between the design phase (Topic 5.2) and the importance of planning for production (Topic 5.3). By understanding that planning involves more than just materials, they can appreciate the need to consider user requirements throughout the process and ensure a smooth transition from a design concept to a functional product. The exploration of dry cooking methods offers a practical example of planning considerations, while the discussion on planning steps reinforces the importance of comprehensive preparation for successful artefact creation.

Topic 5.3 Planning for making artefacts

Content standard

- B9.5.3.1: Demonstrate understanding of planning for making artefacts/products/meals

Indicators

- B9.5.3.1.1: identify basic dry methods of cooking and foods that can be prepared using the method
- B9.5.3.1.2: Demonstrate skills in menu planning
- B9.5.3.1.3: Describe ways of using the natural building materials for production
- B9.5.3.1.4: Demonstrate how to clarify user requirements

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.1: Ability to combine information and ideas from several sources to reach conclusion
 - CP 6.4: Ability to identify important and appropriate criteria and use them to evaluate available alternatives
 - CP 6.5: Ability to select alternative(s) that adequately meet selected criteria
- **Creativity and innovation (CI)**
 - CI 5.3: Identification of requirements of a given situation and justification of more than one creative tool that will be suitable
- **Communication and collaboration (CC)**
 - CC 8.1: Speak clearly and explain ideas
 - CC 8.2: Explain ideas in a clear order with relevant details, using correct construction and structure of speech
 - CC 9.1: Demonstrate behaviour and skills of working towards group goals
- **Personal development and leadership (PL)**
 - PL 5.6: Ability to set and maintain personal standards and values

1. Introduction

Planning is an important part of making products and meals. In order to plan properly, we need to understand the principles of the production process. For example, we need to know the difference between different cooking methods, so that we can have the correct tools and follow the correct procedures. In this topic, will look at different ways of cooking food.

In this topic, learners will demonstrate skills in preparing food, for example using dry methods of cooking, menu planning.

2. Learning expectations

Learners need to be able to:

- identify and describe the basic dry methods of cooking
- identify foods that can be prepared using the dry method of cooking
- discuss the advantages and disadvantages of baking and grilling methods of cooking
- discuss the principles of baking and grilling methods of cooking
- explain what is meant by a menu
- discuss the importance of planning a menu

- discuss the factors to consider when planning a menu
- discuss some types of menus in groups
- in groups, plan a menu for discussion in class
- display planned menus for appraisal
- study the working drawings and cutting list obtained from the communication design
- observe the workshop environment to identify the health and safety needs of the work
- study workshop rules and regulations for better familiarisation before the actual work
- study the needed materials, tools and processes to be employed for better understanding
- write down a summary of your study and observations and discuss in class
- experiment with similar materials, tools and processes to gain confidence prior to the making of artefacts
- discuss how clay/laterite is used for producing bricks/blocks.

Duration

Teachers can teach this topic in four periods or two double periods.

3. Resources needed

- Learner's Book
- Poster paper
- Personal protection equipment (PPE)
- Samples of food products
- Pictures of different food products

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
173	5.22	Question 2: Watch videos on the internet

5. Teaching methodology

5.1 Preparation

The facilitator should:

- do some research about planning for making products
- collect and prepare teaching and learning resources such as pictures that are relevant to lessons, for example prepare chart on various food products.

5.2 Teaching strategies

Role play, brainstorming, discussion (groups and whole class), group work, demonstration, pair work, shower thought

5.3 Relevant background knowledge

People eat different types of meals daily, for example, many people eat breakfast, lunch, snack, brunch and supper. Somebody plans, prepares and serves meals. In this topic, the focus is on the factors to consider when planning meals.

6. Suggested homework

Learners can find out from their parents how they plan meals and the various methods they use in the home to prepare food.

7. Assessment

7.1 Assessment questions

1. What are dry methods of cooking food?
2. Give two examples.
3. Identify three ways of baking.
4. State the temperature range for baking.
5. During baking heat is transferred from the _____ of the baked food to the _____ of the food.
6. Give seven examples of baked foods.
7. What can we use leaves for during baking?
8. What is grilling?
9. State the temperature range for grilling.
10. Mention the name of the dish that involves grilling as a last step to brown the dish that was baked.
11. What is searing?
12. List five examples of foods that can be grilled.
13. Write four advantages and four disadvantages of baking.
14. List four advantages and four disadvantages of grilling.
15. What principles will you observe when baking? Mention four.
16. List any four principles you will observe when grilling.
17. What is a menu?
18. Give two characteristics of a menu.
19. Discuss the importance of a menu.
20. State the two main types of menu.
21. Differentiate between the two main types of menu.
22. What factors will you consider when planning a menu?
23. Identify two planning tools that can be used in gathering ingredients, tools and equipment for preparing meals.

Answers

1. Dry methods of cooking are methods that do not use any liquid such as water or stock added to the dish when cooking the food. They involve high temperatures, above 150 °C or hotter. The heat is transferred to the food items without using extra moisture.
2. i) baking
ii) grilling
3. i) using oven
ii) in hot ashes
iii) covering the dish with hot coals
4. Baking usually occurs at temperatures between 150 and 190 °C.
5. During baking heat is transferred from the **surface of the baked food** to the **centre** of the food.
6. Examples of baked foods are bread, cakes, pastries, pizza, rock buns, baked fish and pies.

7. Leaves are used for:
 - wrapping a dish for baking
 - protecting delicate food items, such as fish fillets from the harsh, dry heat and keeping them moist
 - adding flavour to the baked food.
8. Grilling is the process of placing food directly above or under the heat source and turning it halfway through the cooking time to expose both sides of the food to the heat.
9. Grilling is done at high temperatures, above 260 °C.
10. The name of the dish that involves grilling as a last step to brown the dish that was baked is lasagne.
11. Searing is the process of sealing in all the juices and flavours on the outside of the food.
12. Examples of foods that are grilled are kebabs, plantains, corn, cocoyam and chicken.
- 13.

Advantages of baking	Disadvantages of baking
Food is cooked gradually and evenly.	Baked goods are often dry, which is unsuitable for some people, for example the elderly or ill.
The cook does not have to watch the food all the time while cooking.	Baking takes quite long and needs to be planned ahead.
Baking gives food a delicate texture and taste.	The long cooking time needed for baking may destroy some nutrients.
It promotes the caramelisation of surface sugars in foods, resulting in attractive crusts.	Baked goods often include sugar in the recipe, adding to calorie content.

14.

Advantages of grilling	Disadvantages of grilling
The fat drips away from grilled meat. Less fat on the food itself is healthier and reduces the calorie content.	Grilling meat at high temperatures releases unhealthy substances which can lead to cancer if eaten in large quantities.
Grilling produces bold, intense flavours, especially in the outer parts of the food.	High grilling temperature may destroy nutrients in the food.
Grilled food items look attractive and appetising.	While grilling, the food needs to be watched all the time to prevent burning.
The method is fast and easy.	Grilled food can be hard to chew, especially for young children and the elderly.

15. Four principles to observe when baking are as follows:
 - All ingredients need to be measured carefully to achieve good results.
 - Preheat the oven to ensure that food is evenly cooked.
 - Banging or opening gas oven doors can cause the flame to die.
 - Pans, moulds and baking sheets can be greased with oil and butter to avoid food from sticking in the pan.

16. Four principles of grilling are:
 - Place the food to be grilled directly above, below or between the heat source.
 - To prevent grilled food from drying, it can be basted. That means brushing it with oil, butter or cooked marinade while being grilled.
 - Marinating meat before grilling can improve the flavour and texture. A marinade can include oil, seasonings, herbs, spices, sugar and salt. To prevent spoilage, meat is marinated in the refrigerator, not on the kitchen counter or outdoors.
 - The flames must not touch the food and the coals must not be too hot so as to avoid burns or chars.
17. A menu is a list of the dishes available to eat, usually at a restaurant, a hotel or at a function.
18. Characteristics of a menu are as follows:
 - It shows what dishes are available for the customers to order.
 - It indicates what the price per dish is.
19. The importance of a menu is that it allows customers to study the menu and then order the dishes on the menu that they want.
20. The two main types of a menu are *a la carte* and *table d'hôte*/a set menu.
- 21.

<i>A la carte</i>	<i>Table d'hôte</i> /a set menu
It has a list of different dishes that the customer can choose from.	It consists of two or three courses: a starter, a main course and a dessert.
The customer can order one item or many.	The courses are offered together at one fixed price.

