MINISTRY
OF
EDUCATION, YOUTH & INFORMATION
Every Child Can Learn, Every Child Must Learn

NATIONAL STANDARDS CURRICULUM

RESOURCE & TECHNOLOGY

GRADE 8 APSE1

NATIONAL STANDARDS CURRICULUM GUIDE

GRADE 8

RESOURCE & TECHNOLOGY

APSE1

ACKNOWLEDGEMENT

Our connection with each other is unquestionable and so at the end of this arduous yet rewarding journey, the Ministry of Education, Youth and Information gratefully acknowledges the contributions of the following individuals and institutions who generously gave of their time and resources in the planning and development of the National Standards Curriculum (NSC):

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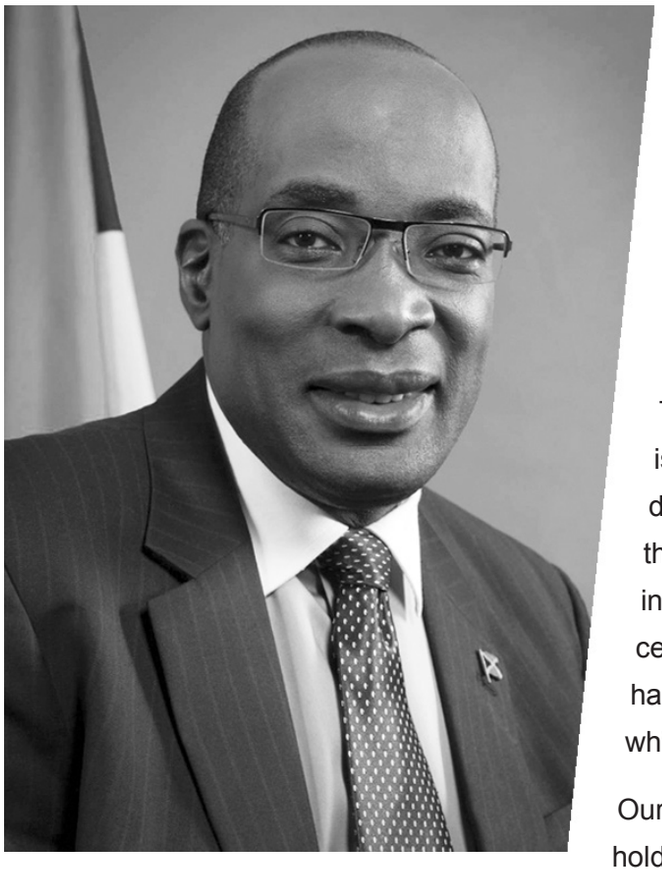
MESSAGE



Education has always been pivotal to societal and economic development. It is for this reason that Jamaica remains unshaken and hopeful of a realized vision to be “the place of choice to live, work, raise families and do business.” The assurance of the possibility of all that such a vision entails comes from the recognition that Jamaica is endowed with tremendous God-given talent and creative potential and as a people of strong faith in spiritual principles and resilience; we are able to harness our capabilities, to make significant influence on the world. It is through this new National Standards Curriculum (NSC) that we hope to propel this vision of the education system whilst becoming more relevant, current and dynamic.

The team at the Ministry of Education Youth and Information is cognizant of the fact that the curriculum is the heart and mind of education and remains the most powerful means by which any country can develop and be sustainable. It is for this reason that the NSC has been designed with the understanding that people, learning and national development are at the core of our existence in a time of rapid change in the physical, social, economic and other dimensions of the global landscape. As a consequence, we celebrate the wisdom of the developers who through the engagement of numerous stakeholder groups, have responded favourably to the need for that kind of education that prepares our young people for life; while challenging our more mature to join in this lifelong journey of learning to learn.

Our commitment to the development of each learner and our support and appreciation of the various stakeholder groups that are partnering with us in providing quality education, remain at the forefront of our efforts in ensuring that this journey transforms education. This commitment is conveyed through our adoption of a Pathway Approach to learning that demands of us to provide customized programmes, differentiated learning experiences and specialized support for our learners. Our actions have been fruitful as is evident by the systems and conditions we have put in place for successful implementation.

Like the rest of Jamaica, I look forward to the testimonials of students, parents, teachers and other stakeholders of the empowering effect of this learner- centred curriculum and remain confident that it will contribute to make Jamaica renown.

The Honourable, Senator Ruel Reid,CD

Minister of Education, Youth & Information

MESSAGE

Building a modern society where young people can prosper and achieve their aspirations is paramount on the Ministry of Education, Youth and Information's (MOEYI) agenda. In its bid to advance this agenda the team at the MOEYI has developed the National Standards Curriculum (NSC) on a clear set of values that will permeate learning and become embedded in young people's approach to life. Young people need to be clear about their Jamaican identity. Justice, democracy, tolerance and respect need to be more than mere words; they need to become an essential part of people's lives. Young people's understanding of, and commitment to, sustainable development is critical to the future of Jamaica and of the world. These values that permeate the new curriculum and more importantly, will by its use, be ingrained in the fabric of the Jamaican society.

The development of a new curriculum is a major achievement in the life of any country. It is even more noteworthy because this curriculum embodies the set of knowledge, skills, values and attitudes that our country deems relevant at this particular time. It is intended that these attributes be conveyed to the next generation as a means of cultural continuity in preparation to cope with the future, both nationally and individually.

I am particularly excited about the prospects of the NSC honing key twenty-first century skills such as communication, collaboration, critical thinking and creativity in our youth as they prepare to take on their roles as global citizens. I encourage parents, students, teachers and indeed the community to partner with us as we prepare our young people not just for today, but for the rapidly changing times ahead.

The Honourable, Floyd Green, MP

State Minister in the Ministry of Education, Youth & Information

MESSAGE

In responding to the challenges confronting education in Jamaica, The Ministry of Education Youth and Information has taken strategic measures to address the need for a national curriculum that is relevant for the 21st century, the dynamics of the Jamaican context and the profile of the learners at the pre-primary, primary and secondary levels. One major output of these strategic actions is the National Standards Curriculum. This curriculum is intended to be one of the means by which the Jamaican child is able to gain access to the kind of education that is based on developmentally-appropriate practice and the supporting systems and conditions that are associated with high quality education.

This curriculum has the potential to inspire and provide challenges in the form of problem situations that all our learners can handle in ways that are developmentally appropriate. It compels us to move beyond the traditional functional perspectives of being literate to a focus on the physical and physiological as well as the ethical, social and spiritual.

I invite all our stakeholders to fully embrace this new curriculum which promises to excite imaginations, raise aspirations and widen horizons. Learners will become critical and creative thinkers with the mindset required for them to be confident and productive Jamaicans who are able to thrive in global settings as they take their place in the world of uninhibited change.

Mr. Dean Roy Bernard

Permanent Secretary , Ministry of Education, Youth & Information

MESSAGE

It was the mandate of the Curriculum Units of the Ministry of Education, Youth and Information to spearhead the crafting of a new curriculum for the nation, in keeping with international standards, global trends in the educational landscape and societal goals and aspirations. The mandate had several facets: to establish clear standards for each grade, thereby establishing a smooth line of progression between Grades 1 and 9; to reduce the scope, complexity and amount of content; to build in generic competencies such as critical thinking across the subjects; to ensure that the curriculum is rooted in Jamaica's heritage and culture; to make the primary curriculum more relevant and more focused on skills development, and to ensure articulation between primary and secondary curricula, especially between Grades 6 and 7. To achieve this, the MoEYI embarked on an extensive process of panel evaluations of the existing curricula, consultation with stakeholders, (re)writing where necessary and external reviews of the end products.

Today, we are indeed proud that, the curriculum development teams have succeeded in crafting a curriculum which has met these expectations. Under the National Standards Curriculum (NSC) focus will be given to project-based and problem-solving learning, with an integration of Science, Technology, Engineering and Mathematics/Science, Technology, Engineering, Arts and Mathematics (STEM/STEAM) methodologies across the system. Learners will benefit from more hands-on experiences which should enhance the overall learning experience and cater to the different kinds of learners in our classroom. In addition, they will be exposed to work-based learning opportunities that will help them become productive citizens of Jamaica and the world at large.

It is anticipated that as school administrators and teachers system-wide implement the National Standards Curriculum that improvements will be evident in the general academic performance, attitude and behaviour of our students.

We anticipate the participation of all our stakeholders in this process as we work together to improve the quality of life and prospects for all the children of Jamaica and to realize our mantra that *every child can, and must, learn.*

Dr. Grace McLean

Chief Education Officer, Ministry of Education, Youth & Information

M E S S A G E

The Ministry of Education Youth and Information (MoEYI) is committed to providing high quality education to all Jamaican children. We have heard the cries from the various sectors of the Jamaican society about the level of preparedness/readiness of our students for life in the 21st century; and we are taking the necessary steps to ensure that our students graduate with marketable skills. The MoEYI has reviewed and redesigned the Grades 1-9 curricula around the principles of Vision 2030 Goal number one; “Jamaicans are empowered to achieve their fullest potential”.

The National Standards Curriculum (NSC) will lay the foundation for students by preparing them for working lives that may span a range of occupations, many of which do not currently exist. This has been done by way of designers carefully integrating the theoretical principles of Science, Technology, Engineering and Mathematics/Science, Technology, Engineering, Arts and Mathematics (STEM/STEAM) methodologies into the curricula at all grade levels. The NSC illustrates that in order to make education effective for our 21st century children; we need to change how we teach, and what we teach.

We are satisfied that the curriculum designers and writers have produced a curriculum that is indeed fitting for the 21st century. The NSC was designed to develop students’ understandings of subject matter and their ability to apply what is learnt; it fosters their ability to communicate and solve problems collaboratively, think critically and create novel solutions.

The success of our children is dependent on the participation of all stakeholders in the learning process. We encourage you all to be our committed partners in education as the true impact of this curriculum will only be felt when we have all hands on board. I am indeed proud to be associated with the development and implementation of this curriculum; it will inspire hope in our nation and future generations; kudos to the various teams that contributed to its development.

Mrs Lena Buckle Scott

Deputy Chief Education Officer,

Curriculum and Support Services, Ministry of Education, Youth & Information

MESSAGE

The 21st century has challenged countries to provide quality education for all. The key challenge to this paradigm is how to develop and sustain an education structure and system that will prepare citizens to compete in the knowledge based economy.

With the paradigm shift in our labour force demands, greater emphasis is being placed on how teaching and learning takes place in our schools. This is with a view to build 21st Century skills among our students who will in a few years join our workforce at different levels. In a bid to ensure that these objectives are met, adjustments and inclusions to our curriculum at the primary level is paramount for the transformation to be effective.

For the first time in our education system, Technical and Vocational Education and Training (TVET) is being integrated at the primary level through the Resource & Technology programme. The Resource & Technology Curriculum emphasizes a project based learning approach that has been adopted to introduce content, skills and attitudes and to ensure authentic learning activities that engage students' varying interests and motivation.

The aim of Resource and Technology at this level is to foster students' awareness of foundational technical skills and their relationship to future careers and occupations. The discrete introduction of this program at Grades 4-6 proposes that students be engaged in the development of projects which will provide them with the opportunity to build foundational Technical and Vocational skills in a real life context. This inclusion not only provides progression to the upper secondary Technical Vocational programmes, but reflects awareness of our national needs.

With these benefits in mind, an inclusion of a Resource & Technology programme at our primary education level and the revision of the secondary programme is fully endorsed and supported..

Mr. Anthony Gray

Assistant Chief Education Officer,

Technical and Vocational Unit, Ministry of Education, Youth & Information

TERMS	DEFINITIONS/MEANINGS
Range of Content	Provides an overview of the concepts, knowledge, skills and attitudes that will be developed in a unit of study.
About the Unit	Gives a brief overview of the content, skills that are covered in the unit and the methodologies that are used. As well as the attitudes to be developed.
Standards	Statements that explain what all students are expected to know and be able to do in different content areas by the end of a course of study e.g. by the end of period spanning grades 4 – 9.
Attainment Targets	An attainment target is a desired or expected level of performance at the end of a course of work, within a given/specified teaching- learning period. Attainment targets identify the knowledge, skills and understanding which students of different abilities and maturities are expected to have by the end of each Grade. It is the standard that we expect the majority of children to achieve by the end of the grade.
Benchmarks	Behaviours students are expected to exhibit at different stages of development and age/ grade levels.
Theme/Strands	Unifying idea that recurs throughout a course of study and around which content, concepts and skills are developed.
Prior Learning	It is what students are expected to already know through learning and experience about a topic or a kind of text.
Specific Objectives	Specific objectives state what the student is expected to know or understand as a result of the learning experience. The specific objective is usually framed in the areas of the knowledge, skills and attitudes that the students are expected to achieve. Specific objectives tell us what the children will learn or will be taught.
Suggested Teaching/Learning Activities	A teaching/learning activity is an organised doing of things towards achieving the stated objectives. They are suggested activities that are crafted in a way to be an efficient vehicle which can move the student between what is to be learnt (objective) and what the student is to become (outcome).

TERMS	DEFINITIONS/MEANINGS
Key Skills	Indicate the important skills that students should develop duringthe course of a unit. Key skills are aligned to the suggested teaching and learning activities in the unit which are intended to develop the skill to which it is aligned. Included in the key skills are the 21st century skills such as critical thinking and problem solving, collaboration, communication and ICT.
Assessment	An assessment is a determination of whether intended results have been achieved. This section of the curriculum speaks to both the product that will be judged as well as the criteria against which it will be judged. It must be noted that this section does not introduce new activities. Instead, it speaks to the judging of the suggested teaching and learning activities. Formal assessment may be conducted with the aid of instruments (e.g. via writen test, portfolio) or by requiring students to complete assigned tasks (e.g. performance), and is usually recorded against a predetermined scale of grading. Informal assessment (e.g. via observation or spontaneous student expression) may also reveal important evidence of learning.
Points to Note	This section provides technical information that must be considered in delivering the unit. It may also include information that provides additional explanation of key concepts that may be unfamiliar to the teacher as well as suggestions for infusion within the unit.
Extended Learning	These are opportunities for students to utilise the knowledge and skills they would have acquired in the unit in authentic situations/experiences.
Learning Outcomes	A learning outcome is a demonstration/ behavioural evidence that an intended result has been achieved at the end of a course of study. The learning outcome tells us if pupils have understood and grasped what they have been learning.
Links to other Subjects	Suggests opportunities for integration and transfer of learning across and within different subject areas.
Key Vocabulary	This section consists of a number of words/phrases that addresses the skills, topics and content that must be covered in the unit.

The Resource and Technology curriculum has been revised at Grades 7-9 and succeeds the previous curriculum which was first introduced in the education system in 1989 with a second review conducted in 1999. The revised Resource and Technology programme has been developed as a working document at the primary and secondary levels of the education system. The subject is now organized in four modules namely, Agriculture and the Environment, Business Basics, Industrial Techniques, and Family and Consumer Management formerly referred to as Home and Family Management. The Design Arts module in the former curriculum is now infused as a unit in the Visual Arts programme. Each module presents appropriate content through which the understanding, creation and application of technology may be achieved, providing technological knowledge and skills peculiar to each.

The first edition of the Resource & Technology curriculum has been developed for the upper primary level as a discrete subject and is a pre-cursor to the Grades 7-9 Resource and Technology programme. Students will be exposed to foundational technical and vocational skills. The curriculum is different in format and design providing numerous opportunities to be engaged in practical skills, constructed according to the strands and attainment targets. Teachers may design or modify the projects to suits the needs of the local environment.

The project-based learning approach has been adopted to introduce content, skills and attitudes and is the instructional approach built upon authentic learning activities that engage student's interest and motivation. At all grades levels the content is presented using real life contexts resulting in practical outcome based activities. Students will have the opportunity to learn new knowledge and develop new and emerging Technical and Vocational skills.

The practical application of Science, Technology, Engineering and Mathematics (STEM) education is being emphasized to ensure that students at this early stage develop an understanding of the importance of integrating these knowledge and skills in the Technical and Vocational programmes. The **'E' Engineering Design Process**, a problem solving approach which is used in Resource and Technology is standard and prescriptive and is the methodology for teaching the subject. This should ensure that similar concepts are learned by all students in all schools irrespective of the nature of the projects selected.

The activities outlined are suggestions and are provided to stimulate further creative ideas for activities as each school context is different in terms of availability of resources and problems to be solved.

RESOURCE & TECHNOLOGY

Encourages the creative and innovative use of tools, material, equipment, knowledge, skills and systems to solve real life problems.

Modules

- Agriculture & the Environment
- Business Basics
- Family & Consumer Management
- Industrial Techniques

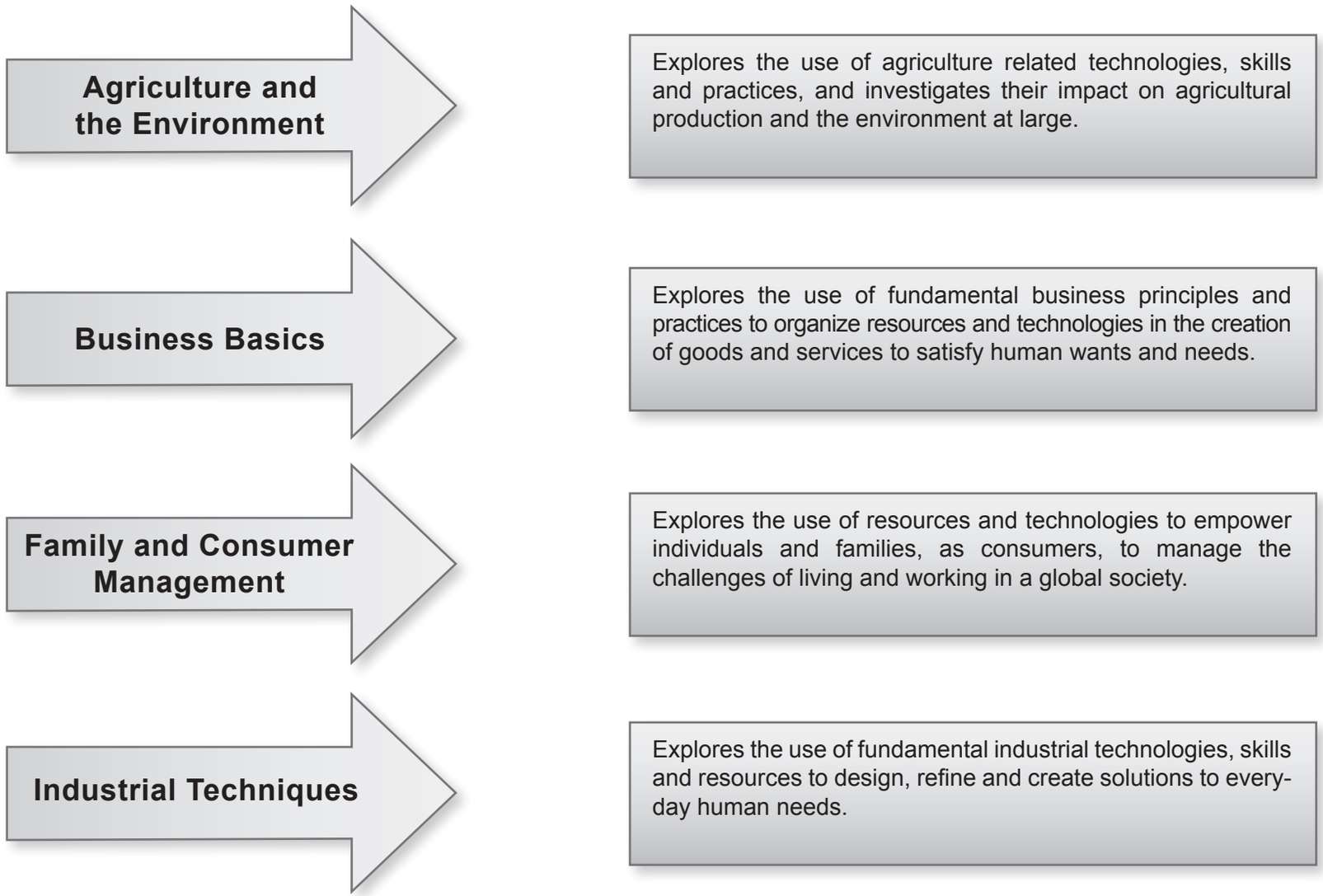
TVET Integration Model

- Grades 1-3
  TVET Induction
  Integrated Approach
- Grades 4-6
  TVET ORIENTATION
  Building TVET foundational skills
  Conceptualizing solutions for everyday problems
  (Project based)
- Grades 7-9
  TVET EXPLORATION
  Introducing new knowledge and emerging skills in real life context
  (Project based)

Areas of Focus

21st Century Skills	Problem solving, critical thinking, communication collaboration and creativity.
New and Emerging Skills	Problem based, reality based, design driven, decision making and technology based
Career Education	Explore traditional and non-traditional careers associated with each module of Resource & Technology
SCIENCE, TECHNOLOGY, ENGINEERING, MATHEMATICS (STEM EDUCATION)	Integration of Science and Mathematics related concepts, utilizing knowledge, skills and attitudes with resources to solve real life problems

Resource and Technology is a single subject spanning the breadth of technical and vocational foundational competencies. Content is organized in four modules with each providing its own specialized knowledge and skills, which are integral to the understanding of how resources and technology are utilized in meeting needs and solving problems experienced on a daily basis.



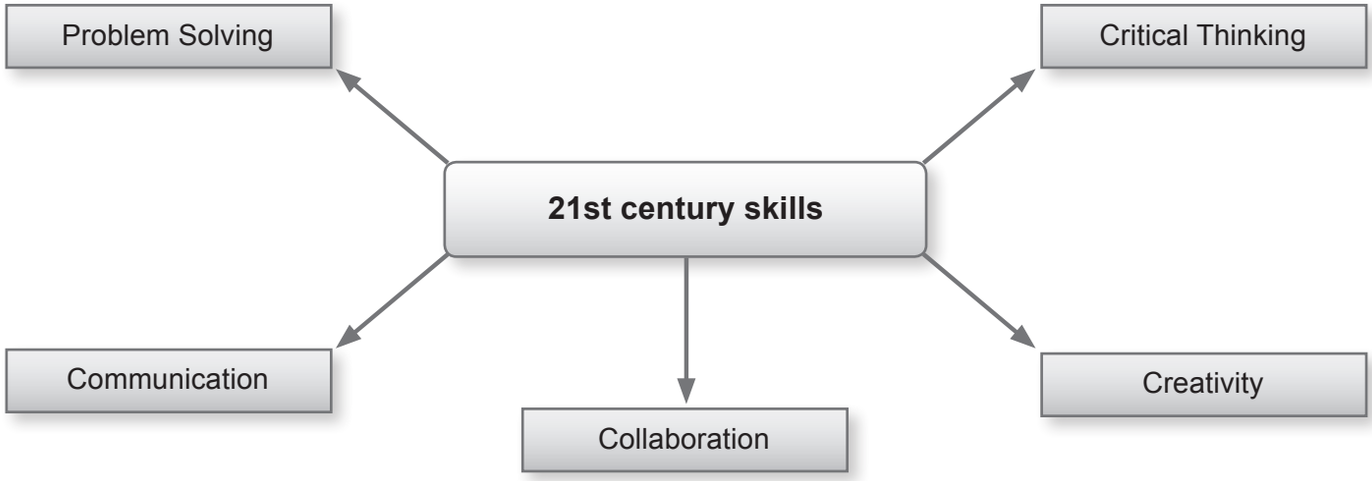
Module Synopses

PHILOSOPHICAL STATEMENT

Technical and Vocational Education in Jamaica has embarked on a new era in the twenty-first century. New and emerging careers are being introduced at a rapid pace and most jobs require a technological background and an understanding of processes to create solutions to the many challenges experienced in the world. If Jamaica is to be a part of the high-tech global market place, the workforce must possess the requisite competencies. To achieve our goal of producing students with the desired technological competencies, attitudes and theoretical knowledge to participate in the international marketplace, technical and vocational education must be seen as the vehicle. We must begin by exposing our learners at the beginning grades to understand, appreciate and develop skills to create solutions to real life problems. It is for this reason that the Ministry of Education has integrated Technical and Vocational skills in the Grades one to three curriculum and the revised Resource and Technology programme is being introduced as a discrete discipline from as early as Grade 4 to provide students to use a range of materials and gain appropriate skills to use tools and equipment efficiently.

The emphasis of the Resource and Technology programme is on 'problem solving' which should unearth the potential of learners so that they can become originators of solutions rather than adapters of solutions. We also believe that an understanding of processes involved in creating a solution or system is critical to the outcome. As part of a global community we must ensure our students develop skills to conceive, plan, design and create solutions which can compete with others goods and services and meet the needs of the consumer. The opportunity must also be provided for learners to utilize available resources at their disposal to create solutions. This will result in greater appreciation and utility of our local and indigenous resources. Students will develop confidence in using them to create solution to everyday problems and assist in using foreign exchange to acquire those items we cannot produce locally.

The Resource and Technology programme is not gender-biased and is designed for learners of all ability levels and socio-economic groups. However, one of the most important features is that it encourages students to work collaboratively in search of solutions to everyday problems. This is a desirable focus that we believe should help students develop critical skills which will be reflected in their lives as they contribute to the productive sector.



Skills of the 21st Century Learner

The inclusion of Resource and Technology as a core subject in the National Standards Curriculum for Grades 4-9 can be justified as it:

- aims to meets the needs of students
- provides for progression to upper secondary
- reflects awareness of national needs

There are 4 Strands and 4 key Attainment Targets within Resource & Technology as outlined below:

STRAND 1:
CREATIVITY & INNOVATION
Students will be able to apply creativity and innovation in the solution of problems

AT 1
Conceptualize and develop solutions that reflect understanding of client needs, and the effectiveness of a particular solution in meeting those needs.

STRAND 2:
EXPLORING METHODS AND PROCEDURES
Students will be able to Explore Methods & Procedures in solving problems

AT 2
Use resources efficiently and use appropriate techniques in the execution of tasks.

STRAND 3:
APPLYING SOLUTIONS
Students will be able to apply appropriate strategies in finding solutions to identified needs

AT 3
Manage resources with the aid of appropriate technologies in the execution of a task.

STRAND 4:
CAREER PATHWAYS
Students will develop awareness of a range of career pathways

AT 4
Refine personal career possibilities and practice the skills related to each.

NSC

RESOURCE & TECHNOLOGY

AGRICULTURE & THE ENVIRONMENT

GRADE 8 PROJECTS

AIM OF AGRICULTURE AND THE ENVIRONMENT

The object of Agriculture and the Environment curriculum is to provide a guide for students at Grades 7-9 to gain fundamental agricultural concepts through hands-on experiences, underpinned by related knowledge and attitudes, which are transferrable to upper-school or out-of-school situations. Through the processes involved in conceptualizing, designing, implementing and evaluating agricultural projects, the students engage available resources in creative ways to find solutions, while striving to protect and/or enhance the natural environment. Mindful of their peer, teachers, and other stakeholders, individual students seek to emphasize safety and hygienic practices in pursuit of competencies in areas such as, leadership, healthy lifestyles, character building, volunteerism, self -confidence, self-actualization, and citizenship.

While not necessarily pursuing an agricultural vocation in the future, the project-based approach to developing and implementing agricultural projects give the student an insight into the role of agriculture in national, regional and international economies, the diversification of agricultural enterprises, the primal role of agriculture, as well as, the realization that all normal humans must interact meaningfully with some form of agricultural outputs.

The study of Resource and Technology should enable students to become:

- critical thinkers and problem solvers
- confident, responsible and productive citizens
- adaptable to changes in the world around them
- aware of range of future focussed career options

TERM 1

Project 8.1: Produce new plants by vegetative propagation

- Economic importance
- Methods
- Types of resources
- Specialized plant structures used in propagation
- Select plants suitable for propagation
- Methods of vegetative plant propagation

Budding	Ground layering	Stem Cutting
Air layering	Grafting	Leaf Cutting
Sucker removal	Runner/Stolon	Division
Tuber cutting	Tissue Culture/Micro propagation	

- Use different methods appropriate to propagate given types and number of plants
- Critical steps in carrying out each propagation method studied
- List three (3) plants commonly propagated by named vegetative methods
- Design and layout planting area
- Keep accurate records

TERM 2

Project 8.2: Rearing Rabbits

- Why raise rabbits?
  - Pros and cons
- Establishing a rabbitry
  - Choosing the right breed
  - Purchasing tips
  - How many rabbit to start with
  - How old should the starter breeding stock be
  - What are the housing options in a tropical climate
- Design rabbit housing
  - Building materials (indigenous, commercial)
- Tools & Equipment (home-made, commercial)
  - Types
  - Description
  - Uses
  - Care and maintenance
  - Performance goals for a given rabbit enterprise
  - Develop a budget for the designed rabbitry
  - Identification system(s) for rabbits
  - Develop record keeping documents for the rabbitry
- Caring the rabbit herd
  - Rabbits nutrition
  - Managing rabbit health
- Marketing rabbit products
  - Strategies
  - Products
- Live rabbits
  - Breeders
  - Pets
  - Experiment
  - Fryers

TERM 3

Project 8.3: Grow crops with emphasis on Soil Fertility

- How crops grow
  - Parts of the plant and their functions
  - Review plant processes
- Where do plants grow
  - Soil growing medium
  - Soilless growing media
- What plants need to grow
  - Environmental conditions for good plant growth
  - Classification of plant nutrients
- Macro –nutrients
- Micro-nutrients
  - Sources of plant nutrients
  - Symptoms of nutrient deficiencies and excesses
- What factors affect soil fertility
  - Impact of soil structure and soil texture on soil fertility
  - Availability of organic matter or humus
  - Erosion of topsoil
  - Nutrient depletion through crop removal
  - Cultural practises used in crop production
- Use cultural practices to enhance soil fertility and improve crop productivity

GRADE 8

RESOURCE & TECHNOLOGY

AGRICULTURE & THE ENVIRONMENT

PROJECT: 8.1

Producing Plants by Vegetative Propagation

Create a Garden Using Plants Produced by Vegetative Propagation

STEM INTEGRATION – CREATE A GARDEN USING PLANTS PRODUCED BY VEGETATIVE PROPAGATION

SCIENCE

- Definition of vegetative/asexual propagation
- Definition of natural and artificial vegetative propagation
- Methods of natural vegetative propagation and artificial vegetative propagation
- Plant parts appropriate for vegetative propagation
- Advantages and disadvantages of vegetative propagation
- Rooting/growing medium appropriate for vegetative propagation
- Importance of rooting hormone
- Conditions necessary for vegetative propagation

MATHEMATICS

- Measurement of size and length of plant parts
- Measurement of planting distance for laying out plot
- Calculate total area occupied by given cropping units
- Calculate the number of plants for the required space
- Calculate resources required based on number of plants to be produced
- Create activity schedule based on time required for the various activities
- Determine the costs of resources based on requirements and unit cost
- Calculate the percentage success obtained
- Estimate value of plant produced based on number and costs per unit.

WHAT IS BEING ASSESSED?

Knowledge and skills required to propagate plants by vegetative/ asexualmeans and using the propagated plants to establish the garden

TECHNOLOGY

- Competence in the use of small hand tools and materials for propagating plants: secateurs, potting bags, propagating knives, cords, strings rooting hormone, polyethylene plastic, potting bags, growth medium.
- Awareness of various forms of technologies used in plant propagation
- Competence in using appropriate tools in caring for newly established plants in garden
- Use appropriate technology to develop design for the garden to be established
- The most appropriate technology to achieve a given number of plants within a specific time

'E' DESIGN PROCESS

- Identification of problem to be solved
- Problem statement created
- Ideas for solving problem generated
- Idea(s) of possible solution selected
- Plan procedure for propagating plants by vegetative means
- Plan procedure for designing a garden
- Implementation of planned procedure
- Outcome of the project evaluated against established criteria
- Presentation of results (success rate of vegetative propagation and survival rate of plants established in the garden)

The students will develop key skills, knowledge and attitudes by learning:

- What is vegetative propagation
- Economic and environmental impact of vegetative propagation
- Types of plants and the method(s) that lend(s) itself to vegetative propagation
- Parts of the plants used in natural vegetative propagation
- What are the method(s) of vegetative propagation
- Advantages and disadvantages of vegetative propagation
- Parts of the plants used in artificial vegetative propagation
- Resources need for vegetative propagation
- Ideal time and conditions necessary for vegetative propagation
- Select and prepare plants for vegetative propagation
- Growing media required for vegetative propagation
- Important design principles in creating a garden
- Classification of resources
- Safe and hygienic practices in the work environment
- The correct use of related tools and equipment
- Qualities to look for when selecting plants for vegetative propagation (disease free, uniformity)
- How to care for the plant before, during and after vegetative propagation
- Explore and practice the different types of natural and artificial vegetative propagation
- Select and prepare propagation media
- Planning techniques/strategies
- Time management
- Team work/group dynamics
- Careers related to artificial plant propagation
- Strategies in evaluating project outcome
- Related strategies to protect the environment

About the Project

In this Project students will learn about producing new plants by artificial vegetative propagation over a period not exceeding one (1) term. Plants may include any grown as ornamental, food, or for medicine and which are produced by vegetative propagation methods. Through the processes involved inconceptualizing, designing, implementing and evaluating agricultural projects, the students engage available resources in creative ways to produce garden(s) from plants grown from vegetative propagation only. While being innovative in the use of resource solving the problem, safety, hygienic and ethical practices

will be pursued, and care will be taken to preserve/protect the natural environment. If at all possible, arrangements should be made for the gardens which should be maintained as a post-project legacy.

Guidance for the Teacher

- The execution of the project utilizes the problem-based approach
- Planning and preparation are critical factors to delivering this programme
- Research local, national, regional, and international importance of artificial vegetative propagation
- Apply Agricultural Business principles and practices to this project
- Establish student groups that facilitate organizational structure, teamwork, and scheduling of duties
- Procure suitable and adequate resources in a timely manner
- Where possible, ensure sufficient scale of the projects that allows for reasonable visibility/marketing potential
- Promote/emphasize safe and hygienic practices at the worksite
- Arrangements should be made to have continuation of the artificial vegetative propagation project
- Organize market for the output of the artificial vegetative propagation project (if applicable)
- Avoid projects holding over through major holidays as a precaution against praedial larceny
- As much as is possible, provide physical protection for the students' enterprise including secured fence/gate
- Promote/reward the observance of practices which sustain and/or enhance the environment
- Promote a culture of technically-sound agricultural practices
- Deliberately promote the linkages between agriculture and other curriculum offerings
- Research!! Research!! Research!!

PROJECTT TITLE: Produce new plants by vegetative propagation

Prior Learning

Check that students:

- are aware that plants and vegetables are used to sustain growth and economy

ATTAINMENT TARGET(S) **Students will be able to:**	**OBJECTIVES** **Students will:**
STRAND 1: apply **Creativity & Innovations** in applying design principles to the use of available resources to produce plants by vegetative propagation	• Create and apply design principles to successfully produce plants by vegetative propagation • Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.
STRAND 2: **Explore Methods & Procedures** in developing a project, and determine from a range of options the design and the plans to produce plants by vegetative propagation	• Explore methods and procedures for effective production of vegetative propagation • Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.
STRAND 3: **Apply Solutions** in producing plants by vegetative propagation through the application of the design principles and basic production and product disposal practices.	• Apply design solutions and principles to the vegetative propagation plants • Evaluate success of project against established criteria such as percentage survival, quality of new plants produced, use of sustainable practises, efficient use of resources, effective use of local resources. • Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.
STRAND 4: demonstrate awareness of a range of **Career Pathways** related to a selected project, which include direct agriculture-based careers/occupations, as well as, careers/occupations associated with the inputs and outputs linked to producing plants by vegetative propagation	• Develop an awareness of career pathways related to vegetative plant propagation • Use appropriate digital tools and resources to plan and conduct career-related research, prepare documents and make presentations.

Mathematics AT2
Students will:

- Use the correct units, tools and attributes to estimate, compare and carry out the processes of measurement to given degree of accuracy.
- Make and explore geometric shapes and solids and apply knowledge of their properties to problem solving situations.
- Collect, organize, interpret and represent data and make inferences by applying knowledge of statistics and probability. (AT 5, G7-9)

Science
Students will:

- Make predictions of what will happen based on scientific knowledge and understanding. Suggest and communicate how to test these predictions.
- Interpret data and decide whether results support predictions, and are sufficient to draw conclusions. (Sc AT1, S1, G6)
- Recognize the nature of water and understand its importance to life. (Sc AT1, S2, G4)
- Be aware of some key environmental problems and how to mitigate them (climate change, solid waste disposal, soil degradation. (Sc AT1, S2, G6)
- Classify living and non-living things, and understand the basis for doing so (feeding, moving, reproducing and growing). Sc AT2, S3, G5)
- Know that foods are grown in different ways (organic, GM and non-organic). Sc AT2, S4, G4)
- Explore what happens when some materials are mixed and how they may be separated (simple separation techniques). (Sc AT2, S4, G4)
- Appreciate the importance of scientific methods and be aware of safety procedures to be taken when using equipment and materials. (Sc AT1, S1, G7)
- Understand the nature of energy transformations (simple one/two-step energy transformations), the various types of energy sources and the importance of energy. (Sc AT7, S6, G7)
- Understand the impact of climate change on organisms and on the environment. (Sc AT1 S2, G7)
- Understand the nature, sources and uses of water (Sc AT1 S2, G8)
- Understand the hierarchical relationship from cells to organisms (cell tissues organs systems organisms). Sc AT2 S1, G7)
- Understand how plants make their food, and how this forms the basis of energy chains and webs. (Sc AT2 S1, G8)

Technology Standards
Students will develop an understanding of:

- the relationship among technologies and the connection between technology and other fields of study
- the role of society in the development and use of technology
- the influence of technology on history
- the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving
- and be able to select and use agricultural and related biotechnologies
- and be able to select and use information and communication technologies.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Introduction to the Project (Creativity and Innovation Students will: • Research, present and discuss the meaning and economic benefits of vegetative plant propagation • Examine different methods of artificial vegetative plant propagation, and, identify local plant applications of the methods	• Identify plants that are suitable for vegetative propagation • Demonstrate the benefits of vegetative propagation	• Suitable plants identified for artificial vegetative propagation • Plants properly matched to artificial vegetative propagation methods • Benefits of vegetative plant propagation explained/demonstrated • List made of two plants commonly propagated using each vegetative method
Project Design Students will: • Design a garden as guided by the teacher • Determine the resources required to implement the designed garden • Prepare a list of tasks necessary to complete the project • Prepare a basic schedule of the activities to be performed • Develop a simple budget for the designed project	• Design a project • Examine resource options and determine resources needed to carry out a project • Prepare a budget • Organize the work flow	• Design created meets set criteria for propagation of selected plants • List of resources for designed project accurately develop • Budget developed to meet the project design
Project Implementation Students will: • Interpret and layout design • Select non-plant resources • Select planting material • Prepare planting material • Prepare propagation area • Prepare planting medium • Establish planting material • Maintain established garden • Keep accurate records • Prepare project reports	• Interpret project design and schedule plan for execution • Prepare for plant propagation activities • Select plant propagation resources • Prepare plant propagation media • Propagate plant • Complete propagation operations • Care for the plants until new growth is observed • Collaborate effectively with teacher and peers • Keep accurate records • Prepare a project report	• Design of project properly interpreted and tasks organized to meet schedule • Tools, equipment and non-plant materials selected to satisfy propagation methods and teacher's instructions • Hygiene/sanitation practices implemented • Propagation material selected and collected according to propagation method, and, species of plant • Propagation material prepared according to propagation method, and, species of plant • Successfully propagated plants using at least three methods • Propagation methods performed according to plant species and teacher's instruction • Propagated plants handled in a manner that reduces risk of damage

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
		• After-care applied to suit the conditions around the new plants • Worksite is cleaned up after tasks are completed • Waste are disposed of in environmentally friendly manner • Records are completed accurately and immediately
Careers associated with Project content Students will: • Conduct research in groups to investigate the different career paths in connection with the vegetative propagation of plants to determine how these jobs impact on livelihoods/economy and sustainability • Discuss outcomes of research with class	• Research and present career-related documents	• Outcome of research undertaken demonstrated understanding of careers in connection with project
Evaluation of Project • Design record sheets and keep accurate records of propagation activities - material and equipment inventory - plant inventory - propagation method used • Use data collected on record sheets to evaluate success level of project outcome against key criteria	• Evaluate project outcome against original project design • Interpret project records • Analyse project records • Make recommendation and conclusion from records	• Accurate records give evidence and proof of successful implementation of project • Objective conclusions drawn • Plausible recommendations made

Learning Outcomes

Students will be able to:

- ✔ Discuss what is meant by vegetative propagation and sexual propagation
- ✔ Recognise the benefits of vegetative propagation to sexual propagation
- ✔ Make a diagram/list to demonstrate the benefits of both vegetative propagation to sexual propagation
- ✔ Compare the benefits of vegetative propagation to sexual propagation
  - Select common plants best suited to
- ✔ Research and discuss the meaning and economic benefits of vegetative plant propagation
- ✔ Discuss what is meant by vegetative propagation and sexual propagation

Learning Outcomes

Students will be able to:

- Recognize the benefits of vegetative propagation to sexual propagation
- Make a diagram/list to demonstrate the benefits of both vegetative propagation to sexual propagation
- Compare the benefits of vegetative propagation to sexual propagation
- Natural vegetative propagation
- Artificial vegetative propagation
- Define key terms: sexual reproduction in plants, asexual reproduction in plants, propagation, root stock, scion
- Discuss the advantages and disadvantages of:
  - Natural vegetative propagation
  - Artificial vegetative propagation
- Identify and describe plant parts used in natural vegetative propagation: with a view to selecting one for planting
  - corms
  - rhizomes
  - tubers
  - suckers
  - bulbs
- Select plants to be propagated naturally
- Explain the steps used in a given artificial propagation technique
- Demonstrate techniques used in artificial propagation
- Select appropriate resources and use safely
- Determine artificial vegetative methods to produce selected plants
- Decide from research, appropriate artificial methods to propagate common food/ornamental plants by vegetative means
- Design a project to include plants propagated by at least three artificial vegetative methods
- Develop work-flow charts for artificial vegetative plant propagation
- Prepare a list of resources to carry out a designed plant propagation project
- Develop a simple income and expenditure budget for the designed project
- Interpret and execute design
- Demonstrate at least three (3) methods of artificial vegetative propagation used to produce new plants
- Select and demonstrate safe use of tools and other resources
- Preparing growing media and establish plants

Learning Outcomes

Students will be able to:

- ✔ Care for propagated plants
  - water
  - fertilize
  - pest control
  - hardened plants
- ✔ Record important activities associated with the project

Points to Note

Students must be made aware of Health & Safety issues in connection with this project at the commencement of the teaching and learning.

Some plants present more challenges to vegetative propagation and may require additional treatment such as hormone.

Extended Learning

Students can use methods learnt and apply them to their own gardens at home if they are able to do so.

Resources

- Parent material sources for stock, cuttings, scions, suckers, divisions, stolons, runners
- Vegetative plant parts (e.g. corn, bulb, rhizome, tubers) plastic bags
- Propagating knife
- Planting media
- Planting containers
- Potting mixture
- Watering can/hose
- Plastic cover
- Labels
- Label marker
- Ties for buds and grafts
- Shovel/spade
- Filter paper
- Flower pots
- Budding tape
- Top soil
- Rooting hormone
- Measuring cylinders
- Roll cut
- Organic manure
- Soil samples
- Test tubes
- Funnels
- Beakers
- Potting bags
- Stakes with hook
- Hammer
- Saw dust/coir

Key Vocabulary

- Vegetative propagation
- Asexual propagation
- Root stock
- Scion
- Rooting hormone
- Rooting media
- Rhizome
- Bud
- Bud wood
- Budding knife
- Budding tape
- Cuttings
- Herbaceous cutting
- Leaf-bud cutting
- Stem cutting
- Tuber cutting
- Hard wood
- Soft wood
- Semi-hard wood
- Corms
- Bulbs
- Potting medium
- Potting
- Coir
- Budding
- Grafting
- Runner
- Vines
- Ground layering
- Circumposing/ Air layering
- Stem
- Root
- Stem tube
- suckers

Links to Other Subjects

Maths: Measuring/calculations
Science: Living processes

GRADE 8

RESOURCE & TECHNOLOGY

AGRICULTURE & THE ENVIRONMENT

PROJECT: 8.2

Rearing Rabbits

STEM INTEGRATION – RABBIT REARING

SCIENCE

- Definition of breeding stock
- Economic importance of rearing rabbits
- Classification of rabbits based on breeds
- Classification of rabbits based on physiological states
- Methods of identification used in rabbit production
- Nutrition supplied in a typical feed/fodder
- Systems of rearing rabbits
- Importance of environmental conditions to the performance of animals:
  - Temperature
  - Ventilation
  - Moisture

MATHEMATICS

- Calculation of space requirements for a given number of rabbits
- Calculation of input resources and products for rabbit production
- Calculate feed requirements based on number of animals and stage of production
- Develop a basic budget for establishing and maintaining a small rabbit unit
- Create activity schedule for rabbits based on established standards (gestation period, period between giving birth and re-breeding, age at weaning)
- Records used to carry out appropriate analyses of the project

WHAT IS BEING ASSESSED?

Knowledge and skills required or rearing rabbits successfully

TECHNOLOGY

- Competence developed in the use and handling of simple tools used in rabbit rearing (identification tools, waterers, feeders)
- Skills in constructing and manipulating brooding boxes
- Competence in handling for the purpose of identifying sex, diseases or injury
- Competence in applying safety rules
- Manipulation of materials for construction of rabbit cage
- Use appropriate technology to develop various records for rabbit rearing (inventory, breeding, production, feed, health)

'E' DESIGN PROCESS

- Identification of problem to be solved
- Problem statement created
- Ideas for solving problem generated
- Resources used/available for rearing rabbits
- Idea(s) of possible solution selected
- Plan of activities developed to test selected solution(s)
- Implement project based on established plan of activities
- Outcome of the project evaluated against established criteria
- Presentation of results

The students will learn Key concepts and terms related to Rabbit Rearing:

- Breeds of rabbits
- Reasons for rearing rabbits
- How to classify rabbits based on physiological states (buck, doe, fryer, kitten)
- Features to look for when selecting animals for breeding
- Age at first breeding
- How to care for pregnant does
- Brooding of kittens
- Resources required for successful rabbit production
- Nutritional requirement
- Spacing requirement
- Housing requirements for rabbits
- Construction of brooding boxes
- Signs of good and ill health
- Pest and diseases affecting rabbits
- Different products to be realized from rabbit production
- Establish and maintain proper records such as breeding, sales, feed, vaccination, medication and weaning
- Students will use records to select animals for replacement
- Care and maintenance of tools and equipment
- Methods of identification used in rabbit production

About the Project

There is nothing in a rabbit rearing venture which cannot be converted into a useful by-product for home consumption or converted into cash. It requires only a little extra energy to engage in these side-enterprises. Working with rabbits is challenging, creative and rewarding.

In this Project students will learn about the various management considerations and practices involved in the rearing of rabbits. The project will examine the requirements for a commercial rabbit enterprise, but research, design, construct and manage a small rabbitry. Good marketing arrangements will be necessary to ensure the effective use of available space as the production cycle is repeated. Given the age range of the target students for this project, the protocol for mating of animals should be done under advisement from school management supported by the recommendation of the teacher.

Guidance for the Teacher

- Planning and preparation are critical factors to delivering this programme
- Research local, national, regional, and international importance of rabbit-production
- Specifically examine literature for relevance of rabbit production to Jamaica's socio-economic status
- Apply Agricultural Business principles and practices to this project
- Establish student groups that facilitate organizational structure, teamwork, and scheduling of duties
- Have pre-instruction design ideas for the specific school/community conditions
- Give students direct instruction and demonstration
- Promote students effort at decision-making and problem-solving efforts
- Engage the resources of local agencies and stakeholders in planning and delivering the rabbit project
- Procure suitable and adequate resource in a timely manner
- Where possible, ensure sufficient scale of the projects that allow for reasonable marketing potential
- Arrangements should be made to have fryers processed for meat
- Students should be guided to explore possible market for the output of the project
- Avoid projects holding over through major holidays as a precaution against praedial larceny
- Resources should include those for 'virtual' models of the agricultural project facilities
- As much as is possible, provide physical protection for the students' enterprise including secured fence/gate
- Promote/reward the observance of practices which sustain and/or enhance the environment
- Promote a culture of technically-sound agricultural practices
- Deliberately promote the linkages between agriculture and other curriculum offerings
- Provide effective performance assessment, using assessment methods to include: informal, formal, observations, checklists, portfolios, journals, ICT tools

PROJECTT TITLE: Rabbit Production

Prior Learning

Check that students:

- Are aware that animals are the main source of protein in human diet
- Are aware of the different types of animals reared for food in Jamaica

ATTAINMENT TARGET(S) **Students will be able to:**	OBJECTIVES **Students will:**
Attainment Target 1: Apply **Creativity & Innovations** in applying design principles to the use of available resources to **rear rabbits.**	• Create and apply design principles to rear rabbits successfully • Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.
Attainment Target 2: **Explore Methods & Procedures** in developing a project, and determine from a range of options the design and the plans to **rear rabbits**.	• Explore methods and procedures for effective production of rabbits • Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.
Attainment Target 3: **Apply Solutions** in **rearing rabbits** through the application of the design principles and basic production and product disposal practices.	• Apply design solutions and principles to the rearing of rabbits • Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.
Attainment Target 4: Demonstrate awareness of a range of **Career Pathways** related to **a selected project**, which include direct agriculture-based careers/ occupations, as well as, careers/occupations associated with the inputs and outputs linked to **rearing rabbits**.	• Develop an awareness of career pathways related to the rearing of animals • Use appropriate digital tools and resources to plan and conduct career-related research, prepare documents and make presentations.