22. Factors to consider when planning a menu are:
 - **Availability of foods/foods in season:** A restaurant can serve fresh vegetables and fruit only when they are in season. For example, to make the mango ice-cream, the restaurant needs fresh, ripe mangoes. In some months of the year, they are not available and the dish will be taken off the menu.
 - **Availability of tools and equipment:** Some dishes require specific tools and equipment. For example a restaurant needs an oven to prepare a dish such as pizza or to bake its own cakes. A restaurant would need a blender and a freezer to make and store ice-cream.
 - **Skill of personnel:** The people who work in a restaurant must be able to make the dishes on the menu. For example, if the restaurant has freshly baked bread or cake on their menu, the staff should include skilled bakers. A menu should include complicated recipes only if the staff know how to prepare it.
 - **Customers' needs and tastes:** A restaurant has to keep the customers satisfied so that they will keep coming back. The menu should include dishes that are popular with the community that visits the restaurant and that suit their tastes and needs.
23. Planning tools that can be used in gathering ingredients, tools and equipment for preparing meals are recipes and shopping lists.

7.2 Reflective practice or diagnostic assessment exercises

1. How well did learners explain dry methods of cooking food?
2. Could learners give two examples of dry methods of cooking?
3. Did learners identify three ways to bake correctly?
4. How well did learners state the temperature range for baking?
5. How well did learners state where heat is transferred from and to the food during baking?
6. Could learners give seven examples of baked foods?
7. Were learners able to describe the uses of leaves in baking correctly?

8. How well did learners explain grilling?
9. Did learners state the temperature range for grilling correctly?
10. Could learners mention the name of the dish that involves grilling as a last step to brown the dish that was baked?
11. How well did learners explain searing?
12. Were learners able to list five examples of foods that are be grilled correctly?
13. How well did learners write four advantages and disadvantages of baking?
14. How well did learners list four advantages and disadvantages of grilling?
15. Were learners able to write four principles to be observed when baking correctly?
16. How well did learners list four principles to observe when grilling?

8. Answers

ACTIVITY 5.18

LB page 166

Learners work in pairs.

1.

Baking	Grilling
a) Muffins	c) corn
b) Macaroni and cheese	

2. Grilling. The heat came from below the food.

ACTIVITY 5.19

LB page 167

Learners work in pairs.

1. The dry cooking method to use to prepare food when:
 - a) you do not have access to an oven is **grilling**.
 - b) the dish has to be cooked while you do other things is **baking**.
 - c) you want your food to have an attractive brown crust is **grilling**.
 - d) to eat less fat is **grilling**.
2. Grilling food has both health benefits and health disadvantages because it allows the fat to drip away from food. For example, grilled meat. Less fat on the food is healthier and reduces the calorie content. Nonetheless, when grilling is done at high temperatures unhealthy substances are released which can lead to cancer if eaten in large quantities. Again, high temperature during grilling may destroy nutrients in the food.
3. Finishing off a dish under the grill will give it a brown crust.
4. Grilled food may not be suitable for a toddler because it may be hard for the toddler to chew.
- 5.

Method of cooking	Describe the different ways in which heat is applied
a) grilling in an oven	radiation, conduction, convection
b) baking in an oven	convection, conduction
c) grilling over coals	radiation, conduction

ACTIVITY 5.20

LB page 170

Learners work in groups.

Let the teacher guide learners to do this activity. Answers may vary.

Teachers can use the rubric, *Creating a poster* on page 133 of this Facilitator's Guide to assess learners' work.

ACTIVITY 5.21

LB page 172

Learners work in the same groups as for Activities 5.13 to 5.16.

Answers will depend on the materials chosen.

Teachers can use the rubric, *Writing a paragraph/report* on page 135 of this Facilitator's Guide to assess learners' work.

ACTIVITY 5.22

LB page 173

Learners work as a class.

Teachers can arrange this class outing to look at examples of brick structures or they can invite a professional to come and speak to the class.

Learners' own answers depending on what they noticed.

ACTIVITY 5.23

LB page 176

Learners work on their own.

1. Copy the diagram on page 174, but draw bigger blocks for each step. In the blocks, write short notes or key words to describe each step.

Suggested answers:



2.
 - a) Laterite bricks require no firing but are not as strong. The process is therefore quicker.
 - b) Clay bricks are stronger than laterite.Learners explain their answers, as well as the different methods.
3. To remove as much moisture as possible, so that they don't crack, shrink, warp or twist during the firing process.
4. They are commonly found in Ghana. They don't need to be fired or baked, but can just be left to dry naturally under a cover.

Linking Topics 5.3 and 5.4: Planning and making

Questions

1. Imagine you have finalised your plans for creating your new Ghanaian cooking implement (from the previous activity). What steps might you take to gather the materials, tools, and equipment needed to make it?
2. might planning a menu be helpful before preparing a meal using dry cooking methods like baking or grilling?
3. Consider the examples of making articles using crocheting and embroidery (Topic 5.4). Brainstorm additional materials, beyond threads and needles, that might be needed for these crafts.
4. How can clarifying user requirements again be helpful during the making of your cooking implement?
5. Think about the concept of "making artefacts from materials". Beyond gathering materials and tools, identify any other important steps involved in the making process.

Answers

1. Possible steps include identifying material suppliers, estimating quantities needed, and ensuring tools and equipment are functional and appropriate for the chosen materials.
2. Planning a menu helps ensure you have all the necessary ingredients for each dish and avoids wasting time or food during preparation using dry cooking methods.
3. Additional materials for crocheting and embroidery might include fabric or yarn for the base, buttons, zippers, or beads for embellishments, and stuffing for creating 3D shapes.

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider the specific project requirements. Depending on the design, they might need fabric or yarn appropriate for crocheting or embroidery, additional materials for closures or embellishments, and stuffing for creating a plush toy or cushion.
- Question 4: Guide students towards potential adjustments during production. Clarified user requirements might reveal a need to modify the size, handle design, or material choice based on user preferences or practical considerations.
- Question 5: Broaden the discussion beyond material gathering. Students might suggest following instructions or patterns, preparing the workspace, or practising techniques before starting the making process. The focus should be on the various stages involved in transforming materials into a finished product.

This activity helps students see the connection between planning (Topic 5.3) and the practical application of their plans in the making process (Topic 5.4). By understanding that gathering materials is just one step, they can appreciate the importance of considering user requirements throughout the making process and following a structured approach to bring their design ideas to life. The exploration of dry cooking methods offers a familiar example of planning for making, while the discussion on making steps reinforces the importance of a well-defined process for successful artefact creation.

Topic 5.4 Making artefacts from compliant, resistant materials and food ingredients

Content standard

- B9.5.4.1: Demonstrate understanding of gathering materials, tools and equipment for making/preparing meals and articles

Indicators

- B9.5.4.1.1: Demonstrate skills in preparing food using the dry methods of cooking
- B9.5.4.1.2: Create advanced articles using crocheting and embroidery stitches
- B9.5.4.1.3: Demonstrate how to gather materials, tools, and equipment for making artefacts

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.1: Ability to combine information and ideas from several sources to reach a conclusion
 - CP 5.5: Effectively evaluate the success of solutions used in an attempt to solve a complex problem
 - CP 5.6: Demonstrate a thorough understanding of a generalised concept and facts specific to task or situation
- **Creativity and innovation (CI)**
 - CI 5.1: Examine alternatives in creating new things
 - CI 5.4: Ability to visualise alternatives, see possibilities, and identify problems and challenges
 - CI 6.3: Ability to select the most effective creative tools for work and give reasons for the choice
 - CI 6.4: Imagining and seeing things in a different way
- **Communication and collaboration (CC)**
 - CC 8.2: Explain ideas in a clear order with relevant detail, using correct construction and structure of speech

1. Introduction

Food preparation

In this section, learners will prepare two dishes, one using the baking method of cooking and the other using grilling. They can use the recipes in the Learner's Book, their own recipes, or recipes that you provide. Be sure to choose a recipe for which they can gather the ingredients, and for which they have the tools and equipment they need.

Sewing

Learners enjoy making their own clothing or handmade items. They need to know how to gather the correct materials, tools and equipment to make articles.

Learners are encouraged to design their own articles and use their own creativity.

2. Learning expectations

Learners need to be able to:

- prepare a dish using baking and grilling methods of cooking
- display food for evaluation and appreciation
- review work on tools, equipment and stitches used in sewing and crocheting
- discuss some crocheted and embroidered articles and their uses
- make advanced articles using crocheting and design or make patterns to decorate using embroidery stitches
- plan and mount an exhibition of products for appraisal
- study and examine the design folio to understand the working drawings and the operations or processes involved
- check the dimensions of the working drawings and the cutting list to ensure accuracy of work
- apply the making operations in sequence to make the artefact
- apply the appropriate finish to the artefact ready
- test the manufactured artefact using the specification as a guide
- prepare a checklist to indicate the good and bad comments about the artefact
- rate the quality of the artefact as excellent, very good, good, fair or poor
- state the suggested modifications for the artefact.

Duration

Teachers can teach this topic in ten periods or five double periods.

3. Resources needed

- Learner's Book
- Ingredients and utensils for two recipes
- Charts on crochet articles
- Real objects (crochet articles such as bags, belts, clothing)
- Specimens/samplers on crochet stitches
- Fabric, crochet thread, crochet pin
- Videos about procedures for making crochet stitches

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, PowerPoint presentations and MS WordPad when teaching this topic.

Teachers can show videos that demonstrate how to make some basic sewing stitches as well as basic crocheting stitches.

Activities that require ICT

Page in LB	Activity	ICT required
184	5.30	Look for designs on internet

5. Teaching methodology

Food preparation

5.1 Preparation

The facilitator should:

- do some research on dry methods of preparing food
- download pictures from the internet that are suitable to support the lessons in the textbook.

5.2 Teaching strategies

Demonstration, brainstorming, group work, pair work

5.3 Relevant background knowledge

Learners have some knowledge of the different methods of cooking food.

Some learners will use these methods to cook food at home. Other learners will have watched and helped their parents and guardians use various methods when preparing food.

Sewing

5.1 Preparation

The facilitator should:

- research and practise how to do crochet stitches
- collect and prepare teaching and learning resources (charts, PowerPoint presentations, specimens, and videos)
- do internet research for further information.

5.2 Teaching strategies

Discussion (group and whole class), group work, pair work

5.3 Relevant background knowledge

Learners are familiar with crocheted and sewn articles.

6. Suggested homework

Food preparation

If there is no food laboratory at school, Activity 5.25 can be given as homework. Learners should record their efforts and present to the class to ensure there is no adult intervention.

Sewing

Use the knowledge acquired in crocheting to make an article for use at home.

7. Assessment

Food production

7.1 Assessment questions

1. Briefly describe each of the following dry cooking methods:
 - a) grilling
 - b) baking

Answers

1. See Learner's Book pages 165 and 166.

7.2 Reflective practice or diagnostic assessment exercises

1. Do learners understand how to apply the two dry methods of cooking: grilling and baking?

Sewing

7.1 Assessment questions

1. Name the tool(s) used for making crochet articles.
2. Name four basic stitches used in a sewing.
3. Name three crocheting stitches.

Answers

1. A pair of scissors
2. Tacking, running stitches, back stitches, overcasting stitches
3. Chain stitches, double treble stitches, triple crochet stitches, slip stitches

7.2 Reflective practice or diagnostic assessment exercises

1. How well are learners able to identify and tools and materials used for crocheting?
2. How well did learners select appropriate tools for making crochet articles?
3. How well were learners able to write the procedure/steps involved in making crochet articles?
4. How well did learners understand how to use materials, tools and equipment for making crochet articles in their groups?
5. How well are learners able to identify real-life objects or pictures of tools and equipment used for making crochet articles.
6. How well are learners able to demonstrate how to care for and maintain tool(s) used for making crocheting?

8. Answers

ACTIVITY 5.24

LB page 177

Learners work in pairs.

1. Vanilla cake = butter, eggs, all-purpose flour, baking powder, salt, sugar, vanilla essence, milk
Grill fish = tilapia, blended spices (ginger, onion, garlic), salt, lime juice or vinegar, ground pepper
2. I will gather the ingredients by using planning tools such as recipes and shopping lists.
3. Tools that will be needed: wooden spoon, mixing bowl, cutting board, spoon, ladle, plate, small bowls, grid etc.
4. Equipment that will be needed: oven, electric mixer, hot coals, gas cooker.

ACTIVITY 5.25

LB page 179

Learners work in pairs or small groups.

The teacher should guide learners to do this activity. Answers may vary.

ACTIVITY 5.26

LB page 182

Learners work in groups. They can discuss one item from each category.

1. Household articles

Hanger: Used to hang clothing

Blanket: For warmth

Pot handle cover: To prevent scalding

Placemat: To prevent a hot pot from burning the table

Items for personal use

Bag: Used to hold personal effects

Cell phone cover/purse: Holds money and cell phone

Waterbottle holder: Holds a waterbottle

Basket: Holds toiletries

Clothing and fashion items

Blouse/dress: Decorative clothing

Collar: Decorative

Hat: To keep sun off

Mittens: For warmth

Booties: To keep baby's feet warm

Toys

Teddy bear: Play item for toddlers

Ball: Play item for toddlers

Rattle: Play item for toddlers

Elephant: Play item for toddlers

ACTIVITY 5.27

LB page 182

Learners work in pairs.

1. **A:** Pillow/cushion
B: Handbag
C: Purses/bags
D: Sneakers
E: Blouse
F: Dresses
G: Towels
H: Jeans pocket

Learners give their own ideas on how the appearance is improved.

2. Learners bring their own items from home, they may mention stem stitches, satin stitches, french knots and others.

ACTIVITY 5.28

LB page 183

Learners work on their own.

Learners make two articles, one by using embroidery and the other crochet stitches.

Teachers can adapt the rubric, *Demonstration: artefacts/tools* on page 132 or *Sewing preparation/ demonstration* on page 133 of this Facilitator's Guide to assess learners' work.

ACTIVITY 5.29

LB page 184

Learners work in groups.

1. **A:** Bag was finished with embroidery stitches.
B: Bag made entirely using crochet stitches.
C: Bag made entirely using crochet stitches.
D: Bag was finished with embroidery.
2. **A:** Embroidery threads, hand sewing needles
B: Crochet thread, crochet pins
C: Crochet thread, crochet pins
D: Embroidery threads, hand sewing needles

ACTIVITY 5.30

PRACTICAL: MAKE A TOTE BAG

LB page 184

Learners work in pairs.



Learners follow the example on page 185 in the Learner's Book to make a tote bag.

Teachers can adapt the rubric, *Demonstration: artefacts/tools* on page 132 *Sewing preparation/ demonstration* on page 133 of this Facilitator's Guide to assess learners' work.

REVISION

(Learner's Book page 186)

1. B
 2. A
 3. B
- (3 × 1)
4. a) a menu from which you can order separate items to make up a meal
- | | | |
|---|-------------------------|-----|
| | a' la carte menu | (1) |
| b) cooking food over hot coals | grilling method | (1) |
| c) another word for a table d'hôte menu | set menu | (1) |
5. a) pentagonal based pyramid (1)
 - b) rectangular prism (1)
6. Orthographic projections are working drawings that provide manufacturers with information on how to make an artefact or structure. Architects and engineers use them to communicate what the measurements and dimensions of an object should be, by showing different views of it. Usually, an orthographic projection drawing also includes measurements of the dimensions of each of the views. This allows the person creating the design to communicate the scale of the object to the manufacturer. (2)
7. Three views:
 - front view
 - plan (also called top view)
 - side view(3)
8. In first angle projection, the plan comes below the front and side view. The object is imagined to lie between the observer and the projection. The object is imagined to be transparent. In third angle projection, the plan comes above the front and side view. The projection is imagined to lie between the observer and the object. (4)

First angle projection	Third angle projection
<p>In first angle projection, the plan comes below the front and side view.</p> 	<p>In third angle projection, the plan comes above the front and side view.</p> 

9. Any one from: moulding/dry pressing/extrusion (1)
10. The two factors are availability of foods/foods in season and availability of tools and equipment. Learners could list others such as cost, diner's choice etc.
11. a) firing b) kiln c) laterite d) quarry (4)
12. a) grilling b) baking c) baking (3)
13. Any two: blanket, pot handle cover, hanger cover, placemats or other correct answers. (2)
14. Embroidery can be used to decorate an article with the aid of a sewing hand needle, embroidery thread or with the use of embroidery sewing machine. (1)

Total: 30 marks

Module 6 Entrepreneurial skills

Topic 6.1 Career pathways and career opportunities

Content standard

- B9.6.1.1: Demonstrate understanding about the changing nature of the workplace, the value of work to society, and the connection of work to the achievement of personal goals

Indicators

- B9.6.1.1.1: Describe how the changing nature of the workplace can bring about global competition and technology
- B9.6.1.1.2: Analyse the value of work to the individual and society in general
- B9.6.1.1.3: Develop a career plan that would assist in the transition from school to eventual entry into a career option

Core competencies

- **Critical thinking and problem-solving (CP)**
 - CP 5.2: Analyse and make distinct judgements about viewpoints expressed in an argument
 - CP 6.2: Ability to explain plans for attaining goals
- **Creativity and innovation (CI)**
 - CI 6.8: Recognise and generalise information and experiences; search for trends and patterns
- **Communication and collaboration (CC)**
 - CC 8.2: Explain ideas in a clear order with relevant details, using correct construction and structure of speech
 - CC 9.4: Help group work on relevant activities

1. Introduction

This topic focuses on the skills an entrepreneur needs to make a success of their business. Learners will discuss the value of work and the differences between working for themselves and for others. They will also learn how to draw up an effective career plan.