Mathematics Standards
Students will:

- Use the correct units, tools and attributes to estimate, compare and carry out the processes of measurement to given degree of accuracy.
- Make and explore geometric shapes and solids and apply knowledge of their properties to problem solving situations.
- Collect, organize, interpret and represent data and make inferences by applying knowledge of statistics and probability. (AT 5, G7-9)

Science Standards
Students will:

- Make predictions of what will happen based on scientific knowledge and understanding. Suggest and communicate how to test these predictions.
- Interpret data and decide whether results support predictions, and are sufficient to draw conclusions. (Sc AT1, S1, G6)
- Recognize the nature of water and understand its importance to life. (Sc AT1, S2, G4)
- Be aware of some key environmental problems and how to mitigate them (climate change, solid waste disposal, soil degradation. (Sc AT1, S2, G6)
- Classify living and non-living things, and understand the basis for doing so (feeding, moving, reproducing and growing). Sc AT2, S3, G5)
- Know that foods are grown in different ways (organic, GM and non-organic). Sc AT2, S4, G4)
- Explore what happens when some materials are mixed and how they may be separated (simple separation techniques). (Sc AT2, S4, G4)
- Appreciate the importance of scientific methods and be aware of safety procedures to be taken when using equipment and materials. (Sc AT1, S1, G7)
- Understand the impact of climate change on organisms and on the environment. (Sc AT1 S2, G7)
- Understand the nature, sources and uses of water (Sc AT1 S2, G8)
- Understand the hierarchical relationship from cells to organisms (cell tissues organs systems organisms). Sc AT2 S1, G7)
- Understand how plants make their food, and how this forms the basis of energy chains and webs. (Sc AT2 S1, G8)

Technology Standards
Students will develop an understanding of:

- the relationship among technologies and the connection between technology and other fields of study
- the role of society in the development and use of technology
- the influence of technology on history
- the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving
- and be able to select and use agricultural and related biotechnologies
- and be able to select and use information and communication technologies.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Introduction to the Project (Creativity and Innovation Students will: • Examine the different uses of farm animals • Research the reasons for rabbit production • Identify wants, needs, and opportunities for rabbit production • Research systems and methods of rearing rabbits • Analyze existing rabbit production processes and solutions • Generate ideas for rearing rabbits at school (at home) • Modify/refine existing ideas • Explore new possibilities for rabbit production • Discuss/discriminate/justify suggested design ideas • Explore/experiment ideas, materials, technologies, techniques	• Classify farm animals based on their uses • Conduct research and present findings • Identify rabbit breeds and their characteristics • Examine and critique commercial and small- scale rabbit production systems • Examine the characteristics of both commercial and small-scale rabbit production systems and the possible limitations (suggestion to replace the above) • Analyze rabbit housing options in the local context	• Checklist on reasons and benefits for/of rabbit production created • Journal entries made representing accurate information on rabbit production systems • Presentations made to required standard on cultural importance of rearing rabbits locally and internationally • Graphics produced to accurately articulate students ideas on different aspects of the project.
Project Design Students will: • Research and utilize different models to develop and present ideas: - Develop and implement a project idea (e.g. CRASH) - Create commercially profitable project ideas (e.g. ICYCLE) - Develop and present a project (e.g. PRISME) - Examine all the linkages in a project (e.g. Rich Picture) • Understand and apply design principles and elements to selected rabbit production designs (e.g. space, light, structure, scale, stability, horizontal, vertical, dimensions, symmetry, sight, touch, purpose, practicality, strength, comfort, affordability, durability) • Establish relationships between form and function of the projectdesigns	• Describe ideas for the rabbit project through conversation and graphics • Describe ideas for the project using limited technical language to describe equipment and processes • Propose a small scale rabbitry while applying design principles and elements • Use ICT in researching, preparing and presenting documents for the project • Identify the resources required for the project • Prepare a basic budget for the project	• Project design portfolio created meets set criteria for rearing of rabbits • Project design utilizes key design elements and principles • ICT tools used appropriately to prepare and present ideas, narratives, graphics about the project design • Flow charts of designed project created showing accurate sequencing and scheduling details • Resources correctly classified into man-made and natural • Techniques and procedures for fabricating and assembling components developed to accurately guide the preparation of production facilities

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Project Design Students will: • Use appropriate computer software to design record sheets and for production activities - Designing - Budget preparation - Material and equipment inventory - Animal inventory - Breeding - weaning • Identify design requirements for the rabbit project • Identify design constraints for the rabbit project • Identify and classify types of materials, e.g. natural and man-made • Examine techniques manipulating resources • Examine techniques for processing materials (cutting, bending, fastening, shaping, chopping, assembling, etc.) • Establish relationships between inputs, processes and outputs • Examine techniques to combine materials • Identify types of tools and equipment • Determine the most suitable project design • Use symbols, narratives, pictures, sketches, and drawings to communicate ideas using different methods including ICT methodologies • Communicate ideas using different methods including ICT methodologies • Communicate design proposals and specifications • Design and communicate packaging, marketing and advertising • Develop a budget for the rabbit project design • Discuss and agree on a number of activities in the project that emphasize different human roles in a project • Determine tools, materials and methods to be used in the project • Differentiate components – physical and human	• Understand that savings can earn interest, and that money for investment in projects can be borrowed • Prepare documents to communicate ideas, proposals and processes • Research, study, solve and take action on environmental issues in rabbit production • Make simple notes and draw pictures to illustrate understanding of the rabbit rearing project	

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Project Implementation Students will: • Implement agree activities in the project that emphasize different aspects of the project • Select appropriate tools, materials and methods used in safe and efficient manner • Establish production sequence (e.g. sourcing, gathering, selecting, layout, shaping, making, smoothing, forming, separating, combining, freezing, treating, assembly, packaging, advertising, marketing and finishing techniques, etc.) • Assemble and/or combine components of the project • Read and interpret plans and drawings • Differentiate simple and complex systems in rabbit production • Organize rabbit production inputs, processes and outputs • Carry out cultural practices of rabbit rearing • Determine use of different types of systems e.g. electronic/ electrical, human, chemical or physical Apply and operate the various rabbit production systems • Demonstrate understanding of layout • Establish relationships between people and systems to implement the rabbit project • Use the implementation of the rabbit project to examine the role of technology in people's lives: - The history of technological innovation - The impacts of automation and computer controlled processing - Sustainable futures – social, legal, ethical and environmental issues - Interdisciplinary nature of technological activities - Dependence on technological developments	• Understand that a project has a start, middle, and an end • Explain how different aspects of the project are suppose to work • Work to solve or anticipate realistic problems • Understand that people in groups have and undertake different roles in a project • Remember where things are kept, and take responsibility for tools, equipment and other resources to be used on the project • Identify necessary literature and use them as suitable references • Fabricate components according to design • Find ways to combine and connect materials successfully • Identify the proper use of tools and equipment • Use materials, tools and equipment to produce particular outcomes • Follow with the support of the teacher, a procedure using suitable materials, techniques, tools, and equipment to produce a designed outcome • Develop and practice basic skills • Use traditional, current and emerging technologies	• Design specifications interpreted correctly • The development of fine motor skills evidenced from tasks carried out • Student generates accurate descriptions about resources necessary to carry out the project • Required calculations done accurately • Preparation of components done according to specifications of design and accepted standards • Correct use of tools, equipment and materials demonstrated • Materials, tools and equipment used safely while carrying out the project tasks • Student demonstrated how to fabricate, assemble and connect components of the physical facilities • Adequately construct facility for housing rabbits • Ability to listen and follow instructions as given evidenced • Ability to correctly carry out cultural practices tasks in rabbit rearing demonstrated • Complete checklists of explanation of project terminologies created • Complete, accurate and timely journal entries made regarding the inputs and outputs of the implementation of the project • Satisfactory audio-visual presentations made on cultural practices of rearing rabbits locally and internationally • Formal written and practical tests passed regarding the various aspects of project implementation • Student produced detailed portfolio on project implementation as instructed

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Project Implementation Students will: • Observe safety procedures to include: - Workplace health and safety issues - Hygiene and preparation - Storage and maintenance of materials, tools and equipment - Personal safety – safety at home, at school, community and in the environment - Protective clothing and use of safety equipment - Choice, use and care of tools, equipment and chemicals - Maintaining a clean and safe work area - Team safety – following group rules • Keep accurate record of various activities during the project	• Understand that a project has a start, middle, and an end • Explain how different aspects of the project are suppose to work • Work to solve or anticipate realistic problems • Discuss actions that can be taken to create and preserve a healthy and safe work area • Follow directions safely for specific purposes • Work co-operatively in pairs of groups to achieve set tasks • Describe an observe safety rules at home and at school • Work within their community locally and globally	
Careers associated with Project content Students will: • Conduct research in groups to investigate the different career paths in connection with the vegetative propagation of plants to determine how these jobs impact on livelihoods/economy and sustainability • Identify and discuss project activities that were enjoyed and done well • Use the project as a basis to identify different tasks of people (e.g. roles, jobs, designers, inventors, creators, manufacturers, researchers, producers, distributers, sellers, artists, transporters, security, etc.) • Invite guest speakers from the community to talk to students about the work they do • Students focus upon their strengths, achievements and interests • Discuss outcomes of research with class	• Reflect upon personal strengths and interests as revealed while working on the rabbit project • Set personal goals by performing different roles in the rabbit projects • Use experiences from implementation of the rabbit project to learn about work and life • Know that people follow rules and procedures, and that following rules makes positive communities • Use the project to identify some key competencies and personal that may be needed for different careers/situations	• In role play scenarios, related strengths and weaknesses properly identified. • Satisfactory understanding of different roles of individuals in an enterprise demonstrated • Most of the key competencies and personal at tributes for a given scenario identified • Outcome of research undertaken demonstrates satisfactory understanding of careers in connection with project

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Project Implementation Students will: • Implement agree activities in the project that emphasize different aspects of the project	• Work towards refining specific skills and attributes that a career will requiref	
Evaluation of Project • Use data collected on record sheets to evaluate success level of project outcome against key criteria • Present and describe the project outcomes • Evaluate and reflect upon own work on the project • Discuss what possible steps could be taken to improve future projects	• Prepare, present and describe outcomes of the rabbit project • Describe throughout the project, what is being done, what things need to be done, and things that have been done • State how things work and how things should be done • Describe what was learned or achieved by carrying out the project • Explain individual achievements and understandings on the project using descriptive language • Share the outcome of the project with others using various forms of presentation • Use digital cameras, scanner, simple templates to enhance the description of outcomes of rabbit project	• Records show evidence and proof of successful implementation of project • A complete report is prepared and presented according to the required format • ICT tools effectively used in evaluating the out come of the project • Analyses of the project are accurate and complete • Statements on lessons learned are reflective of the way of the project

Learning Outcomes

Students will be able to:

- ✔ Select breeds of rabbit based on purpose for which they are reared
- ✔ Design forms for daily records
- ✔ Keep various records accurately
- ✔ Develop a simple budget
- ✔ Construct and or select simple housing and equipment need
- ✔ Select and supply feed for rabbits at various stages of production
- ✔ Determine age for breeding/mating based on breed
- ✔ Calculate kindling date based on date of mating
- ✔ Understand the importance of sanitation in rearing healthy animals
- ✔ Handle rabbit safely with due consideration to animal and self
- ✔ Separate animals based on sexes
- ✔ Recognize signs of ill health
- ✔ Recognize signs of pest infestation
- ✔ Treat for external parasite
- ✔ Select and use appropriate personal protective equipment
- ✔ Identify career path ways linked to rabbit production

Points to Note

Students must be made aware of Health & Safety issues in connection with this project at the commencement of the teaching and learning.

See Guidance for Teacher.

Extended Learning

Students can use methods learnt and apply them by rearing rabbits at home to supplement their families' protein requirement.

Resources

- Housing materials
- Tools and equipment for building rabbit house
- Equipment for rearing rabbits
- Feed for rabbits (forage and concentrate)
- Water
- Medication
- Video

Key Vocabulary

- Investment
- Kindling
- Doe
- Buck
- Nest box
- Brooding
- Production ration
- Droppings
- Snuffles
- Kitten
- Litter
- Mating
- Weaning
- Snuffles manage
- Breed
- Breeding
- Breeding schedule
- Gestation period

Resources

- Chart and records
- Rabbit
- Disinfectant
- Computer
- Text

Key Vocabulary

- Maintenance
  ration

Links to Other Subjects

Maths: Measuring, calculations

Science: Living processes, animal nutrition, animal health, animal reproduction, animal habitat

Language Arts: Using reading, writing, comprehension, speaking skills

ICT: Searching storage devices, processing information, developing data, preparing reports, preparing charts, preparing photos and pictures, preparing presentations, making presentation

Visual Arts: Design principles and elements

Culture: Traditional foods; the production of domesticated animals; use of traditional feed for feeding rabbits at home

GRADE 8

RESOURCE & TECHNOLOGY

AGRICULTURE & THE ENVIRONMENT

PROJECT: 8.3

Grow Crops with Emphasis on Soil Fertility

STEM INTEGRATION – GROW CROPS WITH EMPHASIS ON SOIL FERTILITY

SCIENCE

- Definition of soil fertility
- Definition of soil organic matter, compost, irrigation, soil erosion
- Definition of plant nutrients
- Review plant parts and their functions
- Definition of plant processes and their link to soil fertility (absorption, transpiration, photosynthesis, translocation)
- Nutrients and their function to plant growth
- Classification of plant nutrients into micro and macro nutrients
- Importance of soil fertility to crop growth
- Nutrient requirements for different crop types (leafy vegetable, vine crops, root crops, fruit crops).

MATHEMATICS

- Develop budget to implement project
- Measurement of plot for crop establishment
- Calculate the number of plants for the required space
- Calculate volume of water per weight of fertilizer needed
- Calculate the amount of fertilizer based on crop types
- Create activity schedule for fertilizer application based on crop requirement
- Calculate the percentage success based on fertilizer application procedure
- Estimate value of plant produced based on number and costs per unit.

WHAT IS BEING ASSESSED?

Knowledge and skills required in maintaining soil fertility for the optimum production of crops

TECHNOLOGY

- Competence in the use of small hand tools and materials to grow a crop (including "A" level)
- Competence in using different methods of fertilizer application based on types of crops grown
- Manipulate resources to improve soil fertility
- Use appropriate technology to create records on crops grown, activities and resources used
- Develop effective programme to improve soil fertility
- Competence in construction of compost based on available materials and location.

'E' DESIGN PROCESS

- Identification of problem to be solved
- Problem statement created
- Ideas for solving problem generated
- Idea(s) of possible solution selected
- Plan approach for managing soil fertility
- Implement of cultural practices to maintain soil fertility for effective crop production
- Outcome of the project evaluated based on use of sustainable soil fertility management practices
- Presentation of results based on quality and quantity of crop produced.

Students will develop key concepts and skills related to maintaining soil fertility by learning:

- Technical approach to soil fertility and management
- To implement cultural practices to maintain and enhance soil fertility
- To effectively select and use correct resources
- To apply the use of agricultural terminologies in a given context
- To perform practices that will correct low soil fertility

Key concepts, skills, knowledge and attitudes students will learn in this project include:

- What is soil fertility
- Characteristics of fertile soil
- Factors affecting soil fertility
- Nutrients absorbed by plants
- Role of nutrients in plants
- Nutrient deficiency and excess
- Methods of fertilizer application
- Fertilizer application
- Types of irrigation system
- Types of drainage system
- What is manure
- What is soil erosion
- Effect of soil amendment on soil fertility
- Role of micro and macro organisms in soil fertility
- What is compost
- Composting

About the Project

Fresh vegetables are an excellent source of the vitamins and minerals essential to good health. A garden soil well supplied with organic matter and needed minerals will, under favourable conditions, produce a good yield of vegetables which are high in quality and nutritional value.

High input costs of plant nutrients, impact of soil erosion, and, critical importance of crop production to food security make it essential for a school population and Jamaica, to be aware of some fundamentals of soil fertility, and its maintenance. Through guided experience, students will determine soil fertility, factors affecting soil fertility, and, how to improve or maintain soil fertility.

To achieve learning goals, students will gain competencies in soil fertility by actually growing vegetable crops while observing and managing factors which affect soil fertility and crop productivity. Discovering the importance of soil chemistry to crop production can be challenging, creative, and rewarding.

Guidance for the Teacher

- Planning and preparation are critical factors to delivering this programme
- Research local, national, regional, and international importance of rabbit production
- Specifically examine literature for relevance of rabbit production to Jamaica's socio-economic status
- Apply Agricultural Business principles and practices to this project
- Establish student groups that facilitate organizational structure, team-work, and scheduling of duties
- Have pre-instruction design ideas for the specific school/community conditions
- Where appropriate give students direct instruction and demonstration
- Promote students effort at decision-making and problem-solving efforts
- Engage the resources of local agencies and stakeholders in planning and delivering the project
- Procure suitable and adequate resources in a timely manner
- Where possible, ensure sufficient scale of the projects that allow for reasonable marketing potential or analysis of performance
- Students should be guided to explore possible market for the output of the project
- Avoid projects holding over through major holidays as a precaution against praedial larceny
- Resources should include those for 'virtual' models of the agricultural project facilities
- As much as is possible, provide physical protection for the students' enterprise including secured fence/gate
- Promote/reward the observance of practices which sustain and/or enhance the environment
- Promote a culture of technically-sound agricultural practices
- Deliberately promote the linkages between agriculture and other curriculum offerings
- Provide effective performance assessment, using assessment methods to include: informal, formal, observations, checklists portfolios, journals, ICT tools.

PROJECT 8.3 | **GRADE 8** | **TERM 3**

PROJECTT TITLE: Growing Crops with Emphasis on Soil Fertility

Prior Learning

Check that students:

- Are aware that soil contains nutrients required for plant growth
- Have some knowledge about the exhaustibility soil nutrients

ATTAINMENT TARGET(S) **Students will be able to:**	OBJECTIVES **Students will:**
Attainment Target 1: Apply **Creativity & Innovations** in applying design principles to the use of available resources to **grow crops with emphasis on soil fertility**	• Create and apply design principles to grow crops and sustain soil fertility • Produce a simple budget for the project • Generate a simple layout of the project
Attainment Target 2: **Explore Methods & Procedures** in determining from a range of options the design and the plans to grow crops with emphasis on soil fertility.	• Investigate and select methods and procedures best suited to grow crops and sustain soil fertility
Attainment Target 3: **Apply Solutions** to **grow crops with emphasis on soil fertility** through the application of basic sustainable crop growing practices.	• Employ design principles and solutions to growing crops while sustaining soil fertility • Investigate the effect of selected nutrient or combination of nutrients on plant growth production
Attainment Target 4: Demonstrate awareness of a range of **Career Pathways** related to **soil fertility**, which include direct agriculture-based careers/occupations, as well as, careers/occupations associated with the supply of goods and services to improve and/or maintain soil fertility.	• Cultivate an awareness of career pathways related to crop production and soil fertility

Mathematics Standards
Students will:

- Use the correct units, tools and attributes to estimate, compare and carry out the processes of measurement to given degree of accuracy.
- Make and explore geometric shapes and solids and apply knowledge of their properties to problem solving situations.
- Collect, organize, interpret and represent data and make inferences by applying knowledge of statistics and probability. (AT 5, G7-9)

Science Standards
Students will:

- Make predictions of what will happen based on scientific knowledge and understanding. Suggest and communicate how to test these predictions.
- Interpret data and decide whether results support predictions, and are sufficient to draw conclusions. (Sc AT1, S1, G6)
- Recognize the nature of water and understand its importance to life. (Sc AT1, S2, G4)
- Be aware of some key environmental problems and how to mitigate them (climate change, solid waste disposal, soil degradation. (Sc AT1, S2, G6)
- Classify living and non-living things, and understand the basis for doing so (feeding, moving, reproducing and growing). Sc AT2, S3, G5)
- Know that foods are grown in different ways (organic, GM and non-organic). Sc AT2, S4, G4)
- Explore what happens when some materials are mixed and how they may be separated (simple separation techniques). (Sc AT2, S4, G4)
- Appreciate the importance of scientific methods and be aware of safety procedures to be taken when using equipment and materials. (Sc AT1, S1, G7)
- Understand the impact of climate change on organisms and on the environment. (Sc AT1 S2, G7)
- Understand the nature of energy transformations (simple one/two-step energy transformations), the various types of energy sources and the importance of energy. (Sc AT7, S6, G7)
- Understand the nature, sources and uses of water (Sc AT1 S2, G8)
- Understand the hierarchical relationship from cells to organisms (cell tissues organs systems organisms). Sc AT2 S1, G7)
- Understand how plants make their food, and how this forms the basis of energy chains and webs. (Sc AT2 S1, G8)

Technology Standards
Students will develop an understanding of:

- the relationship among technologies and the connection between technology and other fields of study
- the role of society in the development and use of technology
- the influence of technology on history
- the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving
- and be able to select and use agricultural and related biotechnologies
- and be able to select and use information and communication technologies.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Introduction to the Project (Creativity and Innovation Students will: • Review how crops grow - Parts of the plant and their functions - Review basic plant growing processes (e.g. germination, photosynthesis, transpiration, translocation, flowering, etc.) • Research and discuss nutrient requirements for different crop types (leaf, root, flower, fruit) • Examine growing media in use for crop production • Guided by teacher, develop a working definition for soil fertility • Explore the importance of maintaining soil fertility • Explore the factors that reduce soil fertility • Research, discuss and list possible measures that can be used to maintain or improve soil fertility • Discuss the advantages and disadvantages of the measures identified • Select a combination of methods and resources needed to implement soil fertility measures	The ability to: • Research and present relevant information using search engines, storage devices and presentation tools • Discuss important plant processes • Explain key terms • Discuss nutrient needs of selected common crops • Relate the importance of soil fertility to growing crops	• Soil fertility clearly explained • The importance of soil fertility to crop production discussed with 90% accuracy • Technical measures to improve soil fertility correctly identified • Appropriate soil fertility maintenance measures for given situations illustrated • Factors that reduce soil fertility correctly discussed • The processes of transpiration, translocation explained accurately
Project Design Students will: • Design a crop layout plan to satisfy the project, using design principles and elements • Determine the resources needed to execute the project • Develop a budget to implement the project • Plan to grow selected crops to highlight the importance of soil fertility: - Grow crop with complete nutrients - Grow crop with pre-determined deficiency - Adequate/inadequate soil structure - Adequate/inadequate soil texture - Grow crops in area affected by soil erosion - With complete nutrients and adequate irrigation - With complete nutrients and inadequate irrigation - With incomplete nutrients and adequate irrigation	• Describe ideas for the project through conversation and graphics • Describe ideas for the project using limited technical language to describe equipment and processes • Transform research information/data to design ideas for the project • Prepare a work plan for project/ given tasks • Identify crops to be grown according to design • Identify appropriate resources for the project • Differentiate types of resources	• A workable plan of action to eliminate or minimize factors that may reduce soil fertility prepared • ICT tools effectively utilized to conduct research related to compost-making and findings presented/used in designing a project • Research done on fertilizer application to crop, and a plan developed • Mulching was done according to instruction and industry standards • Soil erosion factors identified and measures to minimize them implemented

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Project Design Students will: • Outline a plan of cultural practices to eliminate or reduce factors that may impact negatively on soil fertility • Research principles, procedures, and practices to make compost • Develop a harvesting, packaging and marketing plan • Design forms to document activities and observations • Design recordkeeping forms and labels according to enterprise requirements, using computer software • Use appropriate ICT tools to prepare and make design-related presentations	The ability to: • Develop basic budgets • Develop ideas on how project may be funded • Develop schedule of activities • Create recordkeeping forms • Conceptualize effective labels • Identify and use appropriate ICT productivity tools in aspects of designing the project • Prepare documents to communicate ideas, proposals and processes • Research, study, solve and take action on environmental issues related to the project • Make simple notes and draw pictures to illustrate under-standing of the project	• Model crop rotation cycle created according to industry standards • Basic soil conservation principles and practices researched and the information used to develop a soil conservation plan for the given situation • Basic irrigation principles and practices researched and an irrigation plan developed for the given situation • Labels designed according to enterprise requirements, using computer software
• Interpret design • Identify and select and use required resources to implement the project stages • Use varying ICT tools to capture information and graphics • Use appropriate methods of labels or identification on the project as necessary • Layout crops to observe impact of different factors on soil fertility • Carry out normal cultural practices in growing crops • Observe and document performance of crops grown under different conditions affecting soil fertility: - soil structure/texture - nutrients - irrigation - plant nutrients - soil erosion - crop rotation	• Read and interpret project design • Select and use suitable resources for the project • Calculate accurately • Lay out project according to design • Apply plant nutrients accord-ing to design • Perform cultural practices according to design and industry standards • Document crop growing performance under different soil fertility condition • Practice real or simulated soil fertility conservation measures	• Compost-making design implemented • Plan for fertilizer application implemented • Basic soil conservation plan implemented • Basic irrigation plan carried out • Factors causing soil erosion identified and explained • Soil erosion prevention measures identified and explained • Plans to reduce soil erosion implemented • Procedure to mulch crop carried out according to standards • Crop fertilized using selected method(s) • Model/design of crop rotation created using the correct principles • Use of appropriate irrigation method to minimize soil fertility loss demonstrated

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: • Practice compost making methods • Demonstrate basic soil conservation methods • Carry out all activities with due consideration to safety of self, fellow students plant and the environment • Use tools, materials and equipment safely • Select and use the appropriate personal protective equipment • Keep accurate records of all related activities and observations • Keep daily/weekly journal entries of project activities and development • Harvest, package and market crop produce according to design and industry standards • Generate basic analyses/interpretations of records • Use appropriate ICT tools to analyse information and prepare presentation/documents	The ability to: • Make and use compost • Articulate the safety plan • Follow instructions on the correct use of materials, tools, and equipment • Maintain accurate records • Harvest, package and market crop produce • Analyse/interpret records	• 'Feel Test' carried out to determine need for irrigation • Soil amendments used safely • Correct application of mulch demonstrated • Appropriate Personal Protective Equipment (PPE) selected and used effectively • Contours constructed accurately and safely using proper practices and implements • Labels created and installed according to enterprise requirements • Accurate journal entries made, and documentation used in decision making • Personal protective equipment selected and used according to manufacturer's or industry standards.
Careers associated with project content Students will: • Research career pathways associated with soil fertility and crop production • Outline qualification requirements for at least five (5) careers related to soil fertility • Dramatize at least three (3) of the identified career pathways • Identify local, regional and international institutions that provide training related to soil fertility • Create a career chart related to crop production and soil fertility • Use quality of crop produce to determine success of soil fertility measures • Use growth of plants and level of production to evaluate the success of nutrients supply and conservation • Assess project for success in controlling soil erosion	• Reflect upon personal strengths and interests as revealed while working on the soil fertility project • Set personal goals by performing different roles in the soil fertility projects • Use experiences from implementation of the soil fertility project to learn about work and life • Follow rules and procedures • Identify some skills that may be needed for different careers/ situations • Work towards refining specific skills and attributes that a career will require	• Careers associated with soil fertility and crop production correctly identified • Associated qualifications correctly identified • Related career pathways dramatized

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Evaluation of Project Students will: • Use quality of crop produce to determine success of soil fertility measures • Use growth of plants and level of production to evaluate the success of nutrients supply and conservation • Assess project for success in controlling soil erosion	The ability to: • Prepare, present and describe outcomes of the soil fertility project • Describe throughout the project, what is being done, what things need to be done, and, things that have been done • State how things work and how things should be done • Describe what was learned or achieved by carrying out the soil fertility project • Explain individual achievements and understandings on the project using descriptive language • Share the outcome of the project with other using various forms of presentation • Use digital cameras, scanner, simple templates to enhance the description of outcomes of soil fertility project	• Journal provided accurate information/data of level of success of implementation of pest control measures, soil conservation measures, and, nutrients supply and conservation

Learning Outcomes

Students will be able to:

- ✔ Define at least eight (8) key terms in connection with concept taught
- ✔ Identify and discuss at least four (4) ways in which soil may lose its fertility
- ✔ Identify and discuss measures that can be used to improve soil fertility
- ✔ Differentiate the impact of various factors on soil fertility
- ✔ Manipulate resources to improve soil fertility
- ✔ Select and implement at least three (3) measures best suited to their school farm
- ✔ Verbalize and demonstrate the soil fertility measures being implemented

Learning Outcomes

Students will be able to:

- ✔ Demonstrate mulching
- ✔ Explain the importance of maintaining soil fertility
- ✔ Determine appropriate time to irrigate and carry out irrigation
- ✔ Select mulches and administer mulching procedures

Points to Note

- Safety of students and environment must be emphasized at every stage of the project
- Students should be encouraged to explore and develop solutions to challenges encountered in the project
- Students should be encouraged to practise safe behaviour when using digital media or searching for information on the internet.