2. Learning expectations

Learners need to be able to:

- find out how changes at the workplace can bring about global competition and technology
- discuss the findings in groups and write a summary individually
- analyse and report the value of work to the individual and society in general, in groups
- discuss the advantages and disadvantages of working for self and others
- discuss the need for a career plan, in groups
- identify and discuss the steps in an effective career plan
- write a summary of your discussion and read to class.

Duration

Teachers can teach this topic in four periods or two double periods.

3. Resources needed

- Learner's Book
- Access to the internet, if possible

4. Using ICT

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, and PowerPoint presentations when teaching this topic.

Activities that require ICT

Page in LB	Activity	ICT required
189	6.1	Question 1: Research online

5. Teaching methodology

5.1 Preparation

The teacher should:

- read and research information on careers in the various technology fields
- collect and prepare teaching and learning resources (find information about careers in technology)
- look for more information on the internet.

5.2 Teaching strategies

Brainstorming, discussion, group work, writing skills, group discussion

5.3 Relevant background knowledge

Learners have some knowledge about entrepreneurship and have sold items at school fairs and markets. They also have existing knowledge from the material covered in Module 6 in Basic 7 and Basic 8.

6. Suggested homework

Activity 6.3 is set as homework.

7. Assessment

7.1 Assessment questions

1. List any three good habits that could improve your life.
2. List any three advantages and three disadvantages of working for yourself.

Answers

1. Learners could list any three of the following:
 - **Discipline:** This is the ability and willingness to do what is necessary to get the job done.
 - **Honesty and reliability:** To be successful at work, we need to be trustworthy.
 - **Punctuality:** At work, we learn to start and finish on time.

- **Good relationships with others:** Good working relationships require that we relate well with colleagues and employers and are able to work together in a team.
2. See the list on page 191 of the Learner's Book.

7.2 Reflective practice or diagnostic assessment exercises

- 1 Are learners able to identify the good habits that could improve their lives?
2. Are learners aware of the advantages and disadvantages of working for themselves?

8. Answers

ACTIVITY 6.1

LB page 189

Learners work on their own and then in groups.

On their own, learners do research online to find out more about the use of machines, robots, drones and ICT in the workplace. They need to find examples of different types of automation.

In groups, they discuss their findings, making their own notes on the following:

How do these technologies:

- improve efficiency and quality
- reduce costs
- save time?

They then write a summary of their findings.

Teachers can use the rubric, *Writing a paragraph/report* on page 135 of this Facilitator's Guide to assess learners' work.

ACTIVITY 6.2

LB page 191

Learners work in groups and then on their own.

1. Learners discuss the advantages and disadvantages outlined on page 191 of the Learner's Book.
2. Learners' own answers

ACTIVITY 6.3

LB page 192

Learners work in groups and then on their own.

They make their own notes as they discuss the need for a career plan.

Then give them two weeks to record and submit their own career plan.

Teachers can use the rubric, *Writing a paragraph/report* on page 135 of this Facilitator's Guide to assess learners' work.

Linking Topics 6.1 and 6.2: Career exploration and business management

Questions

1. Imagine you have a brilliant idea for a new Ghanaian cooking implement (from the previous activities). How might the changing nature of the workplace, with technology and global competition, affect your plan to bring this product to market?
2. Why might understanding the value of work to yourself and society be important when considering a career path?
3. Consider the different legal forms of businesses (Topic 6.2). Brainstorm examples of small businesses in Ghana that might operate under different legal structures.
4. How can understanding “products in demand” be helpful when developing a career plan or starting a small business?
5. Think about the concept of “establishing and managing a small business enterprise”. Beyond legal considerations and resources, identify any other important aspects of managing a successful business.

Answers

1. Technology might offer new ways to manufacture the implement or reach customers through online platforms. Global competition might require competitive pricing or unique features to stand out in the market.
2. Understanding the value of work helps you identify careers that align with your personal goals and contribute positively to society.
3. Examples of businesses with different legal structures include sole proprietorship (local food vendor), partnership (catering company), or limited liability company (clothing production company).

Teacher guidance for open-ended questions

- Question 3: Encourage students to consider the scale and ownership of the business. A sole proprietorship might be suitable for a small shop, while a partnership could be appropriate for a larger venture requiring shared investment.
- Question 4: Guide students towards market research and understanding customer needs. Products in demand ensure there’s a market for your product or service, which is crucial for business success.
- Question 5: Broaden the discussion beyond legalities and resources. Students might suggest marketing strategies, customer service, financial management, or even ethical business practices. The focus should be on the various aspects that contribute to a well-run and sustainable business.

This activity helps students see the connection between career exploration (Topic 6.1) and the practicalities of starting and managing a small business (Topic 6.2). By understanding that the workplace is constantly evolving, they can appreciate the importance of considering market trends and technology when developing a career plan or launching a business venture. Exploring the value of work reinforces the link between personal goals and societal contributions, while the discussion on business management broadens their understanding of the multifaceted nature of running a successful business.

Topic 6.2 Establishing and managing a small business enterprise

Content standard

- B9.6.2.1: Demonstrate understanding of establishing and managing a small business enterprise

Indicators

- B9.6.2.1.1: Describe how to start and run a small business
- B9.6.2.1.2: Explain how to manage resources of small business enterprises

Core competencies

- **Communication and collaboration (CC)**
 - CC 8.1: Speak clearly and explain ideas
 - CC 8.2: Explain ideas in a clear order with relevant details, using correct construction and structure of speech
 - CC 8.4: Anticipate different responses from the audience and plan for them
 - CC 9.4: Help group work on relevant activities

1. Introduction

In this topic, learners will learn how to start and run a small business, considering different business models and their own plans, such as their business idea, or copying an existing business, buying an existing business, or modifying an existing business. They will also consider the legal aspects of starting a business in Ghana, including licensing or registration. Finally, they will consider the processes of managing a business.

2. Learning expectations

Learners need to be able to:

- discuss how to start and run their own business, in groups
- read up on and write a report on legal forms of businesses in Ghana, and discuss in class, in groups
- discuss how to name a business, in groups
- read about the licensing/registration processes, and visit licensing/registration agencies to learn more about licensing/registration procedures
- write a summary of their findings from the visit and discuss in class, in groups
- think-pair-share on products and services that are in demand, and write down their views
- discuss factors to consider when running and managing a small-scale business
- discuss the processes of managing a business, in groups.

Duration

Teachers can teach this topic in four periods or two double periods.

3. Resources needed

- Learner's Book

4. Using ICT (where necessary)

Teachers can use cell phones, laptops, projectors, portable speakers, flash drives, and PowerPoint presentations when teaching this topic.

5. Teaching methodology

5.1 Preparation

The teacher should:

- read and research information on business plans
- prepare teaching and learning resources (find videos about entrepreneurs and entrepreneurship, with material explained in a way that makes it easy for learners to understand)
- find out more about small business support in Ghana, for example look at the following sites and simplify the information to it easier for Basic 9 learners to understand: <https://ghanatalksbusiness.com/2021/04/top-5-national-institutions-that-can-help-support-and-grow-your-business/> or <https://www.forbes.com/sites/meghanmccormick/2020/05/30/female-entrepreneurs-support-women-led-small-businesses-in-ghana-with-new-investment-fund/?sh=f592fa22133e>
- look for more information on the internet.

5.2 Teaching strategies

Brainstorming, discussion, group work, reports, role play

5.3 Relevant background knowledge

Learners have some knowledge about entrepreneurship and have sold items at school fairs and markets. They should be able to identify entrepreneurs in their community. They should also have an idea of how to prepare a basic business plan, since they would have needed one for their stalls.

6. Suggested homework

Learners constantly observe businesses in their communities and make notes of what they sell or offer, how the businesses serve the community, and note any gaps in the market that could be filled. This will help them complete Activities 6.4 and 6.7 (these two are related).

7. Assessment

7.1 Assessment questions

1. List the four models of starting up a small business and briefly describe each one.
2. List the four legal forms of a small business and briefly describe each one.
3. List the five factors to consider when running an SME. Choose any two and describe how they can be used to achieve success.
4. List the six processes to follow when starting a new business.

Answers

1. See the list on page 193 of the Learner's Book.
2. See the list on page 194 of the Learner's Book.
3. See the list on page 197 of the Learner's Book.
4. See the list on page 198 of the Learner's Book.

7.2 Reflective practice or diagnostic assessment exercises

1. Can learners list the four models of starting up a small business and describe each one?
2. Can learners list the four legal forms of a small business and describe each one?
3. Can learners list the five factors to consider when running an SME and describe how they can be applied to achieve a successful business?
4. Can learners list the six processes to follow when starting a new business?

8. Answers

ACTIVITY 6.4

LB page 194

Learners work in pairs.