Extended Learning

The development of skills and better appreciation or the area may be enhanced by the following:

- Field trips
- Research projects
- Visits from resource personnel from related fields
- Home gardening/projects

Resources

- Seeds
- Vegetative planting material
- Land
- Pen manure
- Water hose
- Fertilizer (soluble and granular
- Garden tools
- Lime
- Irrigation system
- Stakes
- Compost
- Mulch
- ICT hardware and software
- Organic matter
- Inorganic fertilizer
- Soil
- Soil amendment
- Compost
- Moulding
- Primary plant nutrients
- nitrogen

Key Vocabulary

- phosphorous
- potassium
- soil organisms
- macro nutrients
- micro/trace nutrients
- fertile soil
- crop rotation
- mulch
- mulching
- liming
- nutrients
- irrigation
- tillage
- drainage
- green-manuring
- erosion
- soil conservation
- contouring
- cover cropping
- terracing
- vegetative cover

Links to Other Subjects

Maths: Measuring, calculations
Visual Arts – principles and elements of design
Home & Family
Business – establish a business enterprise, budgeting, recording keeping, profit and loss
Social Studies
Integrated Science/Biology
ICT – search engines, word processing, spread sheet, charts presentation, pictures/paint, music, printing
Mathematics – measuring, lining out/dimensions, calculations
Language Arts – reading, comprehension, writing, reporting, narrating speaking

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Some Careers related to Soil Fertility

Soil scientist
Agronomist
Botanist
Farm manager
Agro-chemist
Plant physiologist
Extension officer
Weed scientist
Vegetable farmer
Agriculture researcher
Agricultural advisor/consultant
Bio-chemist
Author
Agriculture teacher
Minister of Agriculture

NSC

RESOURCE & TECHNOLOGY

BUSINESS BASICS

GRADE 8 UNITS OF WORK

TERM 1

Unit 1:
Exploring Resources

- Definition of terms associated with the types of production e.g. primary/extractive, secondary/construction, tertiary/services, traditional/subsistence-level, domestic/ local, surplus/export
- Types of production; Primary, secondary, Tertiary
- Productive activities associated with each type of production
- Classification of industries
- The contribution of each type of production to economic development
- Explore geometric shapes and solids, to present information and solve problems
- Levels of production: traditional, domestic surplus or export level of production
- Importance of each level of production in satisfying human needs and wants
- Careers associated with production
- Examine the scientific process of production

TERM 2

Unit 1:
Communication in Business

- Definition of terms: communication, communication process, methods/ channels of communication
- Communication cycle
- Communication channels (oral, electronic, written, visual)
- Methods of each channel of communication
- Documents used to communicate business information
- Communication protocol
- Safety considerations when using communication media to transmit business information
- Careers associated with communication in a business

Unit 2:
Banking Services

- Definition of terms, transactions, lodgment, commercial, cheques, memorandum
- Forms of money used in business transactions, e.g. notes, coins, bank deposits/drafts
- Importance of cheques in business transactions
- Procedures for drawing a cheque
- Services offered by commercial banks to business, accepting deposits, offering loan, lodgements/ deposit slips and documents

TERM 3

Unit 1:
Introduction to Accounting Terminologies

- Purpose of Accounting
- Users of Accounting information
- Accounting as a scientific process
- Definition of terminologies relevant to simple accounting transactions: accounting/book-keeping, receipts/payment, cash/bank, credit/debit, discounts, assets, liability and capital
- Differences between accounting and book-keeping
- Accounting Equation (Capital = Assets – Liabilities)
- Classification of items of Assets, liabilities and capital
- Calculations of the Assets, liabilities or capital of a business from given scenarios
- Construct a simple unclassified balance sheet
- Careers associated with Accounting

Unit 2:
Source Documents used in Business transactions

- Definition of the terms associated with source document (invoices, receipts, debit note, credit note, cheque counterfoil, discount, taxes, etc.
- Types of source documents used in business
- Importance of source documents in business transactions

TERM 1

Unit 2:
Efficiency in Production

- Definition of terms e.g. labour intensive, capital intensive, mechanization, automa tion, productivity, efficiency
- Methods of production- capital intensive (mechanization), automation
- Types of industries which utilize the various methods of production (traditional industries and contemporary industries)
- Features of labour intensive and capital intensive production
- Comparison of labour intensive and capital intensive production
- Types of automated systems used in business e.g. photocopying and document processing
- Economic, social and environmental impact of the traditional and contemporary production
- Safety consideration associated with using the various methods of production
- Careers associated with CAM and automated mail room

TERM 2

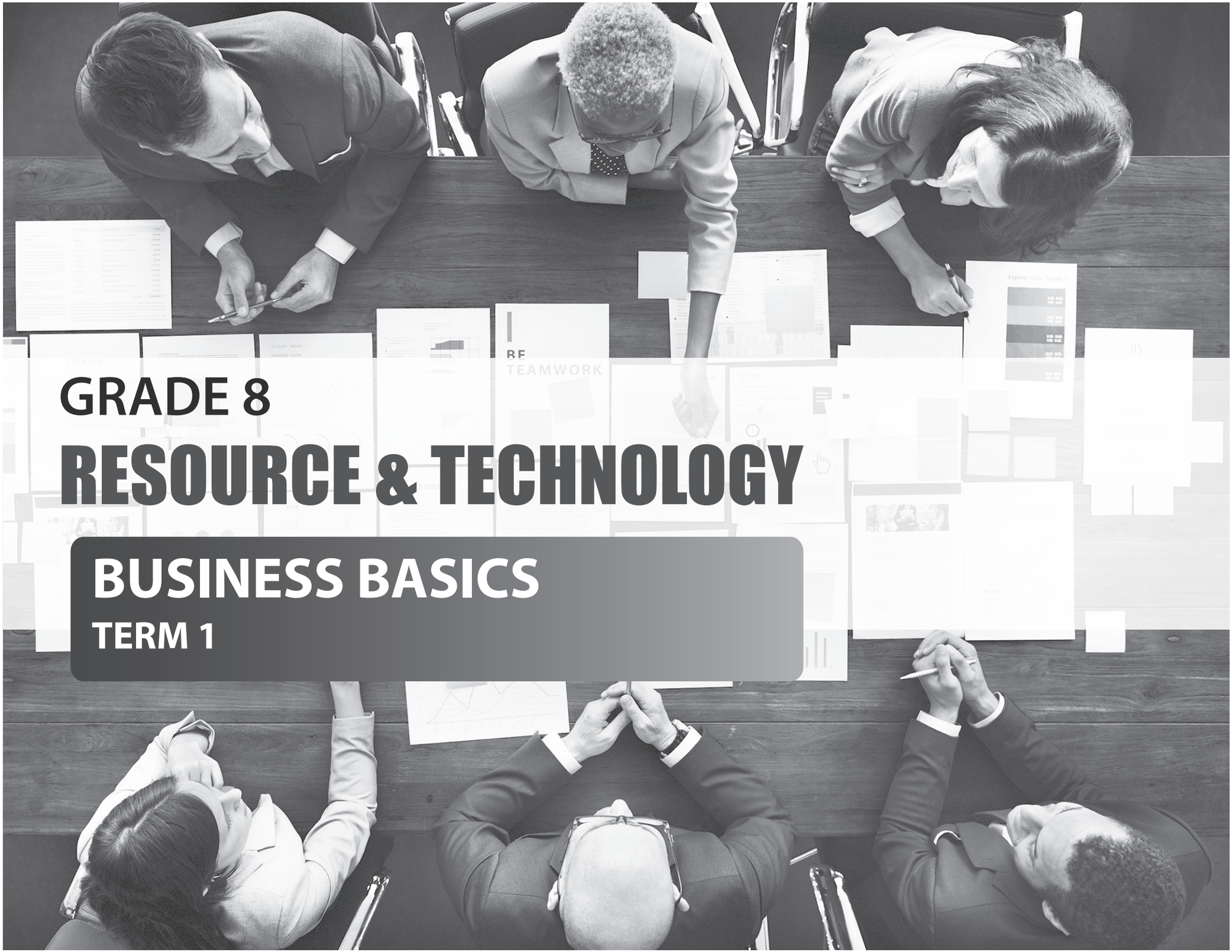
Unit 2:
Banking Services

- Banking forms utilized in withdrawal and deposits for business transactions e.g. application forms, withdrawal and deposit forms, currency breakdown forms and memorandum
- Utilizing automated banking services
  - Procedures for using an automated teller machine/online banking
  - Benefits of an automated teller machine/online banking
  - Practicing safety using automated Teller machine/Online Banking

TERM 3

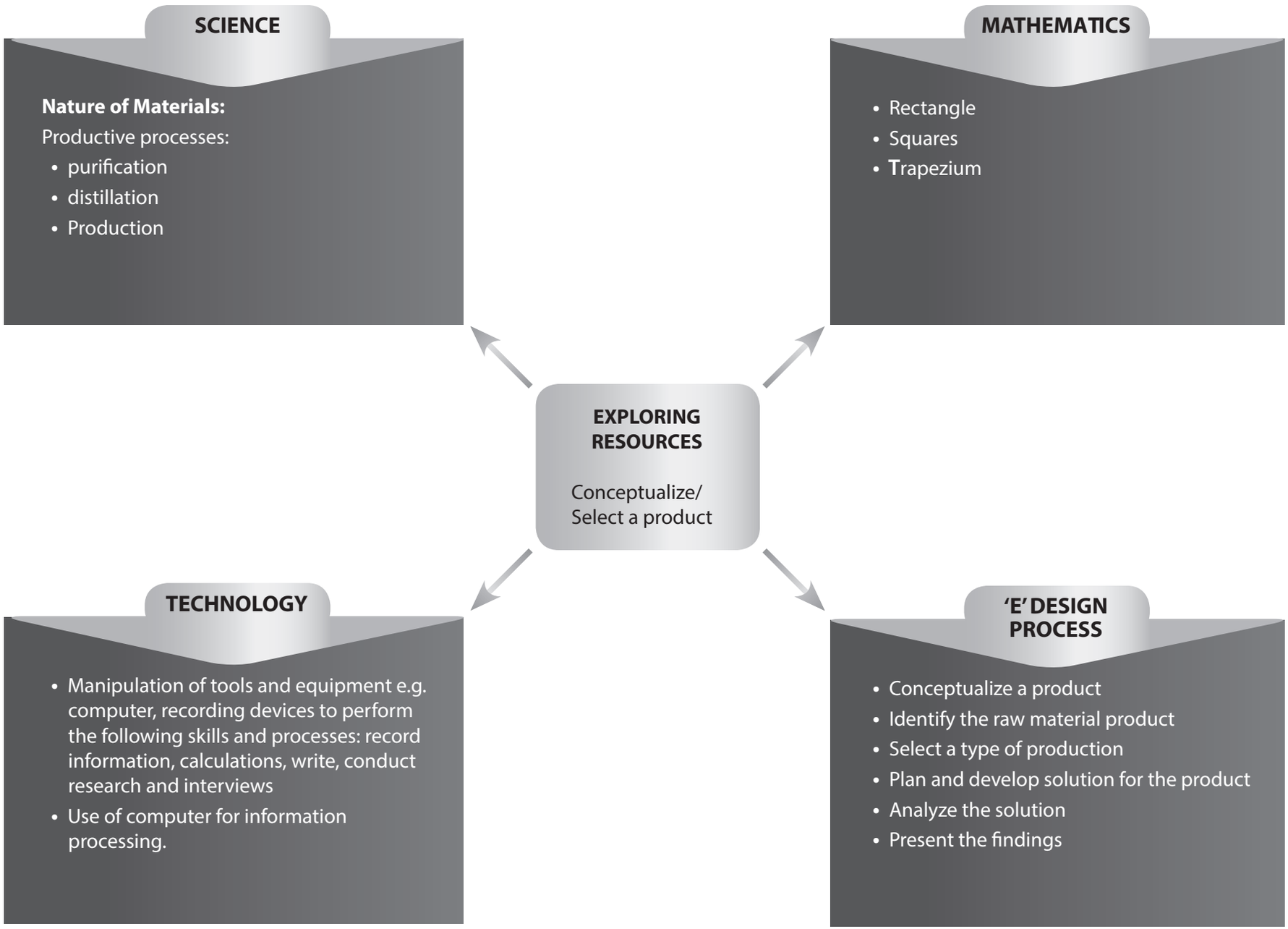
Unit 2:
Source Documents used in Business transactions

- How to prepare source documents (invoice, receipts, debit and credit notes, cheque counterfoil)
- How to calculate discounts and taxes for invoices to determine the final amounts due to be paid
- Use of cheque counterfoil as a source document



GRADE 8
RESOURCE & TECHNOLOGY

BUSINESS BASICS
TERM 1


SCIENCE
Nature of Materials:
Productive processes:
• purification
• distillation
• Production
MATHEMATICS
• Rectangle
• Squares
• Trapezium
EXPLORING RESOURCES
Conceptualize/ Select a product
TECHNOLOGY
• Manipulation of tools and equipment e.g. computer, recording devices to perform the following skills and processes: record information, calculations, write, conduct research and interviews
• Use of computer for information processing.
'E' DESIGN PROCESS
• Conceptualize a product
• Identify the raw material product
• Select a type of production
• Plan and develop solution for the product
• Analyze the solution
• Present the findings

The key concepts, skills and knowledge students will learn in this unit are:

- Definition of terms associated with the types of production e.g. primary/extractive, secondary/construction, tertiary/services, traditional/subsistence-level, domestic/local and surplus/export.
- Types of production: primary, secondary and tertiary.
- Productive activities associated with each type of production
- Classification of industries
- The contribution of each type of production to economic development.
- Explore geometric shapes and solids, to present information and solve problems
- Levels of production: traditional, domestic and Surplus or export level of production.
- Importance of each level of production in satisfying human needs and wants.
- Careers associated with production
- Examine the scientific process of production

About the Unit

Students will develop an understanding of the levels and types of production. Students will be exposed to the types of industries that are linked to each type of production.

Guidance for the Teacher

Review students' knowledge of the Unit 1, Term 2 of Grade 7 'Resources Used in Production'. Real life experiences of types of productive activities being carried out in the school community can be captured using a recording device if students are not able to go on a field trip. The content should be taught using an appropriate scenario to create a context.

Guidelines for Developing Project

The project should be developed on completion of the unit. Students can work individually or in groups. The project must be presented in written form and supported by an oral presentation using any appropriate product application software. Students should be asked to select/conceptualize a product and identify the type of production that would be engaged in the production of a good to be distributed from the primary stage to the tertiary stage.

Students should be encouraged to use available resources and natural resources as much as possible. A rubric should be developed to serve as a guideline for what is expected at each level of production.

UNIT TITLE: Exploring Resources

Prior Learning

Check that students can:

- Define the terms, resources and production
- Explain the factors of production

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target(s)

Students will:

- Explore different approaches to the production of goods and services
- Understand that people create solutions to satisfy a particular need

Strand 2: Explore Methods and Procedures
Attainment Target(s)

Students will:

- Understand that the making of a product is a series of steps.
- Create a flow chart to depict the process of producing goods and services according to the types of production

Strand 3: Apply Solution
Attainment Target(s)

Students will:

- Explain the process or steps involved in converting raw materials to finished goods.
- Differentiate between types and levels of production

Strand 4: Career Awareness
Attainment Target(s)

Students will:

- Identify careers that are associated with each type and level of production
- Participate in group activities
- Observe rules and procedures of working within a group

OBJECTIVES

Students will:

- Define the terms, production, primary/extractive, secondary/construction, tertiary/services, traditional/subsistence-level, domestic/local, surplus/export and Linkages
- Distinguish among types of production.
- Classify the process used to convert a selected raw material from its primary source to secondary source of production.
- Design flow chart using geometrical shape to depict the production process of a product.
- Classify given products according to its industry.
- Discuss the importance of each type of production to the Jamaican economy
- Classify careers within the different types of production.
- Identify the levels of production.
- Differentiate among levels of production.
- Evaluate the role of each level of production to economic development.
- Evaluate given career options by assessing traditional careers versus emerging careers.

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

DIGITAL CITIZENSHIP - Recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Science Standards

- Attainment Target 3. Energy and Matter - Nature of Materials – Grade 3
- Sort materials into groups in a variety of ways, and explain why some materials are suited to specific purposes.

Mathematics Standards

- Attainment Target 3 – Geometry - Make and explore geometric shapes and solids, and apply knowledge of their properties to problem solving situations Grade 6

Technology Standards

- Students will develop an understanding of the attributes of design
- Students will develop the abilities to assess the impact of products and systems

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: Conduct research online or in textbooks to identify the types of production. View pictures or watch video presentation on activities related to the types of production for example oranges being harvested from an orchard, a net of fish being pulled into a boat, foods being processed in a factory, clothes being sewn, someone doing a banking transaction, goods being transported in a truck, teacher instructing a class. Discuss the productive activities observed and tell the types of production taking place and industries in the immediate and wider communities that are involved in the type of production.	Research for information Make judgement Observe and interpret pictures/videos Discuss and classify	Types of production listed and defined correctly
Conduct research online/offline/interview business practitioners to determine the importance of each type of production to the Jamaican economy.	Analyse data/information	Importance of type of production identified
Identify selected products and use appropriate software/ pictorial to design a flow chart depicting the process of converting the raw material to finish product.	Create and format document/multimedia presentations	Production processes
Use appropriate application software or other writing tools to create a glossary of terms associated with the types and levels of production.	Research and compile definition of key terms	Correct definition of terms
Conduct research online or read textbooks to determine the levels at which goods and services are produced and the benefits of producing at each level.	Compile appropriate questions Research for information Deduce relevant information	Students' ability to identify each level and explain the benefit of producing at each level
Interview individuals or businesses in immediate or wider community to determine the levels at which business produce goods and services In groups discuss the reasons the various businesses choose the levels of production and state the contribution each business makes to the immediate and wider community.	Conduct research Present findings	Students' ability to make the correct distinction as well as identifying the importance of each level to the production process.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
From pictures or video observed in the presentation on each type of production: • List the skills or careers • Discuss the roles and career associated with each picture. • Classify the careers as traditional careers vs. emerging careers.	Classify information Analyse information and present findings	Listing of careers under the correct heading. Identify Job functions associated with careers Correct evaluation of the traditional careers vs. the emerging careers.
Conceptualize/select a product and give a detailed report of: • the stages of the production process from raw material stage to the point of final consumer, • outline clearly the types of production at each stage • Indicate the levels of production Use suitable presentation software to present the report (appropriate diagram charts, pictorial) should be utilize to enhance presentation.	Collaborate with peers Plan and organize Creativity in presentation Record information	Types of productive activities a product goes through from the primary to the tertiary production

Learning Outcomes

Students will be able to:

- ✔ Understand the importance of each type production in the creation of goods
- ✔ Know how each type of production contributes to the making of a product
- ✔ Know the activities that are performed at each type of production
- ✔ Illustrate how each type of production is linked
- ✔ Assess the career options to be derived from the various types of production
- ✔ Use suitable application software to design documents

Points to Note

Types of Production
Primary or Extractive, Secondary or Manufacturing and Tertiary or Service industries.

Extended Learning

Have students interview the owner of a businesses or conduct research online to find out how industries involved in the different types of production are linked and the types of linkages that exist.

Points to Note

Examples of each type of production
Extractive production – agriculture, mining
Secondary production – construction, manufacturing
Tertiary production – services which facilitate the buying and selling of goods e.g. banking, transporting, advertising

Levels of Production
Subsistence, domestic and surplus,
The levels of production are dependent upon the resources available and the extent to which the country has developed to exploit these resources.

Extended Learning

Resources

Pictures from magazines illustrating traditional and modern resources or samples of traditional and advanced resources e.g.
internet source, magazines, computer, multimedia projector, speaker.

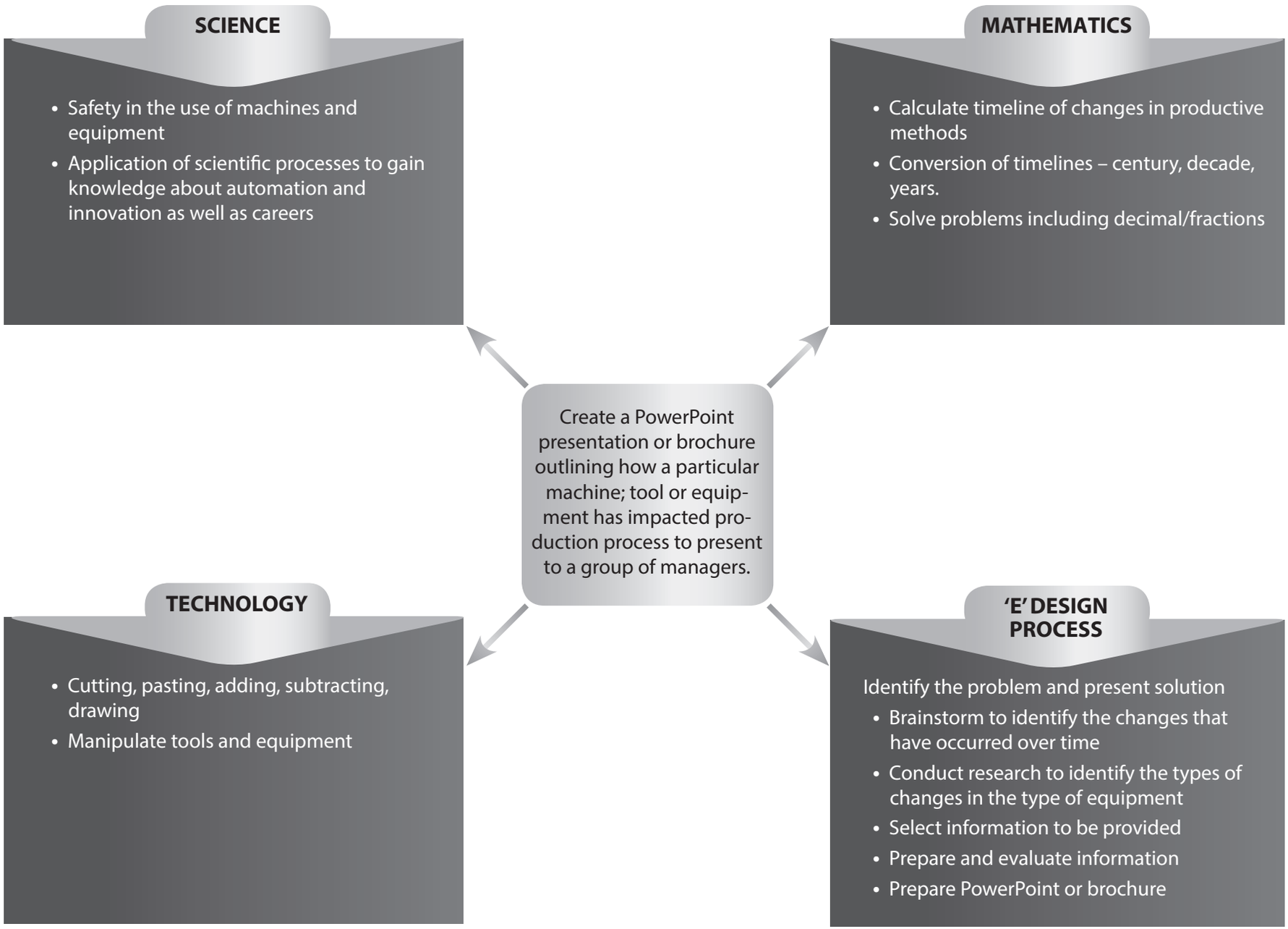
Key Vocabulary

Primary/extractive, secondary/construction, tertiary/services, traditional/subsistence-level, domestic/local, surplus/export and linkages.

Links to Other Subjects

Link with **Social Studies** Grade 7 Attainment Target 2, 'Our common heritage.'

TERM 1 UNIT 2: STEM INTEGRATION – EFFECIENCY IN PRODUCTION



The key concepts, skills and knowledge students will learn in this unit are:

- Definition of terms e.g. labour intensive, capital intensive, mechanization, automation, productivity, efficiency
- Methods of production – labour intensive, capital intensive (mechanization), automation
- Types of industries which utilize the various methods of production (traditional industries and contemporary industries)
- Features of labour intensive and capital intensive production
- Comparison of labour intensive and capital intensive production
- Types of automated systems used in business e.g. photocopying, document processing
- Economic, social and environmental impact of traditional and contemporary production
- Safety consideration associated with using the various methods of production
- Careers associated with CAM and automated mail room

About the Unit

This unit aims at developing students understanding of the various methods of production that are used to efficiently produce goods and services. They will be able to differentiate between the two main methods used in production namely capital and labour intensive production and their impact on productivity. Students will assess the economic, social and environmental impact of the both methods of production on traditional and contemporary productive activities. They will examine the various automated systems utilized in various types of production and how they contribute to efficiency and productivity. Students will explore new and emerging careers associated with the utilization of capital intensive production and automation.

Guidance for the Teacher

The project can be completed in groups or individually. A scenario should be created to guide students to complete the project so that students can implement the design process methodology. Focus should be placed on the more modern or automated equipment used in business particularly the office. A podcast on the industrial revolution could be prepared and presented for students to identify how the methods of production were developed as a result of the revolution.

Guidelines for Completing Project

Create a PowerPoint presentation or brochure to present to a group of managers on the types and advantages of the types of and uses of automated equipment in the production of goods and services.

Outline the economic, social and environmental impact of labour intensive, capital intensive and automation to the business communities.
Include pictures of the automated equipment that can replace traditional or simple machines, stating the uses and associated benefits

UNITS OF WORK | **TERM 1 UNIT 2** | **7 Hours (14 X 30 Minutes)**

UNIT TITLE: Effeciency in Production

Prior Learning

Check that students are:

- aware of the factors, types and levels of production

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target(s)

Students will:

- Identify needs or problems by observing or thinking about a range of design contexts in the environment

Strand 2: Explore Methods and Procedures
Attainment Target(s)

Students will:

- Gather information, data, and images necessary to plan the solution to a given problem
- Create simple drawings/designs, and verbalize ideas

Strand 3: Apply Solution
Attainment Target(s)

Students will:

- Create a visual image of an idea
- Explain the process or steps in handling mails in an office

Strand 4: Career Awareness
Attainment Target(s)

Students will:

- Observe rules and procedures of working within groups
- Utilize technological applications
- Identify skills utilised by different occupations

OBJECTIVES

Students will:

- Define the terms: labour intensive, capital intensive, mechanization, automation, productivity, efficiency
- Explain the methods of production
- Differentiate between labour intensive and capital intensive production
- Create a timeline to show the evolution of productive activities from labour intensive to capital intensive production
- Discuss the safe use of machine used in the production of a selected good or service
- Identify industries which utilize the various methods of production
- Identify types of automated systems used in the business environment
- Analyse how the various methods of production contribute to productivity in a business.
- Discuss the advantages and disadvantages of each method of production
- Discuss the economic, social and environmental impact of the various methods of production
- Identify new and emerging careers associated with the use of ICT in manufacturing and trade.

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

DIGITAL CITIZENSHIP - Recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Science Standards

- Attainment Target 3. Energy and Matter – Energy And forces– Grade 5
- Understand how simple machines work (levers, pivots)
- Attainment Target 1. – Exploring science and the environment – Science Application and Design Practice – Grade 7.
- Appreciate the importance of scientific methods and be aware of safety procedures to be taken when using equipment and materials.

Mathematics Standards

- Attainment Target 1– Number Representation - Grade 6
- Use Mathematical tools to solve problems involving decimals and fractions.