They research existing small businesses in their community and identify three different types of small businesses within the community.

They then arrange an interview with the owners of each of the three businesses and find out the following about each business:

- How was the business started up?
- Which category listed on page 193 does it fit into? Ask the business owner the reasons for why they chose that particular model.
- What type of legal entity is the business? Ask the business owner the reasons for why they chose that particular model.

Learners then document their findings, discussing how businesses were started in each of the following ways and identifying their advantages and disadvantages:

- Own business idea
- Copying an existing business
- Buying an existing business
- Modifying an existing business.

NOTE: Activity 6.7 is a continuation of this activity and should be considered during the interview with the business owners.

Teachers can use the rubric, *Writing a paragraph/report* on page 135 of this Facilitator's Guide to assess learners' work.

ACTIVITY 6.5

LB page 195

Learners work in groups.

1. Learners' own answers – accept any reasonable interpretations of the photos. Suggested possible answers:
 - A:** taxi owner
 - B:** barber/hair stylist
 - C:** business owner
2. Refer to page 194 of the Learner's Book for legal information.

ACTIVITY 6.6

LB page 197

Learners work on their own and then in pairs.

Learners work together in class to present their findings. Learners' answers will differ. Make sure they meet all the criteria in the Learner's Book. There should be at least 10 items but award marks if more varied options are listed.

Teachers can use the rubric, *Writing a paragraph/report* on page 135 of this Facilitator's Guide to assess learners' work.

ACTIVITY 6.7

LB page 197

Learners work in pairs.

This activity is done in conjunction with Activity 6.4. The questions are centred around the products or services, start-up capital needed and business location. They then discuss whether they would've made the same decisions if it were their business and whether the business owner would've made the same decisions the second time around.

ACTIVITY 6.8

LB page 198

Learners work in groups.

1. A business plan provides the blueprint for your business and establishes guidelines you want to follow. A business plan is a useful tool in which all the ideas for the business are summarised, including how the owner of the business will be funded and how the business will be marketed.
2. The business owner lets others in the business also take some responsibility. This reduces stress for the business owner and also develops staff. The risk is that the business owner can only delegate to trained and responsible staff, and an inexperienced person could damage the business financially and in reputation.
3. Learners' own answers, based on their findings in the interviews, but include scheduling processes such as payments, ordering from suppliers, training staff, trading hours, financing and meetings.
4. Learners discuss ways of managing staff. Accept all reasonable answers.
5. Learners role-play a situation in which poor communication between a business owner and a customer resulted in the loss of a sale. Give them time to brainstorm and create the scenario before they act it out to the rest of the class.

Teachers can use the rubric, *Role play* on page 135 of this Facilitator's Guide to assess learners' work.

REVISION

(Learner's Book page 199)

1. B (1)
2. C (1)
3. **a)** sole proprietor (1)
b) shareholder (1)
c) capital (1)
d) non-profit business (1)
4. Refer to pages 195 and 196 of the Learner's Book. (2)
5. Refer to pages 188 and 189 of the Learner's Book. Accept any correct answers of examples from the learners. (3)
6. Refer to page 191 of the Learner's Book. (4)
7. A business sells the rights to their business logo and name to an entrepreneur. The small business owner is in charge and responsible for the business and its profits, but the franchiser controls certain aspects, such as the packaging and signage of the business so that customers recognise the brand. Customers are already familiar with the business and there is less risk than an unknown brand, but being controlled can be limiting to the owner. *(Description with one advantage and one disadvantage)* (3)
8. If people notice that a business cannot keep up with customer demand, they can set up a similar business in the same area and compete with the existing business. Another scenario is when people notice a successful business in one place and set up a similar one in an area where it does not yet exist. *(Accept any reasonable answers)* (2)
9. **a)** controlling (1)
b) communication (1)
c) delegating (1)
d) motivating (1)
10. **a)** **Capital** is the money seeded to start up a business, for example to purchase tools, equipment and raw materials. Without capital, the business cannot be started. It is important that the business owner plans carefully and knows how much will be needed and what he/she will need to borrow from a bank, family or investors. Too much debt can sink a small business. (2)
- b)** **Location** is crucial, especially when selling directly to the public. Such a business should be in a busy area where it is safe to shop. If a business has to transport its products, it should be central or close to transport routes. (2)
- c)** **Market** refers to the people who will be buying the goods and services. Doing market research means finding out who these people are and what their needs are, and also what they will be willing to pay. (2)

Total: 30 marks

Rubrics

Demonstration: artefacts/tools

Ratings	3	2	1	0
Identification	Identifies and names the tool(s) needed	Identifies most of the tools needed	Identifies one or two of the tools needed	Cannot identify the tool(s)
Knowledge	Knows what the tool(s) are used for and understands the task	Knows of most uses for tool(s) and has a basic grasp of the task	Knows of one or two uses, and does not understand the task fully	Does not know what the tool(s) is used for and fails to grasp the task
Demonstration or technique	Knows how to use or clean the tool safely and correctly	Knows how to use or clean the tool, but needs one or two corrective measures	Has a basic knowledge of how to use or clean the tool; misses some safety processes	Does not know how to use or clean the tool and has no grasp of safety procedures
Use of PPE (if relevant)	Knows what PPE to use and how to use it	Does not use all the correct PPE	Only uses some PPE	Does not use any PPE
Final product (if relevant)	Final product is exact, correct and finished neatly	Final product is mostly correct and neat	Final product has a few good points, but is not usable	Final product is incorrect and not usable

Total: 15

Food preparation/demonstration

Ratings	3	2	1	0
Health and cleanliness	Hair is tied back, hands are clean, wearing apron and mask	Some elements of untidiness, but hands are clean	Several elements of untidiness, but hands are clean	If hands not clean, award 0 even if other elements are present
Working with others	Helpful, encouraging, friendly, worked well as a team	Struggled with one or two skills but was generally successful	Struggled to work as a team and only finished under teacher instruction	Failed to work as a team and did not complete task
Technique	Knew all the cutting and prepping techniques and executed them well; used correct utensils	Knew most cutting and prepping techniques and executed them satisfactorily, used correct utensils most of the time	Knew a few of the cutting and prepping techniques and struggled with execution, used incorrect utensils at times	Did not cut or prep properly at all
Ingredients	Identified all the ingredients and prepared the correct amounts	Identified most ingredients and prepared most amounts correctly	Struggled to identify ingredients and did not prepare most quantities correctly	Could not identify ingredients and got quantities wrong
Recipe	Followed the recipe exactly	Missed a few steps or ingredients	Struggled to follow recipe; needed guidance	Could not follow recipe
Final	Dish is tasty, correct and finished neatly	Dish is mostly correct and neat; tastes acceptable	Dish is close to what it should be, but it does not taste good	Did not present final dish
Timeliness	–	Dish was completed on time	Dish was not completed on time	Dish was not completed

Total: 20

Sewing preparation/demonstration

Ratings	3	2	1	0
Knowledge	Followed all the procedures	Followed most procedures	Followed a few procedures	Did not know what to do
Speed	Finished ahead of time	Finished on time	Finished a few minutes late	Did not finish
Neatness	All stitches are firm and evenly placed	Most stitches are firm and evenly placed	Most stitches loose and uneven	Stitches could not be identified
Dexterity (sewing)	Threaded the needle, held the needle and fabric correctly	Struggled a little to thread the needle, held fabric correctly most of the time	Needed guidance to thread the needle and hold the fabric	Could not thread a needle or hold the fabric and sew
Dexterity (crocheting)	Cast a stitch and held the needle and yarn correctly	Struggled to cast a stitch and hold the needle and yarn correctly	Needed guidance to cast a stitch and hold the needle and yarn correctly	Could not cast a stitch or crochet, or hold the needle and the yarn correctly

Total: 15

Creating a poster

Ratings	3	2	1	0
Heading	Heading is clear and relevant	Heading is not completely relevant	Heading is not relevant	No heading
Content	At least five main ideas are conveyed clearly	Three or four main ideas are conveyed clearly	One or two main ideas are conveyed clearly	Ideas not relevant or non-existent
Illustrations or pictures	All pictures have captions and labels; labels are neat and no lines overlap	Most pictures have captions and labels; some lines overlap	A few pictures have captions and labels; most lines overlap or are missing	No pictures or pictures without labels
Creativity	Poster is well-designed; no visible pencil markings; colour is used well	Poster is two-toned and has some visible pencil markings; limited use of colour	Poster is bland; no colour or design, but all elements are present	Poster lacks imagination
Neatness	Poster is neat, spelling and grammar correct; no correction markings	A few spelling and grammar errors; one or two correction markings	Many spelling and grammar errors and correction markings; or poster is untidy	Poster is untidy and lacks cohesion
Presentation	The presenter prepared well, spoke clearly and knows the subject matter	The presenter knows the subject matter well and spoke quite well	The presenter had limited knowledge and stumbled through the presentation	The learner did not present the information
Timeliness	–	The poster was completed on time	The poster was not completed on time, it was submitted within two days	No poster was submitted