Technology Standards

- Students will develop an understanding of the effect of Technology on the environment.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will:		
Retrieve pictures from magazines or textbooks or view video presentation or activities in the school community illustrating the use of manual labour and machinery to perform productive activities in a business e.g. printing documents using a computer and printer, landscaping activities, applying postage stamps to letters.	Observe and describe activities	
Discuss illustrations retrieved from the different sources and identify the type of tools or equipment being used to perform the productive activities.		
Categorize productive activities according to those utilizing more manual labour and those utilizing machine.	Categorise activities Compare and contrast productive activities	
Conduct research online or use textbooks to formulate definitions for the terms labour intensive, capital intensive, mechanization, automation, productivity, efficiency.	Conduct research and formulate definition	Correct definition of terms labour intensive and capital intensive production Similarity and differences identified
Conduct a research online or use textbooks and interviews to identify labour intensive and capital intensive industries in their immediate and surrounding communities.	Research and compile information Classify industries	List of industries, productive activities carried out and the methods utilizing labour and capital intensive
Use appropriate application software to create a table using information gathered from research to compare the features, advantages and disadvantages of labour intensive and capital intensive production/industries.	Compare and contrast Create and format	Features of each method of production
Listen to a podcast presenting a summary of the industrial revolution or research how productive activities have been revolutionized to contribute to efficiency in business.	Analyse the developments	Timeline showing the changes in production methods used by industries.
Use appropriate application software or any other writing tool to create a timeline to show how productive activities have been revolutionized from labour intensive to capital intensive production.	Journal entries Create and format document	Journal

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: In groups conduct interview with workers from various industries or conduct research using textbooks and record the skills required by workers to utilize labour intensive production (traditional industries) and capital intensive production (contemporary industries)	Conduct research for information Present accurate information	Categories of skills utilized by various traditional and contemporary industries
Conduct tour of school office or technical and vocational departments in school or watch video presentation of productive activities and observe the activities which are performed and determine those which are utilizing manual labour, simple and advanced machinery. Categorize activities as labour intensive, capital intensive and automated giving reasons for the categories of the activities.	Observe and analyse activities Compare and contrast activities	Compare and contrast
In groups conduct research online or offline and make a presentation recommending activities that could be more efficiently done using alternative methods of production, listing the hardware and software that could be used.	Research for information Summarize information	Examples of automated activities performed in office
Collect copies of manuals illustrating safety practises for use of tools and machines (simple and advanced) and compile a list of standard rules to be observed.	Read and deduce information compile accurate information	List of standard rules to observed when using advanced and simple machine
Conduct research online of offline to determine new careers that have emerged with the use of automation/ICT in production and trade.	Research information	Demonstration of Careers
Create a PowerPoint presentation or brochure to present to a group of managers. (a)Select an automated equipment used in production, office activities or trading and discuss and outline: • Advantages and disadvantages • Effects on efficiency • Effects on productivity • economic, social and environmental impact of labour intensive, capital intensive and automation to the communities.	Collaborate with peer Designing Oral presentation of findings	Automated equipment required to increase efficiency and productivity Advantages and disadvantages of automated equipment

Suggested Teaching and Learning Activities | Key Skills | Assessment Criteria

Include pictures of the modern automated equipment that can replace traditional or simple machines, stating the uses and associated benefits

Learning Outcomes

Students will be able to:

- Select the most appropriate method of production to manufacture selected goods
- Know the economic, social and environmental impact of each method of production
- Determine the benefits to be derived from utilizing automation over manual labour
- Discuss the evolution of the various methods of production
- Create and format document/multimedia presentation

Points to Note

Definition of Terms

Productivity : A measure of the efficiency of a person, machine, factory, system, etc., in converting inputs into useful outputs. Productivity is computed by dividing total output per period by the total costs incurred or resources (capital, energy, material, personnel) consumed in that period.

Manual labour the predominant use of human beings in the production of goods and services

Mechanization is replacing of human or animal labour with machines in order to produce more quickly and efficiency. Computer-aided manufacturing (CAM) is the use of computer software to control machine tools and related machinery in the manufacturing of goods and services.

Automation is the use of machines in a series of operations, one linked to the other, without human intervention (Show video or picture an examples) Teacher should ensure that students practice online safety and cite sources accurately

Extended Learning

Have students:
Find out from family members and relatives which methods of production they utilize to perform their job related functions

Conduct a research on all the things a robot can now do in a business which humans did 50 years ago, list all the things a robot still cannot do today and why there aren't robots more in firms around the world.

Resources

Field trip, pictures, video presentation, resource personnel, laptop, multimedia projector, internet sources e.g. recording devices, podcast for presenting information on the industrial revolution

Key Vocabulary

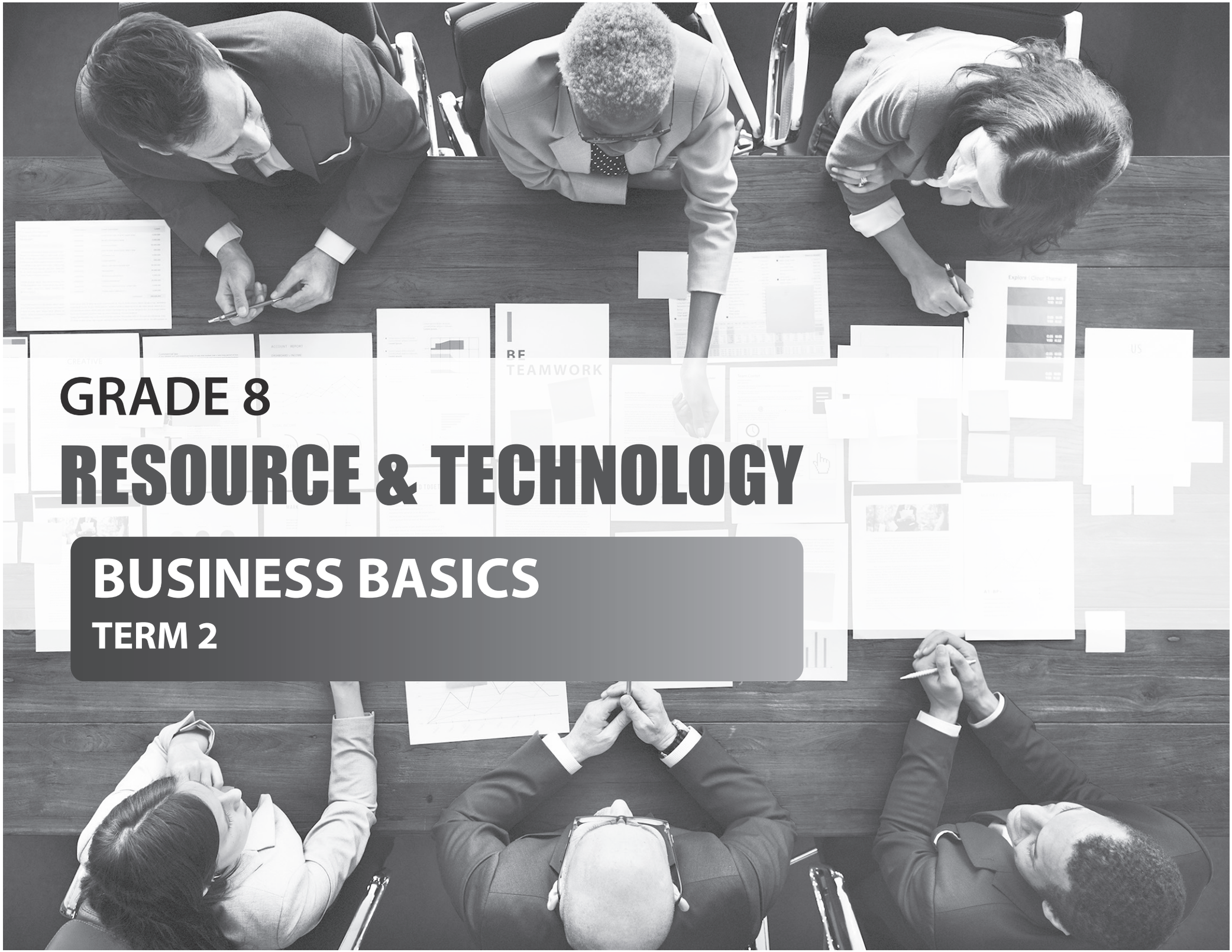
Labour intensive, capital intensive, automation, mechanization, Computer-aided manufacturing, productivity, Mail merge, Addressing machines, Franking machines, Letter openers, Folding machines, Collating machines, Sealing machines

Links to Other Subjects

Social Studies in Grade 5 Attainment Target 4 – Recognize the contribution of individuals who have helped to shape Jamaica's development over time.

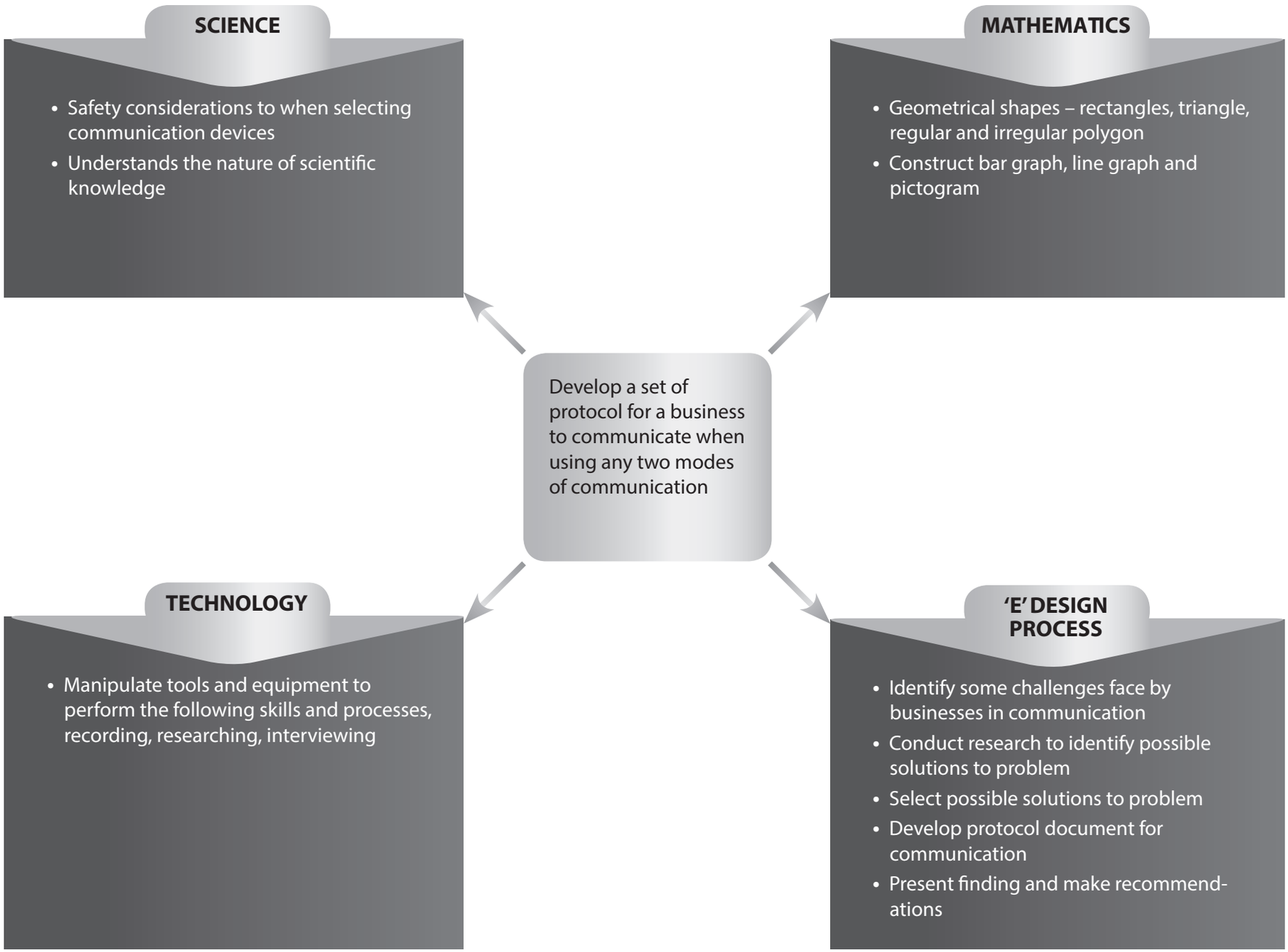
Language Arts AT3: Strand 3 Communication Grades 7-9; write well-constructed paragraphs which have linking sentences within and between them

Language Arts AT 2: Strand 2: Reading for Information Identify and use text features to support navigation of texts, retrieve and synthesise information gained from a range of sources



GRADE 8
RESOURCE & TECHNOLOGY

BUSINESS BASICS
TERM 2


SCIENCE
• Safety considerations to when selecting communication devices
• Understands the nature of scientific knowledge
MATHEMATICS
• Geometrical shapes – rectangles, triangle, regular and irregular polygon
• Construct bar graph, line graph and pictogram
Develop a set of protocol for a business to communicate when using any two modes of communication
TECHNOLOGY
• Manipulate tools and equipment to perform the following skills and processes, recording, researching, interviewing
'E' DESIGN PROCESS
• Identify some challenges face by businesses in communication
• Conduct research to identify possible solutions to problem
• Select possible solutions to problem
• Develop protocol document for communication
• Present finding and make recommend-ations

The key concepts, skills and knowledge students will learn in this unit are:

- Definition of terms: communication, communication process, methods/channels of communication
- Communication Cycle
- Communication channels (oral, electronic, written, visual)
- Methods of each channel of communication
- Documents used to communicate business information
- Communication protocol
- Safety considerations when using communication media to transmit business information.
- Careers associated with communication in a business.

About the Unit

The unit is designed to expose students to the wide range of communication media that exist in businesses. They will explore the various channels within each methods of communication. They will be given practise to select and design appropriate documents to communicate information for given situations in a business. Importantly students will learn about guidelines/protocol that are implemented by business to communicate information.

Guidance for the Teacher

Worksheet with a number of communication scenarios could be developed with a space provided for learners to write their opinion of an appropriate method of communication for that scenario.

To create interest in the lesson students could be given home assignment to write a set of simple instructions for using a piece of equipment they use to communicate in their everyday lives. Some examples could be how to play a song on their IPOD, or how to save a number on their mobile phone. They should write the instructions for other students to be able to follow. They can use pictures if they have the facilities.

Opportunities available in the school or immediate community should be utilized to provide real life experiences for students to ensure understanding of concepts to be learnt.

Guidelines for Completing Project

Students should identify a business of their own. Select two communication media that will be used in the business and develop a set of protocols for each. For example, what method of communication should be selected to respond to queries made by customers about delays in delivery of goods. Protocol could indicate method to respond to customer, content and timeframe to respond to customer.

UNITS OF WORK | **TERM 2 UNIT 1** | **6 Hours (12 X 30) Minutes**

UNIT TITLE: Communication in Business

Prior Learning

Check that students are aware of:

- Reasons people communicate
- Ways people communication in their community
- Devices used in communicating in their environment.
- The importance of communicating with others.

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target(s)

Students will:

- Brainstorm possible methods to communicate information
- Explore different methods of communication to arrive at the most appropriate for a given situation

Strand 2: Explore Methods and Procedures
Attainment Target(s)

Students will:

- Create documents to express or communicate information
- Discuss the role of technology in the development of methods of communication
- Brainstorm barriers to good communication

Strand 3: Apply Solution
Attainment Target(s)

Students will:

- Evaluate the appropriateness of a method of communication for given situations
- Compose and prepare correctly formatted business correspondences

Strand 4: Career Awareness
Attainment Target(s)

Students will:

- Observe rules and procedures of working within a group
- Participate in group activities
- Utilize technological applications
- Work collaboratively to support individual needs and contribution to the learning of others

OBJECTIVES

Students will:

- Define the term communication
- Explain the element of the communication process
- Explain the elements of good communication
- Identify the methods of communication
- Discuss the barriers to good communication
- Select the appropriate methods of communication and express reasons for selection
- Explain the elements of various documents used to communicate
- Design business correspondence using the appropriate layout/format
- Compose business correspondence to respond to a given scenario
- Prepare simple charts and graphs in response to a given scenario using appropriate computer software/writing tools
- Discuss safety consideration when using communication media in a business
- Identify careers associated with using communication media in a business

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

DIGITAL CITIZENSHIP - Recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Science Standards

- Attainment Target 1. – Exploring Science and the Environment –
- Science Application and Design Practice – Grade 7.
- Appreciate the importance of scientific methods and be aware of safety procedures to be taken when using equipment and materials.

Mathematics Standards

- Attainment Target 5– Data Handling and Probability - Grade 5
- Discuss the uses of tables and graphs: draw simple graphs, draw simple graphs and interpret data represented on these graphs

Technology Standards

- Students will develop an understanding of and be able to select and use information and communications technologies.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will:		
Participate in role play illustrating the communication process and identify the features which illustrate the process or cycle.	Observe and discuss	Illustration of the communication cycle
Use computer drawing tools or any other appropriate application software to illustrate a model of the communication cycle and use examples to explain each element of good communication.	Create and make	
View video presentation, or play game (Chinese Telephone) illustrating barriers to good communication. Identify the barriers observed and state how it impacts effective communication and make recommendations for improvement.	Observe, listen and discuss	Barriers to effective communication identified
View mind map showing the various communication methods used to transmit messages in business.	Observe	Flow chart illustrating the methods of communication and examples of
Conduct a research online or use textbooks to identify examples of the methods used in business.	Use search engine/books to research information	
Use a graphic display such as a concept map or flow chart to illustrate examples of methods.	Design and create	Graphic display of methods used in business
In groups read scenarios and determine the most appropriate method of communication giving reasons for selection e.g. complaint about late delivery of goods, advertising a new product, ordering a pizza to be delivered, asking for a pay increase.	Collaborate with peer Create and format document/multimedia presentation	Appropriate method for each scenario with justification for selection
Collect and view samples of documents used to communicate or transmit information in a business	Observe and explain elements	
Discuss the elements of various communication documents e.g. parts of letters, email, memorandum, notice		
Read and discuss scenario and design documents to effectively communicate information.	Design and compose	Correspondence correctly designed for given scenarios
Use appropriate computer software/writing tool design pictorial and graphs in response to a given scenario related to visual communication.	Create and format document	Charts and graphs designed for given scenario

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: Visit a small or medium sized firm, school office or ask family members or friends who work in business about the protocol for communication for preparing documents for meetings, email, queries from customers.	Compile questions for interview Conduct interview and record relevant information Plan and organize information	Protocol for different types of communication List of safety considerations
Conduct a research and develop a set of protocols for a business to communicate using any two of the following: email, meetings, letters, memorandum, telephone messages, flyers, press releases Prepare a written presentation outlining the protocol/procedure for each and the safety considerations to adhere to.	Research for information Plan and organize relevant information	Appropriate set of protocol for any two methods of communication

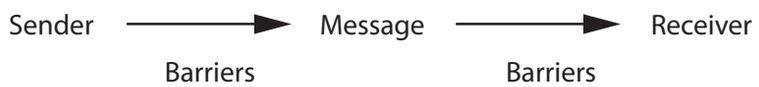
Learning Outcomes

Students will be able to:

- Understand the communication cycle and how it contributes to effective communication
- Demonstrate the use of the communication cycle in the business environment
- Discuss various methods used in each channel of communication to disseminate business messages
- Select and appropriate methods to communication information
- Recommend safety measures to adhere to when communicating in businesses
- List careers associated with communication in business and their corresponding duties and responsibilities.
- Creating and editing documents/multimedia presentations

Points to Note

Communication process



Methods of communication
Written, oral, electronic, visual

Communication Protocols - regulations or guidelines developed by a business for preparing and disseminating information

Extended Learning

Look at advertisements /notices of events in the newspaper/magazines / billboards and identify those that appeal to them. Think of why it attracted them. Study the text and graphics and discuss the differences between those that are good and those that are not.

Watch a short film on telephone etiquette on YouTube or observe telephone etiquette in an office.

Research online to find out about videoconferencing facilities in the Caribbean. See if there are any in Jamaica.

Look at business letters that their family receive and note the similarities and differences between the formats used.

Points to Note

Safety consideration: confidentiality, security issues to protect personal data and prevent hacking or virus, back-up systems to prevent data loss, screening of calls, etc.

Teacher should ensure that students practice online safety and cite sources accurately

Careers associated with communication: receptionist, Secretary, communication specialist, switchboard Operators.

Extended Learning

Resources

Multimedia projectors, computers, internet access, case study, video presentations, telephone message pads, samples of business correspondences, field trip, resource personnel

Key Vocabulary

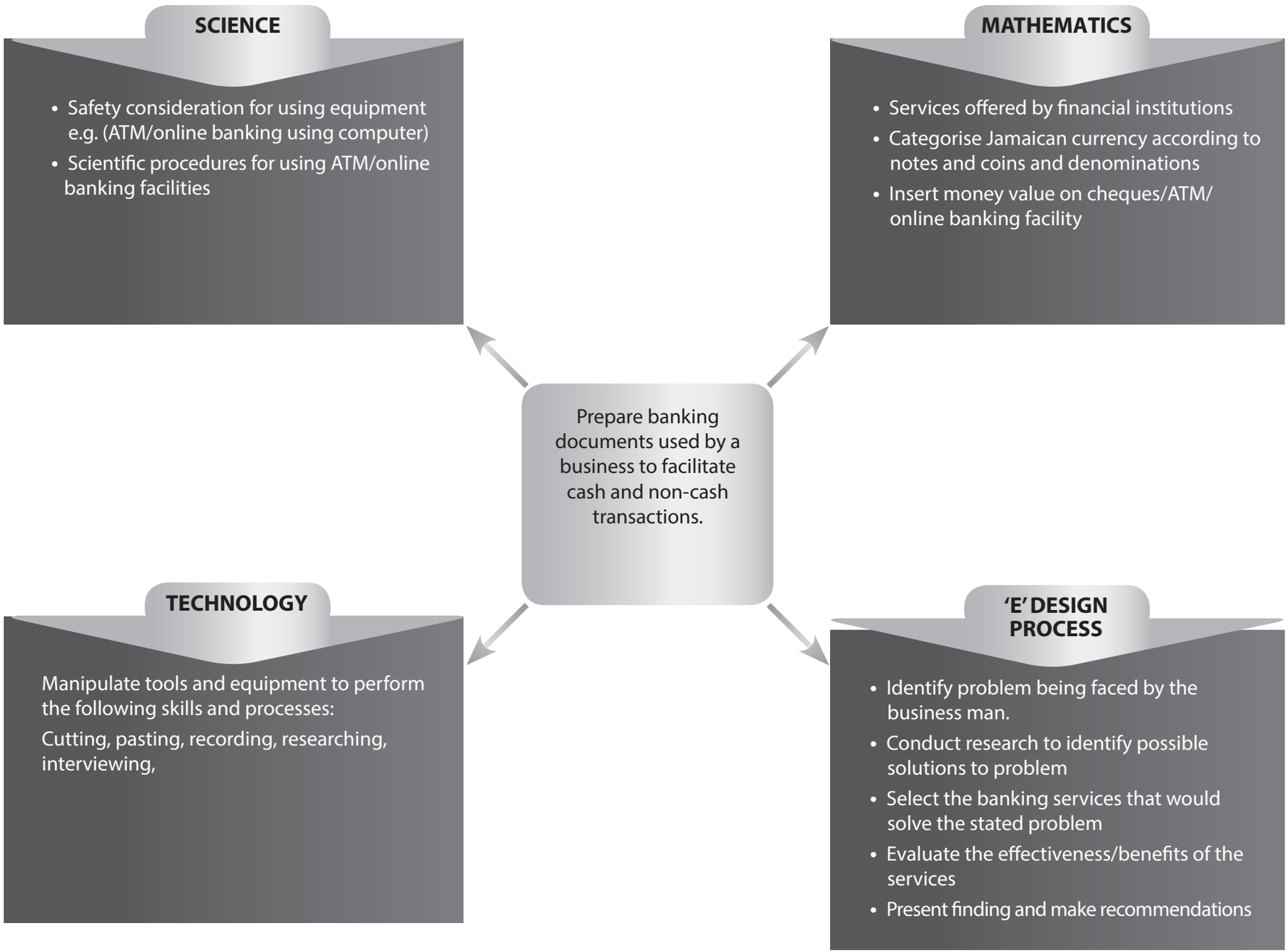
Communication, communication process, sender, message, receiver, decode, encode, barriers protocol

Links to Other Subjects

Language Arts: AT 3 Grade 7-9: Writing: Strand: Communication Write well-constructed paragraphs which have linking sentences with and between them

Language Arts: AT 1: Listening and Speaking: Listen to, recall, understand and respond to speakers' messages, whether implicit or explicit

Drama: AT3 Appreciating and Critiquing Grade 8 Develop and document scenarios for dramatic presentation


SCIENCE
• Safety consideration for using equipment e.g. (ATM/online banking using computer)
• Scientific procedures for using ATM/online banking facilities
MATHEMATICS
• Services offered by financial institutions
• Categorise Jamaican currency according to notes and coins and denominations
• Insert money value on cheques/ATM/ online banking facility
Prepare banking documents used by a business to facilitate cash and non-cash transactions.
TECHNOLOGY
Manipulate tools and equipment to perform the following skills and processes:
Cutting, pasting, recording, researching, interviewing,
'E' DESIGN PROCESS
• Identify problem being faced by the business man.
• Conduct research to identify possible solutions to problem
• Select the banking services that would solve the stated problem
• Evaluate the effectiveness/benefits of the services
• Present finding and make recommendations

The key concepts, skills and knowledge students will learn in this unit are:

- Definition of terms, transactions, lodgement, commercial, cheques, memorandum,
- Forms of money used in business transactions, e.g., notes, coins, bank deposits.
- Importance of cheques in business transaction.
- Procedures for drawing a cheque.
- Services offered by commercial banks to business, accepting deposits, offering loan, lodgement/deposit slip and documents.
- Banking forms utilized in withdrawal and deposit for business transactions e.g., application forms, withdrawal and deposit forms, currency breakdown forms and memorandum.
- Utilising Automated Banking Services:
  - Procedures for using an Automated Teller Machine/online banking
  - Benefits of an Automated Teller Machine/online banking
  - Practising safety using Automated Teller Machine/online banking
- Careers associated to banking services

About the Unit

This unit introduces students to the services provided by the bank to businesses. Students will learn about the forms of money and how to correctly draw cheques and fill in relevant information in various forms utilised by the banks such as application, deposit and withdrawal forms (including online banking). They will also learn the correct procedures for using an automated teller/banking machine and identify the careers associated with the banking services.

Guidance for the Teacher

An appropriate scenario should be developed to teach the content and the design process methodology should be utilized during instruction. Samples of documents such as cancelled cheques, deposit slips application and withdrawal forms, should be used during instruction to give students the experience of completing same. The procedures for completing the forms should be thoroughly explained.

Online simulation of ATM procedures may be videotaped and presented for students to observe. Students could also be asked to visit the Automated Teller Machines with their parents to gain personal experience.

Guidelines for Completing Project (Assessment) – Create a portfolio to include the appropriate banking documents

The following is an exemplar of a scenario that could be used to guide the completion of the project. A small business owner has a regular savings account at the bank. The business owner regularly conducts many cash transactions which involve huge sums of cash. The businessman is at risk, as he or an employee lodges the cash. Provide advice to the business owner that will assist in utilizing the appropriate services efficiently and safely.

Students will be required to develop a portfolio to guide the business owner. The following are suggested activities could include:

- Recommend at least three services that the bank should offers that the business owner could utilize
- Explain the benefits derived from using the services mentioned above.
- Explain the services offered at the ATM/ABM and the complete the appropriated forms utilized with each service.