Total: 20

Drawings

Ratings	3	2	1	0
Heading or caption	Heading or caption is clear and relevant	Heading or caption is not completely relevant	Heading or caption is not relevant	There is no heading or caption
Illustrations or pictures	Drawings are factually accurate and in proportion	Drawings are mostly accurate and in proportion	Drawings are identifiable but not accurate	Drawings are not accurate
Labels	Labels are neat and no lines overlap; all labels included	Some lines for labels overlap; all labels included	Quite a lot of lines for labels overlap; some labels not included	No labels included
Neatness	Drawing is neat, spelling and grammar correct; no correction markings	Some spelling and grammar errors; one or two correction markings	Several spelling and grammar errors or correction markings; or drawings are untidy	Drawings are not identifiable

Total: 12

PowerPoint presentation/oral

Ratings	3	2	1	0
Topic	Topic was researched well and it is presented well	Topic was researched quite well and it is presented quite well	Topic was not researched well and it is not presented well	Topic and presentation do not relate to task
Presentation	Presentation is complete and it contains five or six relevant facts	Presentation is complete, but it includes fewer than five relevant facts	Presentation is complete, but it includes fewer than three relevant facts	Presentation is incomplete
Use of visuals	Visuals are relevant and captions are correct	Not all visuals are relevant and not all captions are correct	One or two visuals are relevant and most captions are not correct	No visuals are included or all visuals are not relevant
Body language	Presenter was prepared, spoke clearly and knows the subject matter	Presenter does not know all subject matter and did not always speak clearly	Presenter had limited knowledge and stumbled through the presentation	Presenter did not speak
Neatness	Presentation is neat, spelling and grammar correct; there are no correction markings	Presentation is quite neat; there are some spelling and grammar errors; there are one or two correction markings	Presentation is not neat; there are several spelling and grammar errors and several correction markings	Presentation is messy and difficult to understand
Timeliness	Presentation was ready on time and speaker was prepared	Presentation was ready, but speaker not prepared	Presentation ready a day late and speaker was not prepared	No presentation was received and nobody delivered presentation
Audience attention	–	Presentation held the class's attention throughout	Presentation held class's attention for some of the time	No presentation for class to watch

Total: 20

Writing a paragraph/report

Ratings	3	2	1	0
Content	Covered all content well	Covered some content quite well	Covered content poorly	–
Understanding	Very good understanding of topic; used own words	Showed some understanding of topic; did not use own words throughout	A lot of content was clearly taken from sources; did not use own words	–
Extent	Stuck to the prescribed length	Writing is a little too long or too short	Writing is much too long or much too short	–
Grammar and spelling	Spelling and grammar correct	Spelling and grammar mostly correct	Quite a lot of spelling and grammar errors	–

Total: 12

Role play

Ratings	3	2	1
Speech	Speech was clear with appropriate volume and emphasis	Speech was sometimes indistinct or quiet	Speech was mostly indistinct and quiet – audience could not hear well
Knowledge	Role was convincing and showed knowledge of the topic	Role deviated from the topic at hand a few times, but generally stayed on topic	Role was mostly not relevant to the topic and went off at a tangent
Relevance	Comments, arguments and viewpoints were relevant to the topic	Had a basic grasp of the topic but a few facts were inaccurate	Knew only one or two facts and didn't fully understand the topic at all
Costumes or props	Costumes and props were appropriately used	Had only one or two items	Had no props or costumes
Preparation	Role play was well prepared and organised	Role play was mostly prepared	Role play was unrehearsed and not well planned

Total: 15

Remedial activities

Topic 1.1

Questions

1. What is one important way to practice good grooming in a food laboratory?
2. Why is it important to keep the food laboratory clean and hygienic?
3. What should be done with dirty utensils and equipment at the close of work in a food laboratory?
4. When working in a food laboratory, should long hair be worn loose or tied back?
5. Which of the following is NOT a good personal hygiene practice in a food laboratory: washing hands thoroughly with soap and water, wearing clean clothes, or keeping jewellery on?

Answers

1. One important way to practice good grooming in a food laboratory is to tie back long hair.
2. It is important to keep the food laboratory clean and hygienic to prevent the contamination of food with harmful bacteria.
3. Dirty utensils and equipment in a food laboratory should be washed and sanitised at the close of work.
4. Long hair should be tied back when working in a food laboratory.
5. Keeping jewellery on is NOT a good personal hygiene practice in a food laboratory.

Topic 1.2

Questions

1. What should you do if you see someone behaving unsafely in the workshop?
2. Where should you report an accident at school?
3. What is personal protective equipment (PPE) used for?
4. Why is it important to maintain a safe working environment?
5. In the workshop, if a tool is broken, what should you do before using it?

Answers

1. If you see someone behaving unsafely in the workshop, you should report it to the teacher or supervisor immediately.
2. An accident at school should be reported to the teacher or a supervisor on duty.
3. Personal protective equipment (PPE) is used to protect yourself from injuries while working.

4. It is important to maintain a safe working environment to prevent accidents and injuries.
5. If a tool is broken in the workshop, you should not use it. Report the broken tool to the teacher or supervisor and wait for a replacement.

Topic 1.3

Questions

Causes and prevention of poor sanitation

1. What is one consequence of poor sanitation in the community?
2. If rubbish is not disposed of properly in the schoolyard, what is this an example of?
3. How can a blocked drain in the workshop cause a health hazard?
4. What is one way to prevent the spread of germs in the home?

Clean energy and improved cookstoves

1. What is an alternative to firewood that can be a clean fuel for cooking?
2. Improved cookstoves are designed to do what?
3. Which of the following is NOT a benefit of using biogas for cooking: reduced smoke in the kitchen, faster cooking times, or increased deforestation?

Answers

Causes and prevention of poor sanitation

1. One consequence of poor sanitation in the community is the spread of disease.
2. If rubbish is not disposed of properly in the schoolyard, this is an example of poor sanitation.
3. A blocked drain in the workshop can cause a health hazard by allowing stagnant water to collect, which can attract insects and promote the growth of bacteria.
4. One way to prevent the spread of germs in the home is by washing hands regularly with soap and water.

Clean energy and improved cookstoves

5. Liquefied Petroleum Gas (LPG) is an alternative to firewood that can be a clean fuel for cooking.
6. Improved cookstoves are designed to use less fuel and burn more efficiently.
7. Increased deforestation is NOT a benefit of using biogas for cooking.

Topic 2.1

Questions

Factors influencing material selection

1. When choosing materials to make a product, what is the most important factor to consider?
2. If you are designing a stool, but the strongest material available is also very expensive, what other factor might influence your choice of material?
3. Kwame wants to build a birdhouse, but he has limited experience with metalwork. What factor should he consider when choosing materials for his birdhouse?

Answers

Factors influencing material selection

1. The purpose and function of the product are the most important factors to consider when choosing materials.
2. The availability of materials is another factor that might influence the choice of material. If the strongest material is too expensive, Kwame might need to choose a different material that is available and affordable.
3. Kwame's skills as a designer are a factor to consider. If he has limited experience with metalwork, he should choose a material that is easier to work with for his birdhouse project.

Topic 2.2

Questions

Factors influencing material selection

1. When choosing resistant materials to make a product, what are three factors to consider?

Techniques and tools for resistant materials

2. Why do resistant materials require specific tools for handling and use?
3. What can happen if you use the wrong tool on a resistant material?
4. What is one safety precaution to take when working with resistant materials?
5. Kwasi wants to cut a metal sheet. What safety equipment should he wear to protect his eyes?

Answers

Factors influencing material selection

1. The purpose and function of the product, the availability of the material, and the skills of the designer are three factors to consider when

Techniques and tools for resistant materials

2. Resistant materials require specific tools because they are strong and can be difficult to cut, shape, or join with ordinary tools.
3. If you use the wrong tool on a resistant material, it could damage the material, break the tool, or cause an injury.
4. One safety precaution to take when working with resistant materials is to wear appropriate safety equipment.
5. Kwasi should wear safety glasses to protect his eyes from flying debris when cutting a metal sheet.

Topic 2.3

Questions

Reasons for using smart and modern materials

1. What is one advantage of using modern materials in products?
2. What is the difference between a modern material and a smart material?

Prototypes with smart and modern materials

3. Imagine you want to design a bag that keeps your drink cold. What smart material could be useful for this project?
4. Kwame wants to build a birdhouse that stays cool in the hot Ghanaian sun. What modern material property might be helpful for this project?
5. Ama wants to design a phone case that changes colour in the sunlight. What kind of material might be useful for this project?