- Identify safety guidelines for using various banking services (cheques, ATM, Debit and Credit card)
- Include brochures or flow diagram explaining the procedures for using banking services such as ATM or online banking
- Prepare and label a cheque
- Present completed bank form which would be utilized by the business man to utilize non cash transactions, debit note, credit note, bank application form, lodgement slip, withdrawal slip, currency memorandum/breakdown

An appropriate rubric should be developed to grade the portfolio. Project could be completed as a group or individual assignment

UNITS OF WORK | **TERM 2 UNIT 2** | **5 Hours (10 X 30 Minutes)**

UNIT TITLE: Banking Services

Prior Learning

Check that students:

- Are aware of at least two (2) forms of money
- Are aware of some services that can be accessed at commercial banks in their communities
- Can identify different types of bank accounts

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target(s)

Students will:

- Understand that the bank provide various services to satisfy the needs of the business sector.

Strand 2: Explore Methods and Procedures
Attainment Target(s)

Students will:

- Identify bank forms required by business to transact businesses at a bank.
- Discuss the procedures for completing bank forms

Strand 3: Apply Solution
Attainment Target(s)

Students will:

- Complete various bank forms used by businesses to transact businesses at a bank.
- Discuss safety consideration for using an ATM
- Demonstrate procedures for using ATM
- Explain benefits of ATM to a business

Strand 4: Career Awareness
Attainment Target(s)

Students will:

- Discuss careers associated with banking.
- Identify skills and behaviours necessary to get along with others.

OBJECTIVES

Students will:

- Identify forms of money used to acquire goods and services.
- Define the terms: commercial banks, bank deposits, cheques cash, notes, withdrawal, deposits, lodgement, currency memorandum, automatic banking, Personal Identification Number (PIN), debit card and credit cards
- Identify services provided by banks to businesses
- Discuss the advantages of using cheques in business transactions.
- Explain the parts of a cheque
- Discuss the safety guidelines for drawing cheques.
- Fill in appropriate information in a blank cheque from given scenario.
- Complete relevant forms to access banking services.
- Discuss the benefits of an Automated Teller Machine/online banking to a business
- Explain the procedures for using an Automated Teller Machine (ATM)/ online banking

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

DIGITAL CITIZENSHIP - Recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Science Standards

- Attainment Target 1: Exploring Science and the Environment – Grade 7
- Appreciate the importance of scientific methods and be aware of safety procedures to be taken when using equipment and materials.

Mathematics Standards

- Attainment Standard 1: Number Operation and Application – Grade 6
- Demonstrate an understanding of financial institutions and their functions
- Attainment Standard 1: Number Operation and Application – Grade 3
- Identify the value of notes and coins in the Jamaican currency and apply these values to the use of money to everyday situations using various combination to show $1000.

Technology Standards

- Standard 13: Students will develop the abilities to assess the impact of products and systems.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: Collect different forms of money and sort them into three categories paper notes, coins and bank deposits.	Classify categories of money	Organise money into three categories and correct denominations.
Organise money according to denominations.		
Discuss scenario illustrating a business main concern regarding the most appropriate form of money to use for safe and convenient payments of large sums of money for goods and services and to pay employees and recommend the most appropriate form of money to use.	Discuss scenario and provide solution to need or problem	Recommendations for the most appropriate form a money to use in the scenario.
View samples of documents that business owners use to transact business at the commercial banks for example cheque, withdrawal and deposit slips. Analyse the documents to determine their purposes.	Observe, critique instrument outline purposes	
Read and discuss a scenario depicting services that are provided by the bank and discuss the procedure for utilizing the following services: Deposits and withdrawal of cash (deposit and withdrawal slips) Lodgements of cash and cheques (currency memorandum) Payments of large amounts to made for goods and services (cheques).	Evaluate scenario and provide appropriate solution.	
Identify and complete the appropriate document with the relevant information to be used for each transaction	Complete documents with appropriate information	Correct information inserted in banking documents
Use drawing software to create, label a cheque and fill in relevant information.	Design sample cheque using appropriate software or manual drawing tools	Cheque correctly labelled
Discuss the safety guidelines for drawing cheques and other documents.		Correct completion of blank cheque using information provided. Safety consideration when using cheques
Watch video presentation or observe flow chart or listen to presentation from a class member on the procedures for using an automated teller/banking machine.	Observe/listen to presentation and discuss the procedures.	Explain correct procedures for using the ATM
Use suitable presentation software to make a presentation of the types of automated banking services and the benefits derived from using these services.	Research and compile information Create and format presentation	

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Use appropriate application software to create/write a letter to a friend who owns a small business explaining the benefits of an automated banking/teller machine and the correct procedures for using the automated banking/teller machine.	Create and format document using appropriate computer software.	Correct sequencing of the procedures for using an Automated Teller Machine. Benefits from using an Automated Teller Machine/online banking
Provide advice to a business owner on the most appropriate banking services to use in response to a problem outlined in a case study.	Recommend solution to problems identified.	Appropriate recommendations on banking services to use in response to case study
Interview/listen to presentation from banking personnel on careers in the banking industry. Cut out advertisements for jobs in the banking field from the newspaper, magazine or retrieve from online sources. Paste clips in manuscript and use the information to create a table showing the careers in the banking industry, qualification and job functions.	Listen to presentation/ ask questions on careers in banking. Develop interview protocol Research for information	Identify careers associated with the banking industry along with qualifications and job functions.
Using case study, develop a portfolio which should include: • An overview of services offered by the bank to its customers • Brochures from the bank • Samples /pictures of forms used by the bank (deposit slips, withdrawal slips, bank application etc.) • Flow charts showing procedures for using the ATM/online banking • Labelled sample of cheque clearly showing the parties • Guidelines for preparing cheques • Safety consideration to observe with preparing cheques and using the ATM/online banking. • Glossary of banking terms	Create and format document Compile and present information	Portfolio developed

Learning Outcomes

Students will be able to:

- Efficiently utilize the services of commercial banking services
- Identify the appropriate banking services which benefit businesses
- Complete relevant banking documents appropriately
- Practise safety precautions when completing banking documents/ATM to safeguard against fraud
- Identify the careers associated with banking services and discuss the associated skills and training needed.
- Create and format document using appropriate software

Points to Note

Forms of Money include: cash, coins and bank deposits e.g. cheques

Banking documents include:
Application form, withdrawal and deposit slips, currency breakdown form (lodgement form), cheque

Benefits of ATM/online banking allows access to withdraw, lodgement or make inquiry into bank account 24 hours per day

To use an ATM/online banking, one will need a bank account and an ATM/ ABM card.

Procedure to access services using an ATM or internet facilities - PIN

Teachers should ensure that students practice online safety

Protection of PIN

Secure ATM/Debit /Credit card

Advantages/benefits of using cheque VS cash

Safest method of transmitting money

They can be easily traced

Payment may be stopped by the drawer if necessary

Create control in payment arrangement (crossing the cheque) Can be used to make payment of large sums of money

Transferable from payee to another person.

Extended Learning

Students will:
Discuss with relatives and friends other reasons for using the commercial bank.

Further reading or online research on the types of banks and barriers to automated teller machine.

Accompany relative to observe procedures in using ATM/online Banking .

Resources

Cheque, application form, deposit/lodgement forms, withdrawal form, currency memorandum/breakdown form, coins, paper notes, sample cheques, debit card, credit card, computer, resource persons, internet access, video presentations, brochures from bank

Key Vocabulary

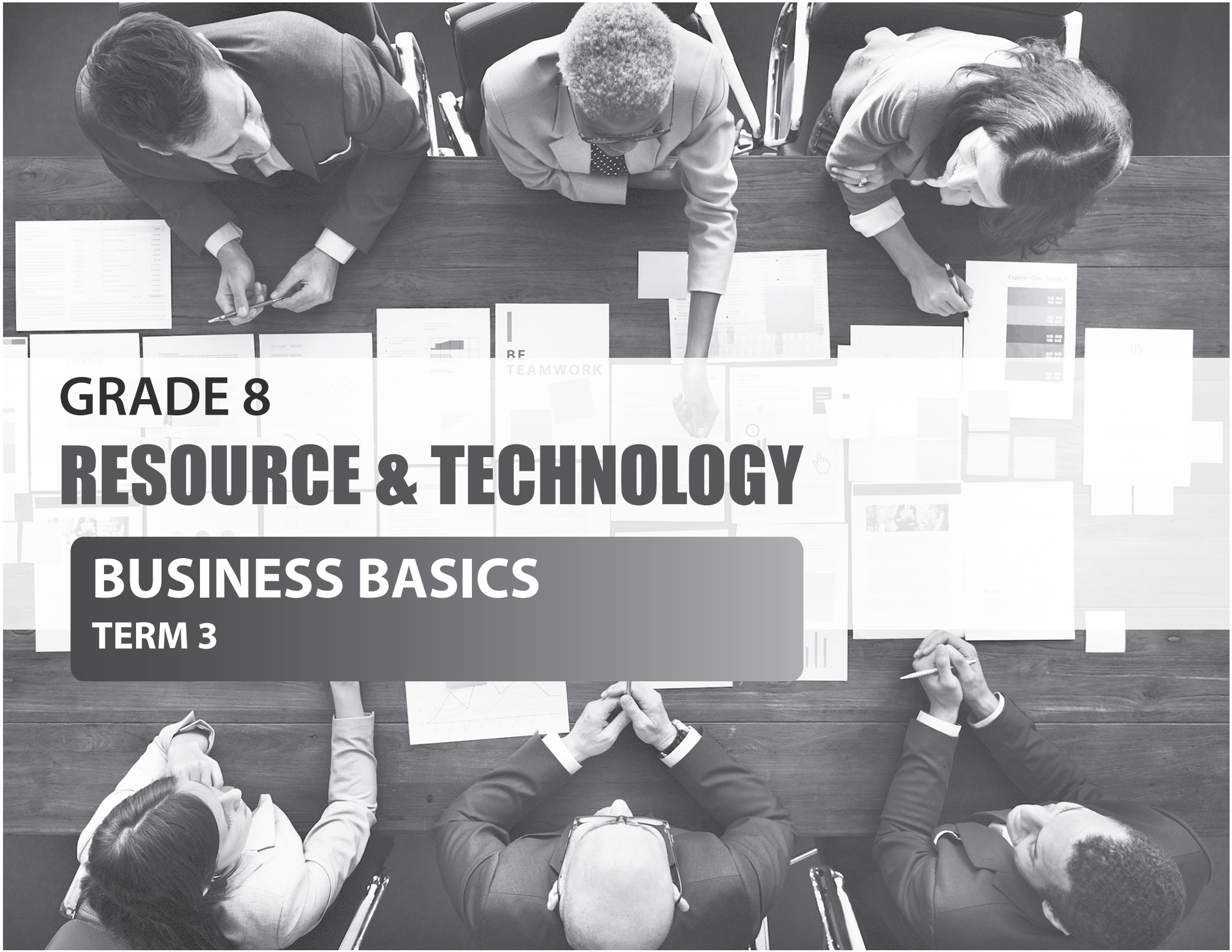
Money, cheques, withdrawal, application forms, lodgement/deposit forms, currency memorandum/breakdown, Automated Teller Machine/Automated Banking Machine transaction, online banking, coins, banking notes, Bank Tellers, Bank Managers, Chartered Accountants, Loan Officer

Links to other subjects

Mathematics: Grade 7 & 8 Attainment Target 1 , 'Number operation and application.'

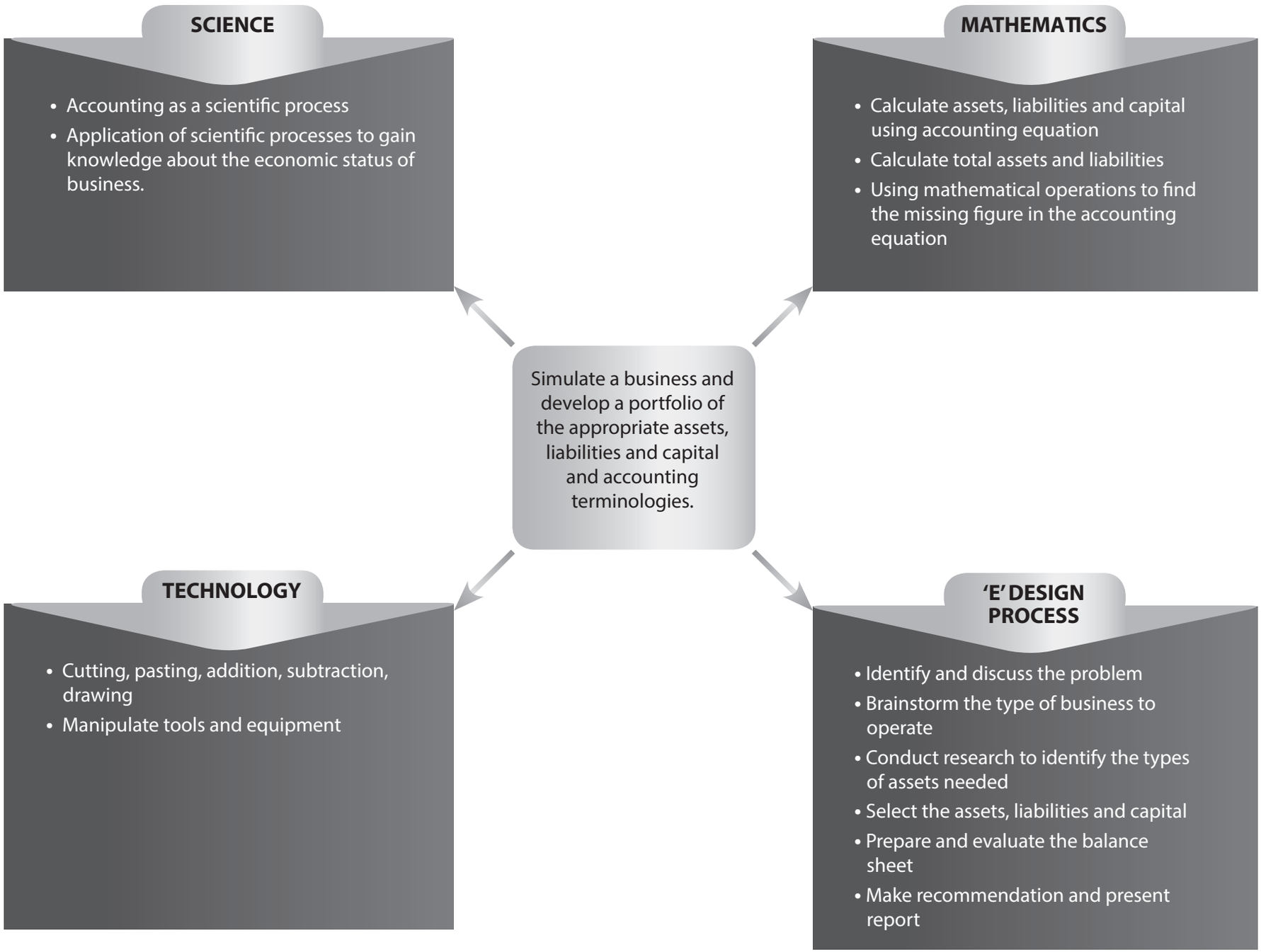
Language Arts AT 3 Grade 7-9: Writing: Strand: Communication Write well-constructed paragraphs which have linking sentences with and between them

Language Arts AT 1: Listening and Speaking: Listen to, recall, understand and respond to speakers' messages, whether implicit or explicit



GRADE 8
RESOURCE & TECHNOLOGY

BUSINESS BASICS
TERM 3


SCIENCE
• Accounting as a scientific process
• Application of scientific processes to gain knowledge about the economic status of business.
MATHEMATICS
• Calculate assets, liabilities and capital using accounting equation
• Calculate total assets and liabilities
• Using mathematical operations to find the missing figure in the accounting equation
Simulate a business and develop a portfolio of the appropriate assets, liabilities and capital and accounting terminologies.
TECHNOLOGY
• Cutting, pasting, addition, subtraction, drawing
• Manipulate tools and equipment
'E' DESIGN PROCESS
• Identify and discuss the problem
• Brainstorm the type of business to operate
• Conduct research to identify the types of assets needed
• Select the assets, liabilities and capital
• Prepare and evaluate the balance sheet
• Make recommendation and present report

The key concepts, skills and knowledge students will learn in this unit are:

- Purpose of accounting
- Users of accounting information
- Accounting as a scientific process
- Definition of terminologies relevant to simple accounting transactions: accounting/book-keeping, receipts/payment, cash/bank, credit/debit, discounts, assets, liability and capital.
- Differences between accounting and book-keeping
- Accounting Equation (Asset – Liability = Capital)
- Classification of items as assets, liabilities and capital
- Calculation of the assets, liability or capital of a business from given scenarios
- Construct a simple unclassified balance sheet
- Careers associated with accounting.

About the Unit

In this unit students will explore simple terms relevant to accounting transactions. Students will use mathematical operations to calculate asset, liability and capital of a business.

Guidance for the Teacher

Case studies/presentation should to be developed that introduce the students to the accounting equation, assets, liabilities and capital. Students should be encouraged to create an accounting dictionary to record the definitions of terms learnt. Guest presenter from the accounting field can be invited to make presentation (e.g. Bank representatives, accounting professionals, School Bursar, career counsellors from universities or colleges offering accounting courses etc.) and present on purpose of accounting, users and careers in the industry.

Guidelines for Developing Project

The project should be developed on completion of the unit. The project must be presented in written form. Students should identify and explain the accounting terminologies relevant to the operation of a business. Students should simulate a business of their own and give examples of the appropriate assets, liability and capital that would be utilized in the business. A rubric should be developed to be used as a guide to ensuring that students meet the expectation of the summative assessment.

UNITS OF WORK | **TERM 3 UNIT 1** | **2 Hours (4 X 30 Minutes)**

UNIT TITLE: Introduction to Basic Accounting Terms

Prior Learning

Check that students can:

- Explain the purpose of a business
- Identify factors of production utilized in a business

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target(s)

Students will:

- Brainstorm to select the correct terminologies

Strand 2: Explore Methods and Procedures
Attainment Target(s)

Students will:

- Gather information to identify the accounting procedures adopted by businesses

Strand 3: Apply Solution
Attainment Target(s)

Students will:

- Follow instructions to calculate the assets, liability and capital of a business

Strand 4: Career Awareness
Attainment Target(s)

Students will:

- Discuss the jobs related to the performance of accounting duties and responsibilities.

OBJECTIVES

Students will:

- Explain the purpose of accounting
- Identify the main users of accounting and how they use accounting information
- Discuss accounting as a scientific process.
- Explain simple accounting terms relevant to business transactions.
- Differentiate between accounting and book-keeping
- Classify resources as assets, liability and capital as relevant to business
- Discuss the relevance of the accounting equation to a business
- Apply mathematical operation to re-arrange the accounting equation to find the missing figure.
- Calculate the asset, liability and capital of a business using the balance sheet equation.
- Construct a simple balance sheet in basic format
- Identify the careers associated with the accounting practices of business
- Apply basic accounting terminology to the interpretation of business transaction.

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

DIGITAL CITIZENSHIP - Recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Science Standards

- Attainment Target 1: Exploring Science and the Environment – Grade 3

  Measure quantities to make comparisons and contrasts, identify simple relationships, draw conclusion from results and begin to use scientific knowledge to suggest explanations.

Mathematics Standards

- Attainment Target 4: Algebra – Grade 6
  Use operation symbols to complete mathematical sentences.

Technology Standards

- Standard 12: Student will develop the abilities to use and maintain technological products and systems.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: View a video or PowerPoint presentation or listen to guest presentation on the purposes and users of accounting information. In groups discuss and present information on how various entities use accounting information.	Observe/listen to presentation Collaborate with team members Record information accurately	
In groups conduct a research online or use textbooks to identify the basic terms associated with accounting e.g. bookkeeping, assets, capital, liabilities, credit, debit etc. Create a glossary of related business terms for inclusion in the portfolio	Read and discuss case study/scenario Collaborate with team members Research and collate information	Correct definition of key terms relevant to accounting transactions.
Listen to a presentation made by an employee in a business or the school Bursar outlining the job functions of an accountant and a bookkeeper Record the presentation using audio/video recording device and replay for class feedback then correctly define each term accounting and book-keeping. Record the job functions that are being performed and categorise the activity as book-keeping or simple accounting making reference to definitions previously developed. Conduct research online or using text books to identify other accounting related careers and use computer software or writing tools to design a map of accounting related careers (to be included in portfolio)	Listen and ask appropriate questions Recording audio/video and replay Record key points and categorise activities	Correctly differentiate between accounting and book-keeping. Careers associated with accounting and the job functions.
Interview teachers in the school or surrounding communities to determine what is owned and what is owed Conduct research to define terms assets and liabilities, then from the interview conducts with individuals the classify items owned as assets and items owed as liability appropriately. Participate in teacher-led discuss to understand the relevance of accounting equation of Asset = Liability (A = L) to a business.	Design questionnaire items and conduct interview List and classify information appropriately	Classification table for assets, liabilities and capital

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Watch video presentation illustrating the concept of the accounting equation to further reinforce concept Record examples of assets, liabilities and capital mentioned in the video presentation	View video presentation and record information correctly	
Participate in class discussion and respond to questions e.g. Why do business borrow, why is it important for assets to exceed liability, What were the assets and liabilities identified in the presentation etc.	Ability to engage in discussion	
Create a podcast about ten minutes in length that will summarize the questions in the above activity.	Create and format multimedia presentation	
Use scenarios/case studies and discuss the mathematical relationship among the components and show how the equation can be rearranged to calculate the asset, liability and capital. Solve simple problems to calculate the asset, liability or capital for a given transaction.	Calculate Perform mathematical operations (addition and subtraction) Problem solving	Correct calculation of the assets, liabilities and capital for a given scenario.
Draw up a simple 'T' balance sheet to illustrate the accounting equation using information given in a scenario	Apply principles to perform calculations Calculate totals	Correct presentation of simple balance sheet
Simulate a business of their own and prepare a report to include the following: • list of the assets, liabilities and capital of the business • pictures to illustrate the assets of the business • a simple balance sheet showing the value assets, liabilities and capital (accounting equation should be used to create a balance , Assets = Liabilities + capital) • dictionary clearly explaining the relevant accounting terminologies	Collaboration with team members Compile information and present report	Correct meanings of terminologies Correct application of accounting principles

Learning Outcomes

Students will be able to:

- define the key terminologies associated with accounting transactions
- explain the uses and users of accounting information
- discuss the differences between accounting and book-keeping
- Identify careers associated with the accounting practices of business organizations.
- Classify business resources as assets, liability and capital
- Use the accounting equation to calculate the value of the asset, liability and capital of business
- Construct a simple balance sheet in basic format
- Create and format multimedia presentation

Points to Note

Purpose of Accounting To provide information on a business and its performance Provides information that is used for decision making.

Accounting as a scientific process

- By definition, accounting is the process of classifying, analysing and summarizing data, reporting it, and documenting financial transactions in a uniform way. Because Accounting has exact methodologies by which the reporting and documenting is done it is said to follow a pseu do-scientific method.
- Accounting is a scientific process as it follows a series of steps that can be repeated by different people and still have the same results.
- Accounting like science follows a systematic and organized path to understand the economic status of the entity. Science is obtaining knowledge about by a systematic pattern including observation, study, practice, experiments and investigation. Like Science; Accounting is used to gain knowledge about the economic status of business by systematic study.
- Accounting is seen as a science because it includes rules, principles, concepts, conventions and standards like science Accounting users include individuals, businesses, investors, creditors, government agencies, tax authorities, non-profit organizations (clubs and societies).

Accounting users include individuals, businesses, investors, creditors, government agencies, tax authorities, non-profit organizations (clubs and societies).

Extended Learning

Have students interview a family member, relative or the owner of a business to find out the basic terminologies that every business owner must know in order to manage the accounting affairs of the business.

Points to Note

Capital is classified as a liability.