Answers

Reasons for using smart and modern materials

1. Modern materials can offer advantages such as being lighter, stronger, or more durable than traditional materials.
2. Modern materials are simply new and advanced materials, while smart materials are those that can respond to their environment in some way, such as changing colour or shape.

Prototypes with smart and modern materials

3. A material with insulating properties could be useful for designing a bag that keeps drinks cold.
4. A material with reflective properties might be helpful for Kwame's birdhouse project, as it would reflect sunlight and keep the interior cooler.
5. Ama could use a photochromic material for her phone case, which is a type of smart material that changes colour when exposed to light.

Topic 2.4

Questions

Selecting food commodities

1. When choosing fruit at the market, what is one way to tell if it's ripe?
2. Fresh meat should not have any unpleasant odours. True or False?

Meal planning for family members

3. Which family member typically has a higher need for protein than others?
4. Pregnant and lactating mothers need to ensure they consume enough of which nutrient?
5. Older adults may have difficulty chewing. What is one thing to consider when planning meals for them?

Answers

Selecting food commodities

1. One way to tell if a fruit is ripe is by gently pressing it. If it gives slightly, it is likely ripe.
2. True. Fresh meat should not have any unpleasant odours.

Meal planning for family members

3. Adolescents typically have a higher need for protein than other family members due to growth spurts.
4. Pregnant and lactating mothers need to ensure they consume enough calcium for their own health and the developing baby.
5. When planning meals for older adults, consider softer foods that are easier to chew.

Topic 3.1

Questions

Tools and equipment for measuring and marking

1. What is a ruler used for in measuring and marking out?
2. Which tool is best suited for measuring curved lines?

Using measuring and marking tools

3. When measuring with a tape measure, where should the metal end be held to ensure an accurate measurement?
4. How can you mark a straight line for cutting with a pencil and ruler?

Cleaning and maintaining measuring and marking tools

5. What is one way to clean dirt or debris from a steel ruler?
6. Why is it important to store measuring and marking tools properly?

Answers

Tools and equipment for measuring and marking

1. A ruler is used for measuring straight lines and marking straight lines for cutting.
2. A tape measure is best suited for measuring curved lines because it can bend around the curve.

Using measuring and marking tools

3. The metal end of a tape measure should be held against the starting point of the measurement for an accurate reading.
4. To mark a straight line for cutting with a pencil and ruler, hold the ruler in place and slide the pencil along the edge of the ruler to create a straight line.

Cleaning and maintaining measuring and marking tools

5. You can clean dirt or debris from a steel ruler by wiping it with a damp cloth.
6. It is important to store measuring and marking tools properly to prevent damage and ensure they remain accurate. This could involve storing them in a toolbox or hanging them on a rack.

Topic 3.2

Questions

Tools and equipment for cutting and shaping

1. Kwame wants to cut a straight line on a piece of wood. Which tool would be most appropriate: a saw, a hammer, or a chisel?
2. Ama needs to measure and cut fabric for a new dress. What tool should she use to measure the fabric?
3. Kobina is preparing vegetables for a meal. What tool is commonly used for chopping vegetables?

Using shaping and cutting tools

4. How can you ensure a safe cutting motion when using a sharp knife in the kitchen?
5. Why is it important to use the correct saw for the job?

Care and maintenance of tools

6. What should you do with a chisel after using it in the wood workshop?
7. Sewing scissors should be kept sharp for clean cuts. True or False?

Answers

Tools and equipment for cutting and shaping

1. A saw would be the most appropriate tool for Kwame to cut a straight line on a piece of wood.
2. Ama should use a tape measure to measure the fabric for her new dress.

3. A chopping knife is a common tool used for chopping vegetables.

Using shaping and cutting tools

4. To ensure a safe cutting motion when using a sharp knife in the kitchen, keep your fingers pointed away from the blade and cut towards yourself.
5. It is important to use the correct saw for the job because different saws are designed for different cutting tasks. For example, a hacksaw is better for cutting metal than a wood saw.

Care and maintenance of tools

6. After using a chisel in the wood workshop, you should clean any debris from the blade and store it safely in a toolbox.
7. True. Sewing scissors should be kept sharp for clean cuts on fabric.

Topic 3.3

Questions

Joining and assembling materials

1. What is one common way to join fabric pieces together in a sewing workshop?
2. How can bread dough be joined to create a single loaf of bread?

Using joining and assembling tools

3. Kwesi wants to join wooden boards to make a bookshelf. What tool is commonly used for creating strong, permanent joints in wood?
4. When assembling a metal scoop, what type of joining method might be used instead of glue?
5. What is one important safety precaution to take when using a glue gun?

Care and maintenance of joining and assembling tools

6. What is a general rule for storing joining and assembling tools?
7. Why is it important to be mindful of the material a joining tool is made of?

Answers

Joining and assembling materials

1. Thread and a sewing needle are a common way to join fabric pieces together in a sewing workshop.
2. Bread dough can be joined by pinching the edges of the dough together and sealing them with a gentle press.

Using joining and assembling tools

3. Kwesi could use wood glue and clamps to join wooden boards to make a bookshelf. This creates a strong and permanent bond.
4. Soldering or riveting could be used instead of glue when assembling a metal scoop, as these methods create a permanent metal join.

5. One important safety precaution to take when using a glue gun is to avoid touching the hot nozzle, as it can cause burns.

[C-head] Care and maintenance of joining and assembling tools

6. A general rule for storing joining and assembling tools is to keep them in a clean, dry place where they won't be damaged.
7. It is important to be mindful of the material a joining tool is made of because using the wrong tool on a material can damage the tool or the material itself. For example, you wouldn't want to use a glue gun on fabric, as the heat could melt the fabric.

Topic 3.4

Questions

Selecting and purchasing kitchen essentials

1. Kwame has limited space in his kitchen. What should he consider when choosing a blender or food processor?
2. Ama wants to buy a new pot. She has enough money for a high-quality stainless steel pot or a cheaper pot with non-stick coating. Which factor might be most important for her decision?
3. You are buying a kitchen knife. Durability is an important factor to consider. What material is known for making strong and long-lasting knives?

Using mechanical and labour-saving equipment

4. List one advantage of using a pressure cooker to cook food.
5. What is a potential disadvantage of using a food processor to chop vegetables instead of a knife?

Answers

Selecting and purchasing kitchen essentials

1. Kwame should consider the size of the appliance and choose a blender or food processor that will fit comfortably in his limited kitchen space.
2. Intended purpose and use are the factors Ama might consider most. If she wants a pot for everyday cooking that is easy to clean, the non-stick pot might be a better choice. Stainless steel pots are known for durability but may require more effort to clean.
3. Stainless steel is a material known for making strong and long-lasting knives.

Using mechanical and labour-saving equipment

4. One advantage of using a pressure cooker is that it can cook food significantly faster than traditional cooking methods.

5. A potential disadvantage of using a food processor to chop vegetables instead of a knife is that the food processor may chop the vegetables too finely, depending on the desired outcome. Additionally, using a food processor requires cleaning multiple parts, whereas using a knife requires minimal cleaning.

Topic 3.5

Questions

Applying finishes to resistant materials

1. Why is it important to prepare a surface before applying a finish to a resistant material?
2. What can happen if you paint a rusty metal surface?

Finishing edges in sewing

3. What is the purpose of finishing the edges of fabric in a sewing project?
4. Kwasi is sewing a cushion cover. What is a simple way to finish the raw edges of the fabric to prevent fraying?
5. Ama wants to create a rolled hem on a skirt. What tool would she use to help her fold the fabric edge?

Answers

Applying finishes to resistant materials

1. It is important to prepare a surface before applying a finish to a resistant material to ensure a smooth, even finish and better adhesion of the paint or other coating. This may involve cleaning, sanding, or removing any rust or dirt.
2. If you paint a rusty metal surface, the paint may not adhere properly and will likely peel or flake off over time. The rust can also continue to spread underneath the paint.

Finishing edges in sewing

3. Finishing the edges of fabric in a sewing project prevents fraying, strengthens the edges, and gives a neater, more professional look to the finished garment.
4. A simple way to finish the raw edges of fabric to prevent fraying is to use a zig-zag stitch on a sewing machine.
5. Ama would use an iron and a sewing gauge to help her fold the fabric edge precisely when creating a rolled hem on a skirt.

Topic 4.1

Questions

Mechanisms in products

1. A seesaw is a simple example of which mechanism?

2. Flagpoles often use a system of ropes and wheels to raise and lower the flag. What mechanism is at work here?

Features and operations of mechanisms

3. What is the main feature of a lever that allows it to multiply force?
4. Crank mechanisms are used in many machines. Describe the basic movement of a crank mechanism.