Accounting equation are transposed to reflect that:
Assets = Capital + Liability
Capital = Assets – Liability
Liability = Assets – Capital

Careers in Accounting

Accounting Clerk, Bank Tellers, Bank Manager, Bursar, Payroll Clerk

Book Keepers, Accountant, Financial Controller, Auditors

Extended Learning

Resources

Internet access, computer, computer software, textbooks on accounting, video presentation, case study, guest presenter, crayon, markers, paper, paper folder, printer, calculator, ruler, What I Owe and Own worksheet, pictures, glue, scissors, ruler

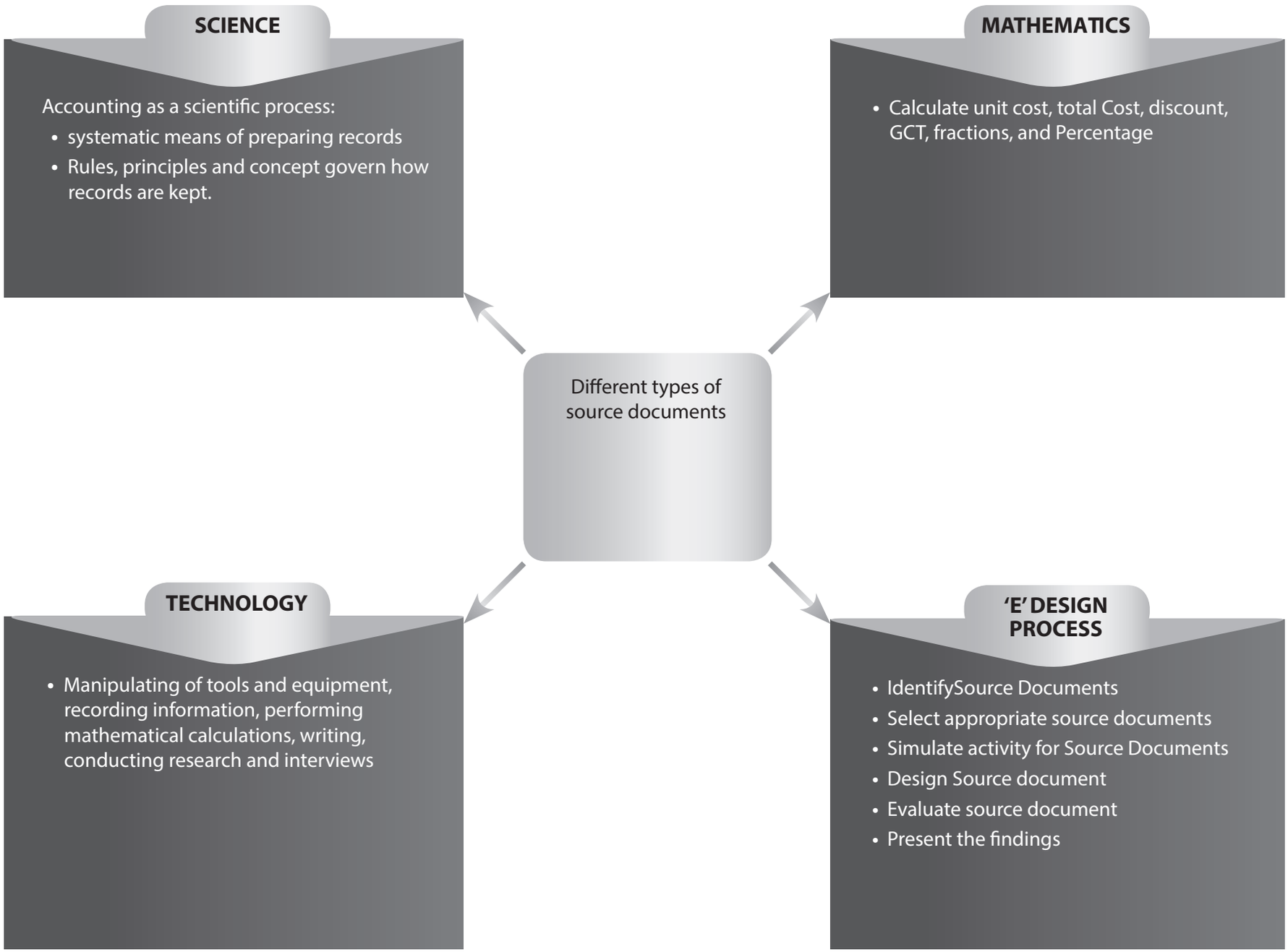
Key Vocabulary

Accounting, book-keeping, debit, credit, discount, assets, liability, capital , balance sheet, Accountant, Bank Manager, Bursar, Payroll clerk, Bookkeeper, Financial Controller, Accounting equation, profit, loss, transaction, cash, bank, debtors, creditors, receipt, payment, stock, machinery, equipment, loan, balance sheet

Links to Other Subjects

Mathematics Grade 7 AT1: Number operations and application – Solve simple linear equations using the balancing method

Language Arts AT 1: Listening and Speaking: Listen to, recall, understand and respond to speakers' messages, whether implicit or explicit


SCIENCE
Accounting as a scientific process:
• systematic means of preparing records
• Rules, principles and concept govern how records are kept.
MATHEMATICS
• Calculate unit cost, total Cost, discount, GCT, fractions, and Percentage
Different types of source documents
TECHNOLOGY
• Manipulating of tools and equipment, recording information, performing mathematical calculations, writing, conducting research and interviews
'E' DESIGN PROCESS
• IdentifySource Documents
• Select appropriate source documents
• Simulate activity for Source Documents
• Design Source document
• Evaluate source document
• Present the findings

The key concepts, skills and knowledge students will learn in this unit are:

- Definition of the terms associated with source document (invoices, receipts, debit note, credit note, cheque counterfoil, discount, taxes, etc)
- Types of source documents used in a business.
- Importance of source documents in business transactions.
- How to prepare source documents (invoices, receipts, debit and credit notes, cheque counterfoil)
- How to calculate discounts and taxes for invoices to determine the final amounts due to be paid..

About the Unit

This unit introduces students to the main source documents used to record business transactions. Students will be provided the opportunity to design and complete source documents, develop problem-solving skills and interpret information from business transactions. They will also develop basic skills that will enable them to participate effectively and responsibly in today's business environment.

Guidance for the Teacher

A clear distinction should be made among the various source documents and their purpose in business transactions explained. The design and preparation of each source document must be done independently. The importance of accuracy of information on all source documents should be emphasised. Students could be asked to take samples of source documents from home such as receipts, utility bills, purchases invoices etc. or teachers can provide samples for students to view. A scenario could be developed for business transactions or sample brochures or price list used for simulated transactions. Blank templates may be distributed by teacher or students could be asked to prepare templates for use.

Guidance for Completing Project

Teacher could develop a scenario/worksheet with transactions to be used to complete the various source documents. Students should be required to determine the most appropriate source document to be used for each transaction.

Create a portfolio to include the following

- Completed source document for business transaction,
- Definition of each source document and use of each source document.
- Neat and accurate completion of source documents.

UNITS OF WORK | **TERM 3 UNIT 2** | **5 Hours (10 x 30 Minutes)**

UNIT TITLE: Source Documents used in Business

Prior Learning

Check that students can:

- Explain the purpose of a receipt
- State the information contained on receipts/bills
- Define terms GCT, discounts and total prices

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target(s)

Students will:

- Select from a range of source documents the most appropriate document to be used for a given scenario

Strand 2: Explore Methods and Procedures
Attainment Target(s)

Students will:

- Perform basic calculations(GCT and discounts) with complete accuracy
- Design/prepare source documents from business transactions according to instructions given

Strand 3: Apply Solution
Attainment Target(s)

Students will:

- Understand basic accounting concepts and principles by using, interpreting and recording information on source documents
- Discuss and bring samples of source documents where applicable.

Strand 4: Career Awareness
Attainment Target(s)

Students will:

- Develop skills and interest necessary that would enhance a career involving the use of basic accounting
- Develop a list of parties who use source documents and propose how each may use information from these source documents.

OBJECTIVES

Students will:

- Define the term source document
- Identity the main source documents used in business transactions.
- Define related terms (source document, invoice, receipts, debit note, credit note, cheques)
- Distinguish among the various types of source documents used in business transactions.
- Discuss the importance of each type of source documents used in business transaction.
- Complete invoices using information from catalogues, pricelists to show unit cost and total cost.
- Calculate simple discounts/GCT on an invoice.
- Complete receipt for payments made.
- Prepare credit notes and debit notes to show adjustments to customers or suppliers account..

Science Standards

- Attainment Target 3. Energy and Matter – Energy and Forces – Grade 4
  Understand the effects of forces and the concept of work.

Mathematics Standards

- Attainment Target 1. – Number Applications and Operations – Grade 7
  Compute the total price given quantity and unit price.
  Compute unit price given the quantity and total price

Technology Standards

- Students will develop an understanding of the attributes of design
- Students will develop the abilities to assess the impact of products and systems

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: Collect samples and view samples of relevant source documents used in business transactions. Conduct research to define the meanings and the relevance of the information on each source document In group formulate and record definitions for each source documents	Observe and critique differentiate	
Read and discuss scenarios illustrating the use of source documents then tell the importance of source documents to the business identified. Use simple business tools such as calculators or manually calculate discounts and GCT manually from business transactions given.	Perform mathematical functions	Correct mathematical calculations
Following illustration by teacher, design samples of invoices, receipts, debit and credit notes, and cheque stub from given scenario using software and other drawing tools or use brochures, pricelists and catalogues to complete blank templates of each source documents with relevant information.	Interpret information correctly Apply correct accounting principles	Source documents correctly designed and calculated
Prepare appropriate documents for a simulated business. Students will determine the most appropriate source document to be prepared from a given scenario. Documents should be presented in a logical sequence	Analyse information apply accounting principles to construct documents	Relevant source documents from a given scenario

Learning Outcomes

Students will be able to:

- Identify the main type source documents used in business transactions
- Explain differences and similarities between the various types of source documents
- Discuss the importance of source documents used in business
- Perform basic calculation of discounts and GCT with complete accuracy
- Apply accounting principles to complete source documents (invoices, receipts, debit and credit notes) according to instructions given.

Points to Note

Source Document: An original document verifying that business transactions occurred. It contains the details to substantiate a transaction entered in an accounting system.

A source document describes all the basic facts of the transaction such as:

- the amount of the transaction,
- to whom the transaction was made,
- transaction date
- The name of the businesses
- A reference number
- A description of the transaction

Types of source documents used in business transactions
Sales/purchases invoice

- Receipts
- Cheque counterfoil
- Debit note
- Credit note
- Deposit slips/lodgement book

Importance of source documents in business transactions

- Serve as evidence that the financial transaction occurred.
- It is used to make entries in the subsidiary books

Discount is a reduction in the listed price of an item. Usually quoted as a percentage.

General Consumption Tax is tax charged on items specified by government. It is quoted as a percentage and the rate vary according to the items.

$$\text{Calculation of Discount/GCT} = \text{Price of Item} \times \frac{\text{Percentage}}{100}$$

Total price = Unit Price X quantity

Students are to practice safety rules when researching on the Internet

Extended Learning

Students will:
Research how technology has affected source documents and analyze the legal implications of receiving source documents in an electronic format rather than printed copies.

Resources

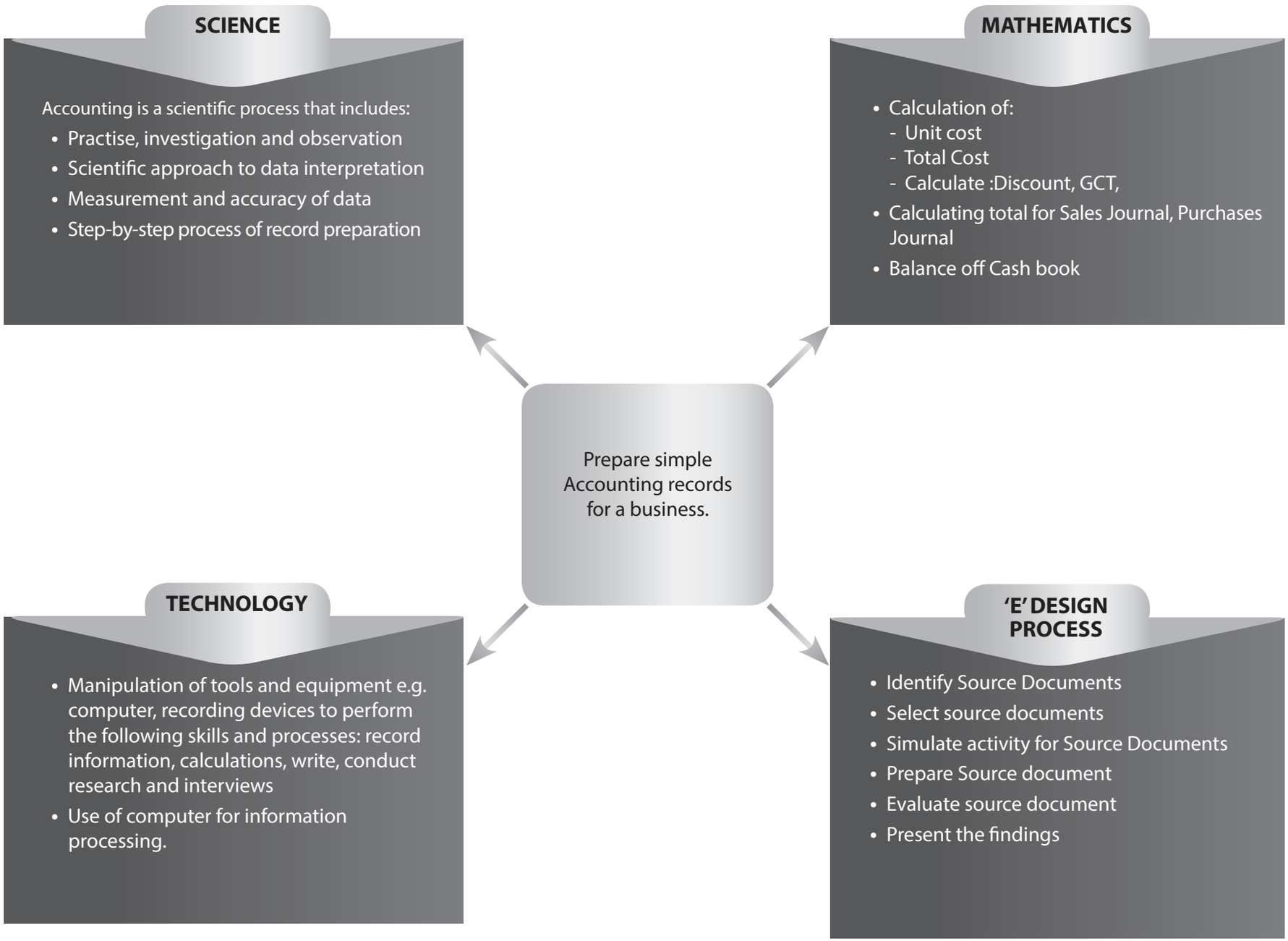
Sample source documents (invoices, receipts, debit note, credit note, cheque counterfoil), calculators, note books, ruler

Key Vocabulary

Books of original entry, invoice, purchase invoice, sales invoice, receipt, debit note, credit note, cheque counterfoil, discount, tax, GCT, total price, quantity, unit price

Links to other Subjects

Mathematics, Grade 7 Attainment Target 1: Number Operation and Application


SCIENCE
Accounting is a scientific process that includes:
• Practise, investigation and observation
• Scientific approach to data interpretation
• Measurement and accuracy of data
• Step-by-step process of record preparation
MATHEMATICS
• Calculation of:
- Unit cost
- Total Cost
- Calculate :Discount, GCT,
• Calculating total for Sales Journal, Purchases Journal
• Balance off Cash book
Prepare simple Accounting records for a business.
TECHNOLOGY
• Manipulation of tools and equipment e.g. computer, recording devices to perform the following skills and processes: record information, calculations, write, conduct research and interviews
• Use of computer for information processing.
'E' DESIGN PROCESS
• Identify Source Documents
• Select source documents
• Simulate activity for Source Documents
• Prepare Source document
• Evaluate source document
• Present the findings

The key concepts, skills and knowledge students will learn in this unit are:

- Definition of books of original entry, purchases journal, sales journal, cash book
- Books of Original entry
  - Purchases journal
  - The Sales Journal
  - The Cash Book
- Format of each book of original entry
- Recording transactions in the books using source documents
- Total /balancing the books
- Interpret the balances on the books

About the Unit

This seeks to familiarize students with the fundamentals of basic accounting records used by a business. Students will be introduced to the books of original entry in which transactions are first recorded. Students will learn the procedures for preparing the Sales and Purchases Journals and Cash Book. They will understand the procedures involved in extracting information from source document and recording the transactions in the appropriate books of original entry. The will also learn how to total the journals and balance the cash book.

Guidance for the Teacher

Three (3) books of original entry should be emphasized namely the purchases journal, sales journal and cash book.

Students are required to prepare and balance a two column cash book. The Sales and Purchases journals should be totalled and all columns should be completed. A case study or scenario should be developed and students create the appropriate source document, enter the transactions into the books of original entry and balance/total each book. A worksheet should be created with a list of cash and credit transactions for students to classify. The source documents created in the previous unit should be used so that students can see the accounting cycle being implemented.

UNITS OF WORK | **TERM 3 UNIT 3** | **12 Hours (24 X 30 Minutes)**

UNIT TITLE: Basic Accounting Records used by a Business

Prior Learning

Check that students can:

- Differentiate between cash and credit transactions
- identify source documents (invoices, receipts, cheque counterfoil)

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target(s)

Students will:

- Explore different approaches to organize and record accounting

Strand 2: Explore Methods and Procedures
Attainment Target(s)

Students will:

- Gather information necessary to be able to analyze source documents
- Explain the steps necessary to record information into the journals and cash book.

Strand 3: Apply Solution
Attainment Target(s)

Students will:

- Explain the steps necessary to enter the transactions into the appropriate books of original entry used in a business
- Follow instruction to balance the cash book

Strand 4: Career Awareness
Attainment Target(s)

Students will:

- Integrate classroom learning with work-related learning.
- Increase awareness of employability skills as they relate to the work environment.

OBJECTIVES

Students will:

- Define terms books of original entry
- Differentiate between cash and credit transactions
- Identify source documents related to books of original entry
- Explain the uses of books of original entry
- Distinguish between receipt and payment in the cash book
- Use information from source document to post entries in the books of original entry (purchases book, sales book, cash book)
- Prepare and balance a cash book
- Interpret balances of the cash book

Science Standards

- Attainment Target 3. Energy and Matter – Energy and Forces – Grade 7
  Appreciate the importance of scientific methods and be aware of safety procedures to be taken when using equipment and materials.

Mathematics Standards

- Attainment Target 1. – Number Applications and Operations – Grade 7
  Compute the total price given quantity and unit price.
  Compute unit price given the quantity and total price
  Calculate profit and loss in monetary and percentage terms.

Technology Standards

- Students will develop an understanding of the attributes of design
- Students will develop the abilities to assess the impact of products and systems

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: Review samples of completed source documents prepared in the previous unit (invoices, receipts and cheque counter-foil) and discuss the purposes of each document.	Observe and critique information Discuss information	
Read example of transactions conducted by business and differentiate between those which involve cash and those which involve credit and explain the meaning of cash purchases and credit purchases.	Read and interpret for information Differentiate between terms	Correct definition of terms
View samples of books of original entry, read and discuss the transactions recorded in each book.	Read and interpret information	
Analyze the source documents and the books of original entry to which they are related – sales invoice, purchases invoice, receipts and cheque counterfoils. Guided by teacher define term 'books of original entry' Select the appropriate book to enter transactions form source document	Analyse to determine relationship	Show relationship of source documents with the books of original entry Correctly define term
Observe the procedure for designing and preparing books of original entry, then read accounting transactions and apply the principles learnt for enter information from purchases invoices and sales invoices into the purchases journal and sales journal individually	Analyse and record information appropriately	Correct information recorded in sales and purchases journals
Examine the parts of a cash book, making clear distinction between receipts and payments. From guided discussion with teacher, outline the procedure for writing up and balancing cash book.	Explain procedures correctly	Students' ability to explain the steps required in preparing the cash book from given transactions.
Examine the information on samples of receipts and cheque counterfoils in the cash book, then transfer information from receipts and counterfoils to cash book and adhere to the procedures of balancing the cash book. Collaborate with each other and explain the significance of the term 'balance brought down' on the cash book.	Analyse and record appropriately Calculate correctly Analyse and explain principle	Students' ability to enter business cash transactions from given scenario into the cash book and balance off the cash book

Learning Outcomes

Students will be able to:

- ✔ Analyse business transaction
- ✔ Differentiate between cash and credit transactions
- ✔ Discuss the relationship between source documents and books of original entry
- ✔ Apply principles to record business transaction is the relevant accounting
- ✔ Discuss the importance of documenting business transactions

Points to Note

- Entries in a journal are chronological records of all transactions within a set of records
- Focus on three books of the six books of original entry
- Cash Book, Sales Journal, Purchases Journal
- A Journal is an accounting record that is used to record the different types of transactions in chronological order or date order.
- The Sales Journal is a special journal where credit sales to customers are recorded. Another name for this journal is the Sales Book or Sales Day Book.
- The Purchases Journal is a special journal where credit purchases from customers are recorded. Another name for this journal is the Purchases Book or Purchases Day Book
- The Cash book is a combination of a cash account and a bank account in one book. It is used to record the receipt and payment of cash and cheque.
- A Contra entry is a transaction for which the entire double entry is completed in the cash book as it involving transfer of money between the cash account and the bank account.
- Cash transactions are the business transactions that are paid immediately as the transaction occur while credit transactions are those business transactions that have not been paid for as at date when the transactions occurred. The cash transactions are recorded in the cash book, while credit transactions are recorded in the Journals book account.

Extended Learning

Students will:
Research how journals can be used on a computerized accounting system.

Resources

Journal sheets, cash book sheets, sample completed journals, sample completed cash book, source documents (invoices, receipts, check counter-foil), ruler , calculator, computer

Key Vocabulary

Books of original entry, purchases, sales. credit purchases, credit sales, cash purchases, cash sales, purchases journal, sales journal, cash book, debit, credit, Contra entry, transaction, source documents, invoice, receipt.

Resources

Mathematics Grade 7 AT1: Number operations and application

NSC

RESOURCE & TECHNOLOGY

FAMILY & CONSUMER MANAGEMENT

GRADE 8 UNITS OF WORK

TERM 1

Unit 1:
Safe Food School Restaurant

Food Safety
- Importance of Food Safety

Selection and Storage of Food
- Safe food handling practices

Multi mix Principle
- Types of mixes
- Nutritive value of mixes

Macro and Micronutrients
- functions, sources and deficiency diseases

Methods of Cooking
- Classification
- Steaming and Frying

Meal Planning
- Factors to consider when planning meals
- Factors affecting meal planning
- Packed Lunches

Using a Recipe

Cake Making
- Rub-in Method

Career Pathways

TERM 2

Unit 1:
Clothing Decisions
- Reasons for wearing clothes
- Interpreting clothing message

Wardrobe Planning
- Importance of wardrobe planning
- Wardrobe inventory

Clothing Purchase
- Factors Involved in
- Where to shop

Seaming techniques

Taking body measurements

Career in clothing and Textiles

TERM 3

Unit 1:
Introduction To Accounting terminologies

Processes of Management
- Resources of Management
- Time Management

Work Simplification
- Work Simplification Techniques

Money Management
- Reasons for preparing a budget
- Steps in preparing a budget

Consumer Education
- Consumer wants and needs
- Methods of payment for goods and services
- Consumer rights and responsibilities
- Consumer credit – forms of credit

Advertising
-Purpose and Methods of advertising
- Advertising Techniques
-Effects of Advertising on the consumer and manufacturer

Career Pathways

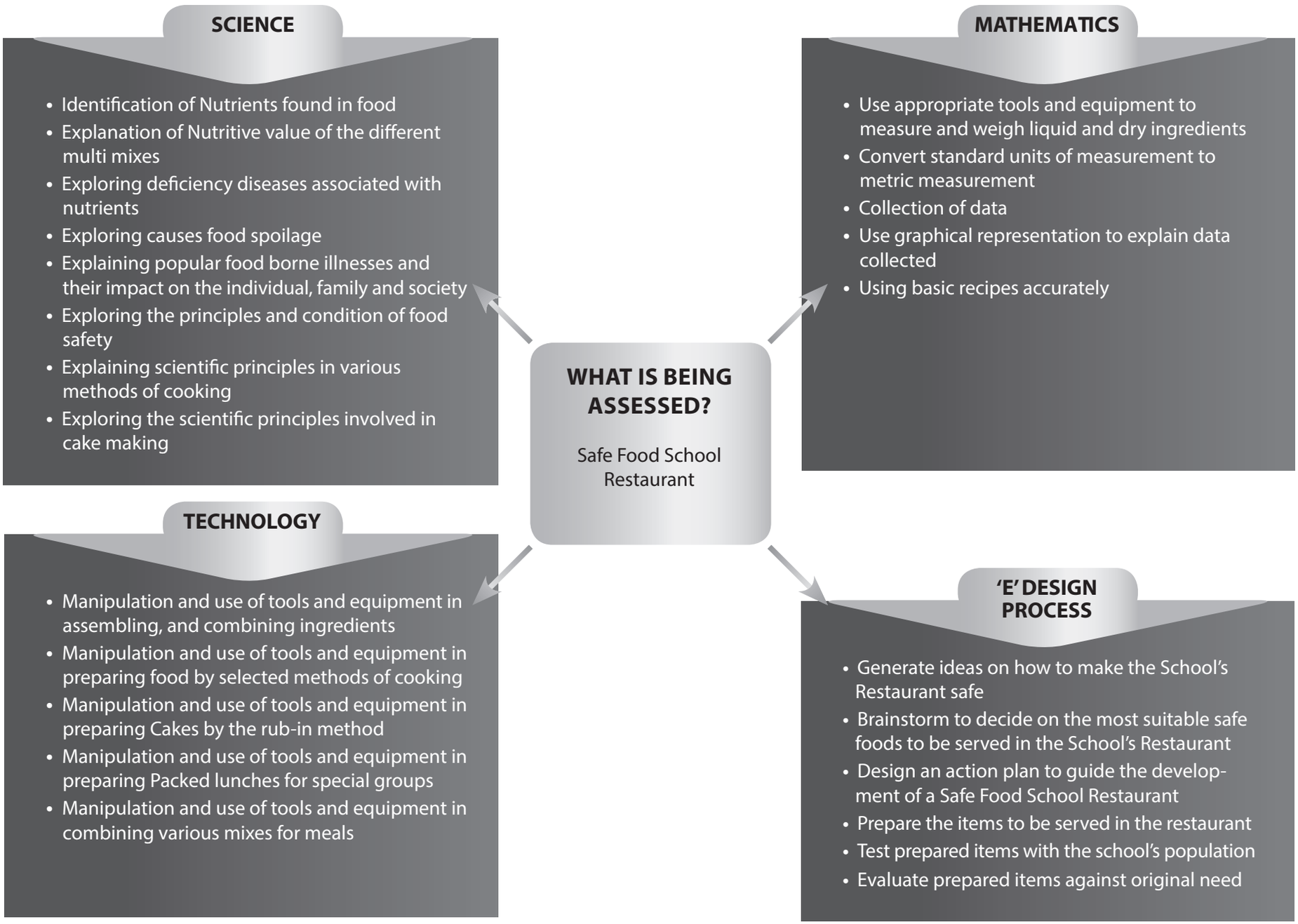
GRADE 8

RESOURCE & TECHNOLOGY

FAMILY AND CONSUMER MANAGEMENT

TERM 1

TERM 1 ROJECT: STEM INTEGRATION – FAMILY AND CONSUMER MANAGEMENT



The key concepts, skills and knowledge students will learn in this unit are:

- Food Safety
  - Importance of Food Safety
- Selection and Storage of Food
  - Safe food handling practices
- Multi mix Principle
  - Types of mixes
  - Nutritive value of mixes
- Macro and Micronutrients
  - Functions, sources and deficiency diseases
- Methods of Cooking
  - Classification
  - Steaming and Frying
- Meal Planning
  - Factors to consider when planning meals
  - Factors affecting meal planning
  - Packed Lunches
- Using a Recipe
- Cake Making
  - Rub-in Method
- Career Pathways

About the Unit

In this project, students will be encouraged to promote and adhere to food safety procedures and guidelines throughout the school's environment. They will be expected to use innovation and creativity to develop original products in keeping with the recommended dietary guidelines in order to maximize nutritional needs and requirements of family members. Students will be given opportunity to use the design process to develop an action plan to guide the development of a Safe Food School Restaurant.

Guidance for the Teacher

Elements of a Safe Food School

A food-safe school will:

- Promote food safety throughout the school's environment through policies, procedures, and programmes
- Assess school food safety practices on a regular basis
- Provide initial and ongoing food safety training to foodservice and health services staff, teachers, and students as appropriate
- Promote a school-wide approach to preventing foodborne illness that ensures that food is as safe as possible in all places where it is stored, prepared,

served, or consumed

- Provide a physical environment that encourages proper food safety and hand washing behaviors for students and staff
- Educate students, staff, and families about food safety and encourage them to model appropriate behavior
- Promote collaboration among staff, parents, and other school community members on hand washing and food safety
- Monitor, detect, and respond appropriately to foodborne illness in school
- Have a foodborne illness outbreak response plan

What is the SAFE Food School Action guide?

A Safe Food School action guide can help schools identify gaps in food safety and develop an action plan for becoming food safe. It includes individual critical recommendations on what key school staff and community members can do to prevent foodborne illness. Recognizing that school staff often has little discretionary time to devote to searching for new resources and materials, the Action Guide also contains useful tips and resources to help them prioritize recommendations and take action.