Designing with mechanisms

5. Imagine you are designing a nutcracker. Which mechanism(s) would help crack nuts with minimal effort?

Answers

Mechanisms in products

1. A seesaw is a simple example of a lever mechanism.
2. Flagpoles often use a pulley system with ropes and wheels to raise and lower the flag.

Features and operations of mechanisms

3. The main feature of a lever that allows it to multiply force is the fulcrum, which acts as a pivot point. The distance between the effort (force applied) and the fulcrum compared to the distance between the load (resistance) and the fulcrum determines the mechanical advantage of the lever.
4. Crank mechanisms convert rotary motion (circular) into reciprocating motion (back-and-forth). Imagine a bicycle pedal - the circular motion of your foot pedalling translates to the back-and-forth movement of the pistons in the engine.

Designing with mechanisms

5. A nutcracker could benefit from a combination of mechanisms. A lever principle can be used with a handle acting as the effort arm and a hinge acting as the fulcrum to crack the nut. Additionally, a screw mechanism could be incorporated within the lever to increase the crushing force applied to the nut.

Topic 5.1

Questions

Developing surfaces of objects

1. Imagine a box of juice. What basic 3D shape is the juice box most similar to?
2. Why is it important to develop the surfaces of objects before they are manufactured?

Developing surfaces with instruments

3. How many flat faces does a square pyramid have?

4. When developing the surface of a rectangular prism, how many rectangles will typically be needed to create the complete shape?

Understanding orthographic projections

5. What is the main function of using orthographic projections?
6. There are two main types of orthographic projections used in technical drawings. Name one of them.

Answers

Developing surfaces of objects

1. A juice box is most similar to a rectangular prism, a 3D shape with six rectangular faces.
2. Developing the surfaces of objects before they are manufactured allows for planning, measuring materials needed, and creating templates to ensure the final product is made accurately and efficiently.

Developing surfaces with instruments

3. A square pyramid has five flat faces: one square base and four triangular sides.
4. When developing the surface of a rectangular prism, you will typically need six rectangles to create the complete shape (one for each face).

Understanding orthographic projections

5. The main function of using orthographic projections is to represent a 3D object in two dimensions (flat drawings) by showing the front, top, and side views of the object. This allows for clear communication of the object's design and dimensions for manufacturing purposes.
6. One of the two main types of orthographic projections is first-angle projection. There is also a third-angle projection.

Topic 5.2

Questions

Designing for users

1. Imagine you are designing a school bag for students. What are some user requirements you would consider?
2. Kwame wants to design a bird feeder for his garden. What is one way he can clarify the user requirements (the needs of the birds) for his design?

Generating ideas

3. Ama is designing a new phone case. List two ways she can generate creative ideas for her design.
4. Why is it important to generate multiple ideas during the design process?

Developing the solution

5. After generating ideas, how can you choose the best solution for your design project?

Answers

Designing for users

1. User requirements for a school bag might include things like size, comfort, durability, number of compartments, water resistance, and style preferences of students.
2. Kwame could research the types of food different birds eat and design a feeder with openings suitable for the birds he wants to attract.

Generating ideas

3. Ama could generate creative ideas for her phone case design by sketching different ideas, looking at existing phone cases for inspiration, or researching online trends and popular designs.
4. Generating multiple ideas during the design process allows for a wider range of possibilities and a better chance of finding the most creative, functional, and user-friendly solution.

Developing the solution

5. After generating ideas, you can choose the best solution for your design project by considering factors like how well it meets the user requirements, its originality, feasibility of production, and overall aesthetics.

Topic 5.3

Questions

Cooking methods and planning

1. Kwame wants to cook a whole chicken for dinner. Which dry cooking method would be most suitable: baking or grilling?
2. What is one advantage of using dry cooking methods like baking or grilling?
3. Ama is planning a lunch menu. What is one important factor to consider when planning a menu?

Clarifying user requirements

4. What is the purpose of a cutting list when planning to make an artefact?
5. Working drawings can help clarify user requirements. True or False?

Natural building materials

6. Clay is a natural building material. List one use for clay in construction.
7. Laterite is mentioned twice. Is laterite a commonly used natural building material in Ghana?

Answers

Cooking methods and planning

1. Baking would be the most suitable dry cooking method for a whole chicken.
2. One advantage of using dry cooking methods like baking or grilling is that it can help create a crispy outer layer on food.
3. One important factor to consider when planning a menu is the dietary needs and preferences of those who will be eating.

Clarifying user requirements

4. A cutting list helps plan and ensure you have the correct measurements and quantities of materials needed to cut for an artefact before you begin construction.
5. True. Working drawings with measurements and details can help clarify user requirements by visually representing the final product.

Natural building materials

6. Clay can be used in construction for bricks, floors, or even as a plaster material.
7. Yes, laterite is a commonly used natural building material in Ghana. It is a reddish-brown stone or earthen material valued for its durability and fire resistance.

Topic 5.4

Questions

Dry cooking methods

1. Ama wants to bake a cake. What are two examples of dry ingredients she would need?
2. Kwesi is grilling chicken for dinner. What tool would he use to turn the chicken pieces on the grill to ensure even cooking?

Crocheting and embroidery

3. Crocheting and embroidery are both techniques for creating textiles. What is the main difference between crocheting and embroidery?
4. Ama wants to make a tablecloth using embroidery. What is one type of fabric that would be suitable for embroidery?

Gathering materials and tools

5. Kwame is planning to build a birdhouse. List two examples of materials he might need to gather for this project.
6. Before starting any craft project, it is important to check you have all the necessary tools and equipment. True or False?

Answers

Dry cooking methods

1. Flour and sugar are two examples of dry ingredients Ama would need to bake a cake.

2. Kwesi would use tongs to turn the chicken pieces on the grill to ensure even cooking.

Crocheting and embroidery

3. Crocheting uses yarn or thread to create complete fabrics or objects through loops and stitches. Embroidery involves decorating existing fabric with needle and thread to create patterns or designs.
4. Ama could use cotton fabric as a suitable base for embroidering a tablecloth.

Gathering materials and tools

5. Kwame might need to gather wood and nails as two examples of materials for building a birdhouse.
6. True. Before starting any craft project, it is important to check you have all the necessary tools and equipment to avoid delays or frustration during the creation process.

Topic 6.1

Questions

Changing workplace

1. Imagine a factory that used to employ many people on an assembly line. How might workplace automation affect the number of people needed in that factory?
2. What is one way that Information and Communication Technology (ICT) can be used in the workplace?

Value of work

3. Ama wants to open her own catering business. What is one benefit of working for herself?
4. Kwesi enjoys fixing electronics in his free time. How could his skills be valuable to society if he pursued a career in electronics repair?

Career planning

5. Kwame is interested in a career in fashion design. What is one step he could take now, while still in school, to help him with his career plan?

Answers

Changing workplace

1. Workplace automation could lead to a decrease in the number of people needed on the assembly line, as machines might be able to perform some or all of the assembly tasks.
2. ICT can be used in the workplace in many ways, such as for communication (email, video conferencing), data storage and management, or using specialised software for design, engineering, or accounting tasks.

Value of work

3. One benefit of Ama working for herself is that she would have more control over her work schedule and potentially her income.
4. Kwesi's skills in electronics repair could be valuable to society by helping people fix their broken electronics, reducing waste and saving them money.

Career planning

5. Kwame could take a fashion design class or workshop to learn more about the skills and knowledge needed for a career in fashion design. He could also research different career paths within fashion design and explore opportunities for internships or apprenticeships.

Topic 6.2

Questions

Starting a small business

1. Kwame wants to start a small business selling fruit drinks. List two different ways he could go about starting this business.
2. What is the importance of choosing a legal form of business (e.g., sole proprietorship) before starting a business?

Managing resources in a small business

3. Ama wants to know what products are in demand before starting her bakery. What is one way she can find out this information?
4. Kwesi understands the importance of managing resources in his small business. List one factor he should consider when managing his resources.

Processes of starting and managing a business

5. The passage mentions different processes involved in starting and managing a business. Can these processes be completed in any order? (True/False)

Answers

Starting a small business

1. Kwame could start his fruit drink business by taking over an existing business or starting a completely new business venture.
2. Choosing a legal form of business helps determine ownership, liability, and tax implications for Kwame's business.

Managing resources in a small business

3. Ama could conduct market research by surveying potential customers, researching existing bakeries in the area, or looking at online trends to see what baked goods are popular.
4. One factor Kwesi should consider when managing his resources is the cost of supplies, such as fruit, sugar, and packaging materials, to ensure he can run his business profitably.

Processes of starting and managing a business

5. False. There are specific steps involved in starting and managing a business, such as obtaining licenses before starting operations.

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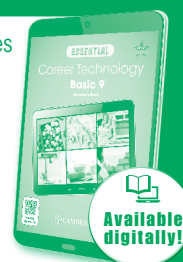
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