Sample of a Micronutrient Data Sheet

Name _____ Date _____

Class _____

I WILL BE AN EXPERT ON IODINE

Micronutrient Name	Iodine
What is it?	Mineral
Importance to humans	Makes thyroid hormones that control the body's metabolism and other important functions. Thyroid hormones are needed for proper bone and brain development during pregnancy and infancy.
Sources of micronutrient	iodized salt, fish, seaweed, shrimp, dairy products, grain products, fruits, vegetables (amount depends on iodine in soil and fertilizer
Symptoms of deficiency	Cannot make enough thyroid hormone; stunted growth, mental retardation, and delayed sexual development in a foetus; lower-than average IQ in infants and children; decreased ability to work and think clearly in adults; goitre

PROJECT TITLE: Sustaining the health and well-being of the family

Prior Learning

Check that students can:

- Students should be familiar with ways in which the health and well-being of the family can be met.

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target 1

Through a project based approach students will be able to apply creativity and innovation in the solution of problems.

Strand 2: Explore Methods and Procedures
Attainment Target 2

Through a project based approach students will be able to explore Methods and procedures in solving problems.

Strand 3: Apply Solution
Attainment Target 3

Through a project based approach students will be able to apply appropriate strategies in finding solutions to identified needs.

Strand 4: Career Awareness
Attainment Target 4

Through a project based approach students will develop an awareness of a range career pathway.

OBJECTIVES

Students will:

- Describe the functions, sources and deficiency diseases for each micro-nutrient
- Define the term food safety
- Explain the importance of promoting food safety
- Identify the key components of a recipe
- Interpret and use a basic recipe
- Evaluate a basic recipe for its accuracy
- Classify the methods of cooking
- Prepare dishes using steaming and frying as methods of cooking
- Prepare a variety of cakes using the Rub-in method
- Describe the conditions and practices that promote safe food handling
- Demonstrate safe food handling practices during the preparation, storage and service of food.
- Identify food borne illnesses
- Discuss food borne illness as a health issue for individuals and families
- Explain the multi-mix principle
- Write menus using the multi-mix principle
- Describe the factors that should be considered when planning meals for the family
- Describe the factors that affect meal planning
- Plan and prepare a suitable packed lunch

Science Standards

Understand the importance of the life processes in plants and animals, their interdependence, their interaction with the environment, and how lifestyles determine health and wellbeing.

Mathematics Standards

Use the correct units, tools and attributes to estimate, compare and carry out the processes of measurement to given degree of accuracy..

Technology Standards

Students will develop abilities to apply the design process

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

DIGITAL CITIZENSHIP - Recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: **ATTAINMENT TARGET 1** The Daily Gleaner published an article entitled "Schools grappling with safe foods for children to consume". Discuss the issues of food safety and identify possible solution to the problem.	Observe, Record, Analyse, Interpret, Research, Develop, Creative, Discuss, Create, Present	Evidences of findings of perishable food items left on shelf for an extended period of time presented.
Food Safety Observe and record findings of perishable food items that have been left on a shelf for an extended period of time. Conduct information search on the causes of food spoilage and create a poster using available software to depict food spoilage. **Use images, sound clips and text to create a digital story/ video promoting safe food handling during preparation, storage and service.**	Creativity, Critical thinking, Planning, Analyze, Create	Rubric/checklist used to assess poster and digital story on food spoilage presented.
Micronutrients Review of Macronutrients Become an expert on at least one micronutrient by conducting an information search Create a crossword puzzle to reflect the following : • What is it? • Scientific name of the micronutrient where applicable • Importance to humans? • Good sources of this micronutrient • Symptoms a person displays if he or she is deficient in this micronutrient • Interventions or treatments for a person who is deficient? • Other interesting information about this micronutrient? Develop a complete Micronutrient "Data Sheet" Prepare a dish using excellent / good sources of the selected micronutrient. Dish must be suitable for serving in a safe school restaurant.	Design Assess Develop Interpret View Create Observe Critique Analyze Design	Evidences of crossword puzzle and data sheet on micro nutrients presented.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Multi- mix Principles View and discuss interactive multimedia presentation on the multi mix principle. Create a journal and make entries of meals eaten for a day and assess the number of food groups and multi mixes represented. Identify the foundation food groups that are used to prepare the different mixes	Research, collaborate, brainstorm, discuss, analyze, develop, assess, create	Evidences of journal entries made of meals eaten within a day presented.
Collect pictures of foods and make collages to represent meals of the different multi mixes such as a two mix, three mix and four mix. **The nutritive value for each multi mix represented must be identified and explained.**		Checklist used to assess collage on multi mixes presented.
Work in groups to establish a health food store. Choose foods from the health food store to prepare samples of the two mix and three mix that can be served in a safe school restaurant.		Present rubric used to assess samples of multi – mix meals prepared.
ATTAINMENT TARGET 2: **Methods of cooking** Participate in a culinary work shop on the methods of cooking with emphasis on steaming and frying. This workshop will include the following activities: • Presentation and classification on the methods of cooking moist heat methods – boiling , steaming, stewing, dry heat methods –baking, grilling , roasting, combination method – braising		
• Students work in groups to make an interactive game using appropriate software to highlight the classification of methods of cooking	Research, creative, plan, view, design, collate, analyse, interpret	Evidences of interactive game made to highlight the classification on the methods of cooking presented.
• Culinary experts demonstrating the different ways of steaming and frying foods		
• Students working in groups of three to prepare and serve one dish demonstrating steaming and frying. These dishes must be suitable for serving in a safe school restaurant.	Collaborate, create, research, prepare, collate, evaluate, collect, record, Critical thinking	Rubric used to evaluate dishes prepared by steaming and frying presented.
Conduct a survey of restaurants to determine how many dishes are prepared by the different methods of cooking. Identify the commonly used methods of cooking and explain the scientific principle involved in each method. Use graphical representation to share findings.		

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Cake making Visit a bakery to observe how bakery products are made. Prepare a report on the visit made including important mathematical and scientific principles involved in this process.	Collaborate, create, prepare, research, critical thinking, conduct survey	Evidences of a variety of cake recipes reflecting the rub-in method collected
View and discuss a video presentation on the rub-in method of cake making.		Rubric used to assess cakes made by the rub-in method presented.
Collect recipes of a variety of cakes that can be made using the rub-in method and add them to recipe catalogue.		
Work in groups to prepare samples of cakes made by the rub-in method that can be served in a safe food restaurant.		
Use appropriate software to design labels and select appropriate packaging for samples of cakes made.		Rubric used to assess designed labels presented.
Meal planning Work in groups to discuss and create multimedia presentation on the factors to be considered when planning meals and factors affecting meal planning. Conduct online or offline information search on planning meals for special groups such as infants, school aged children and the elderly.	Classify, creative, collect, assemble, discuss, prepare, collaborate	
Brainstorm to highlight foods that are suitable for packed lunches in a safe food restaurant. Discuss the guidelines that should be considered when preparing packed lunches and create a pack lunch checklist which will be used to assess samples of packed lunches that can be served in a safe school restaurant.		Checklist for assessing packed lunches created
Write suitable menus of packed lunches that would cater to the individual needs of family members (such as mother, father, and child) and adolescents.		
Work in groups to prepare samples of packed lunches that can be served in a safe school restaurant.		Present rubric used to assess samples of packed lunches prepared

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Using a recipe Brainstorm to define the term recipe and the importance of same. View samples of recipes and highlight key components. Observe and critique a recipe for accuracy using established guidelines Develop a simple recipe of an original product using established guidelines Design a catalogue for collection of recipes that will be used to create products for open day	Research, collaborate, brainstorm, discuss, analyze, develop, assess, create	Rubric used to assess recipe developed for original product presented.
ATTAINMENT TARGET 3: The Daily Gleaner published an article entitled "Schools grappling with safe foods for children to consume". In light of this alert, students will create an action plan that will guide the development of a Safe Food School Restaurant. This guide will be presented to the School's administration. Generate ideas on how to make the School's Restaurant safe Brainstorm to decide on the most suitable safe foods to be served in the School's Restaurant Design an action plan to guide the development of a Safe Food School Restaurant Prepare the items to be served in the restaurant Test prepared items with the school's population Evaluate prepared items Provide feedback	Identify, generate, discuss, collaborate, prepare, evaluate, design, provide feedback	Action plan to guide the development of a Safe Food School Restaurant created and presented to the school's administration using the design process
ATTAINMENT TARGET 4: Develop a portfolio showing career possibilities that are aligned to the different skills exposed to Create a storyboard of an interested related career	Identify, describe, assess, develop, analyze	Evidences of career portfolio o developed Checklist used to assess storyboard related career presented.

Learning Outcomes

Students will be able to:

- Conduct formation search on food spoilage conducted and create poster
- Develop videos promoting safe food handling during preparation, storage and service.
- Create action guide on Food-Safe school programme.
- Conduct information search on selected micronutrient
- Create crossword puzzle on selected micronutrient
- Develop micronutrient data sheet
- Prepare a dish reflecting selected micronutrient.
- Create power point presentation on factors affecting meal planning.
- Write packed lunches menu
- Create checklist for assessing packed lunches
- Prepare samples of packed lunches

Points to Note

Food spoilage is caused by the action of enzymes and microorganisms such as bacteria, yeasts and moulds. Enzymes are chemicals present in all living cells.

The multimix principle is a simple way of ensuring nutrient balance. The mixes create several options to facilitate persons on a low income consuming the best nutrient balance. The double mix is the simplest combination. It uses only two food groups such as Staple + food from animal or Staple + legume. The three mix includes the final foundation group and allows the following combinations: Staple +legume+ vegetable, Staple +food from animal+ vegetable and Staple+ food from animal + legume. In the four mix all of the foundational groups are included making it the most nutritious mix. Staple + food from animal +legume+ vegetable.

A storyboard is used to brainstorm and capture all the ideas before taking action. The process of visual thinking and planning, placing ideas on the storyboard and then arranging the components of the storyboard fosters more ideas.
The key points are:

- Capturing all the ideas before taking action, and
- Visually thinking, planning and placing ideas on a storyboard

Extended Learning

Students can research and compare the evolution of factors affecting meal planning

Students can identify local food items within their community and develop simple recipes with them

Become an advocate for a SAFE – Food school

Resources

Ingredients for preparing dishes/items, books, pen, pencil, glue, paper, Equipped laboratory, tools and equipment, computer, internet, Multimedia devices

Key Vocabulary

Vitamins, minerals, deep fat frying, Shallow fat frying, Moist heat, Dry heat, storage, safety, selection, contamination, risk, hazards, deficiency, balance, diet, healthy

Links to other subjects

Language Arts:

- Apply the reading process and strategies to achieve tasks.
- Demonstrate competence in using various information sources including knowledge-based and technical texts to perform specific tasks.
- Demonstrate competence in speaking to provide, distribute or find information

Mathematics:

- Measure time, temperature, volume and weight
- Use inductive and deductive reasoning
- Add subtract, divide, multiply whole, mixed numbers, fractions and decimals
- Convert measurement units

Science:

Measure time to complete task
Analyse the importance of healthy eating on the body
Apply scientific methods to solve problems
Apply and use laboratory technique safely
Measure the volume of liquid and solids

ICT:

- Use computer for information processing
- Social Studies
- Demonstrate awareness of local resources

Visual Arts:

- Apply the elements and principles of design

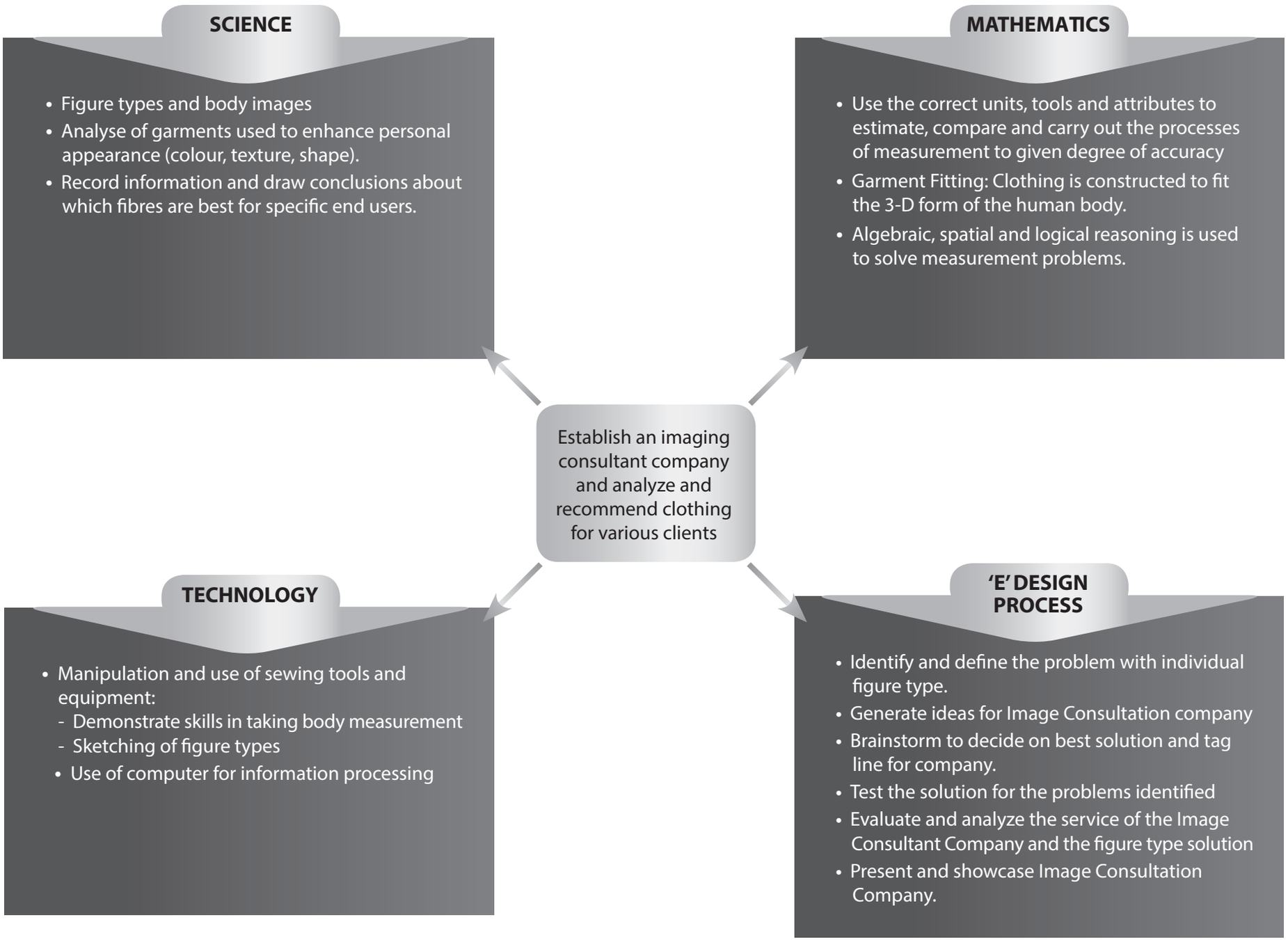
GRADE 8

RESOURCE & TECHNOLOGY

APPAREL DECISION AND PERSONAL APPEARANCE

TERM 2

TERM 2 PROJECT: STEM INTEGRATION – APPAREL DECISION AND PERSONAL APPEARANCE



Range and content are project specific, and cover key concepts, skills, knowledge and attitudes students will learn in Clothing and Textile at Grade 8:

- Clothing Decisions
  - Reasons for wearing clothes
  - Interpreting clothing message
- Wardrobe Planning
  - Importance of wardrobe planning
  - Wardrobe inventory
- Clothing Purchase
  - Factors Involved in
  - Where to shop
- Taking body measurements
- Career in clothing and Textiles

About the Unit

In this project, students will develop an awareness of clothing decisions and how it affects personal appearance. The students will explore reasons for wearing clothes, take body measurements and determine figure types, evaluate and plan a wardrobe, shop for clothes, practice basic clothing care and repairs. For the project, students will establish an imaging consultant company where they will analyse and recommend clothing for various clients. Problem-solving activities include the selection of personal collection of clothing complimentary to the individual.

Guidance for the Teacher

Students need to know that clothing is an important part of a person's image. Selecting and wearing appropriate clothing for the workplace and to special functions/events is a skill students need to develop. If students are informed about textiles and construction techniques they will become more effective consumers.

The content topics will provide opportunities for students to analyze what factors influence and what messages are communicated by overall appearance and the apparel people decide to wear. Content topics will also provide opportunities for students to apply communication, leadership, management, and thinking skills to apparel decisions.

The Fashion industry is an important component of the economy and an area that provides many opportunities for entrepreneurship. This project will help students explore career opportunities in this field and help them develop skills needed for employment.

UNITS OF WORK | **TERM 2** | **11 Weeks**

PROJECT TITLE: Apparel Decision and Personal Appearance

Prior Learning

Check that students:

- Have been introduced to fibres and fabrics in grade 7.
- Have designed and sewn an item/product from textile with their own surface design .

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target 1

Through a project based approach students will be able to apply creativity and innovation in the solution of problems.

Strand 2: Explore Methods and Procedures
Attainment Target 2

At the end of this project, students will be able to Explore Methods & Procedures in solving problems relating to apparel decision and personal appearance.

Strand 3: Apply Solution
Attainment Target 3

At the end of this project, students will be able to Apply Solutions to develop garments/products suitable to enhance personal appearance.

Strand 4: Career Awareness
Attainment Target 4

At the end of this project, students would have developed awareness of a range of Career Pathways in the Apparel and Textiles

OBJECTIVES

Students will:

- Explore the main reasons for wearing clothes
- Determine how messages are communicated through apparel and over all personal appearance
- Explore the relationship between body measurement and figure types and sketch the main figure types.
- Analyze and plan a wardrobe for an individual or group .
- Examine the factors to consider when purchasing clothing.
- Evaluate project against established project rubric
- Investigate careers in the apparel and textile industry

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

DIGITAL CITIZENSHIP - Recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Science Standards

Working scientifically: Apply scientific knowledge and processes to the solution of real word problem.

Living Things and Life Processes: Students should learn practically about structures and functions of the major organs and systems in living things and the scientific basis of how life is maintained and perpetuated. They should also learn the scientific basis of how to maintain health and wellbeing.

Energy and Matter: Students should explore:

- A range of matter, energy and forces, in everyday situations and also from a scientific perspective.
- The structure of materials and explore their properties
- Energy forms and how energy change affects materials.
- Understand physical and chemical changes and know that chemical changes take place through the re-arrangement of atoms.

Mathematics Standards

- Use the basic operations, number relationships, patterns, number facts, calculators and software to compute and estimate in order to solve real world problems involving fractions, percentages and decimals.
- Explore paths, geometric shapes and space and make generalization about geometric relationships within the environment
- Use the correct units, tools and attributes to estimate, compare and carry out the processes of measurement to given degree of accuracy

Technology Standards

Develop an understanding of the attributes of design and engineering design (Design - Standard 8 and 9)

- Develop the abilities to apply the design process.(Abilities for a Technological World - Standard 11) Develop an understanding of and be able to select and use construction technologies (The Design World - Standard 20)
- Select and use information and communication technologies
- Understand the role of troubleshooting, research and development, invention, innovation and experimentation in problem solving.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: **STRAND 1: Creativity and Innovation** **Week 1** Watch a video clips showing how individuals dress in the society; for work, special occasion/event or daily activities on the streets. For example person wearing shorts to church, formal gowns /party clothing to funerals, miss- match colours, ill-fitting clothing, clothing that emphasize figure faults etc. Discuss the issues, allowing students to describe their personal experiences and cite incidences of what they consider appropriate/inappropriate dress. Discuss changes that have occurred in society and what is considered appropriate attire.	Investigate Think Critical about how people dress in our society Solve clothing problems Discuss clothing choices in society Problem solving	
Conceptualizes and develop creative and innovative solutions for dealing with or solving the clothing problems presented in the video. Lead questions can be asked such as: • What can be done about clothing choices? • How can we educate people about proper dress code? Brainstorm to come up with creative solutions to the clothing problems identified and present proposals for treating with particular clothing problem chosen.	Creativity, collate, plan, critique	Written proposal:- Proposal is well presented, logical, ideas practical, creative and innovative. Written quiz on reasons for wearing clothing
STRAND 2: Explore Methods and Procedures **Week 2 and 3** **Reasons for Wearing Clothes** Brainstorm and analyse reasons for wearing clothes. Post or project a poster with reasons e.g. protection, modesty, identification, status etc. Discuss each, citing examples.		Chart or poster with reasons for wearing clothes.
Conduct interviews in the school community or classroom to find out why people wear clothes. Use electronic device to record interviews, share and report findings with class. Compare local clothing with those of other country/climate to identify why people select their clothing.	Research clothing choices in communities/families/class Record, explore, communicate, evaluate	
Use magazines or online sources collect pictures of clothing and accessories that people wear for various reasons. Place these under the headings protection, adornment, modesty, identification and status.		Work sheet identifying reasons people wear clothing.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Interpret clothing cues and messages by viewing pictures of people dressed in various ways and discuss the messages portrayed… i.e. situation, activity, occasion, place, social context other.	Analyze personal beliefs and culture about dress	Written script depicting how clothing affects occasions or events. Should be informative and convincing.
Role play several situations in which clothing could affect the outcome Example: casually dressed for a formal job interview or over dressed for a social occasion. Emphasize the importance of knowing the dress code before attending an event.	Creative, collate	Role play should incorporate the importance of dress code for events or different occasions.
Create a BLOG: to discuss clothing affects personal appearance and personality.	Create a BLOG Discuss, design, cooperate	Checklist for creating BLOG and correct information written on personal appearance and personality.
Week 4 and 5 **Body Measurement and Figure Type** Discuss rules for taking body measurement. Identify body areas from which measurements are taken. Demonstrate how to take body measurements. Record personal measurements on a standard body measurement chart.	Demonstrate how to take correct body measurements Record, accuracy, calculate,	Observe proper techniques in taking body measurements. Rubric/checklist used to assess accurate taking and recording body measurement.
Discuss and sketch the main figure types. Using individual body measurements to help determine and analyze figure types.	Analyze body measurements and figure types Classify, discuss, explore	Evidence of sketching and labelling figure types.
Using the common figure types, discuss clothing styles and outfit recommendations based on the design fundamentals. Highlight physical assets and camouflage figure liabilities.		Presentation on common figure types and recommended suitable clothing styles/outfits.
Week 6 and 7 **Wardrobe Planning** Brainstorm to define wardrobe. Discuss in groups, the importance of wardrobe planning and factors to consider when planning a wardrobe.	Collaborate, assess, analyse, plan, report	
Analyse personal wardrobe by conducting a clothing inventory to identify what items of clothing are available and what needs changing then prepare a written report and share with class. Plan a wardrobe for a celebrity, justifying why each item is selected.		

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Week 8 **Purchasing Clothes** Examine factors to consider when purchasing clothing such as activities, quality of clothing, fit of the garment, care, cost, brand names and labels and other factors. Watch video or read articles and prepare a brochure on how to recognize quality when purchasing clothing. Identify places to shop for clothes such as malls, department stores, boutiques and specialty shops, factory outlets, internet, catalogues and discount stores. Compare the advantages and disadvantages of purchasing clothing from the different places. Given a specific budget (sum of money) simulate a shopping activity at a shopping centre to purchase an outfit ensuring that the best quality is obtained at the lowest possible price and that it is appropriate for a specific occasion, personality etc. Show and discuss the item, giving reasons for choice.	Examine, communicate	Rubric/checklist to assess the wardrobe planned for the celebrity Checklist used for clothing inventory and purchasing clothes Student choice of item should be of good quality, for a reasonable market price, serves the purpose/functions for which it was intended and appropriate for the figure type and personality. Booklet to outline the advantages and disadvantages of shopping at different places identified in the lesson. Rubric to assess shopping simulated exercise conducted.
STRAND 3: Apply Solution **Week 9-10** Establish an Image Consultant Company at school. Collect and showcase garments and accessories to be worn for specific occasion/event and different figure types. Analyse clients figure type and make recommendations for appropriate clothing style and accessories. Highlight physical assets and help clients camouflage liabilities. Evaluate projects against set standards given	Working as a team in designing and forming business Create documents, analyze, create, assess, evaluate, discuss, communicate, write,organize	Evaluate project using established criteria and checklist. Display organized and oral presentation with accurate information, evidence of research and group cooperation. Peer assessment Brochure or presentation contains information on personal image, the information is accurate, clearly communicated, organized and attractively presented.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
STRAND 4: Career Awareness **Week 11** Research online/offline sources and present the roles and functions of individuals engaged in helping with apparel decision and personal appearance in the fashion industry and especially an Image Consultant. Use graphic organizer or other form to capture information and careers.	Research personal career choice	Prepare a report on various roles and function of an Image Consultant
Practice the skills relevant for the selected career in apparel decision and personal appearance.	Select clothing for specific careers	
Invite people from different occupations to talk about appearance and dress for work.		

Learning Outcomes

Students will be able to:

- Select appropriate clothing for different occasions
- Recognize how clothing is used to communicate a person's personality/mood
- Taking accurate body measurement
- Examine the physical aspects of appearance.
- List the personality qualities of a successful image.
- Interpret the signals of status in a photo example.
- Select style suitable for various body shape and personality.
- Recognize various reasons for wearing clothes
- Analyze proportions of body types and identify figure type.
- Practice the skills related to various careers in apparel industry
- Simulate an image consulting company.
- Understand how image consulting fits into the hierarchy of the fashion industry.

Points to Note

Reasons why we wear clothes are for protection (from harsh weather, occupational hazards), identify (profession, culture), status, modesty / decency and beauty

A wardrobe chart provides a handy tool to evaluate the clothing owned by individuals and planning additions

Points to consider when planning a wardrobe are need, activities of user, versatility, accessories one has, care and finance (economic status).

Safe work practices must be observed when conducting and activity. Identify the possible health and safety hazards that might occur and guide the students.

Recognize some of the dangers associated with internet use and demonstrate safe online behavior.

Follow guidelines to promote healthy use of ICT tools.

Extended Learning

Students will be able to:

- Select appropriate clothing for specific needs and activities.
- Explain to others how apparel and appearance contribution to or distract from positive communication.
- Communicate ways apparel choices and overall appearance can facilitate individual self expression.
- Form an image consultant business to assist individuals in their community
- Offer image consultant services to celebrities/ public personalities community members and families.

Resources

Sample pieces of natural and manmade fabric/fibres, pair of scissors, tape measure, computers, Internet access, mirrors, make up, colour swatches, Article of clothing, Manniquin or Dress Form, Fashion books and magazines, Virtual beauty makeover Websites, speakers, pictures, books and related literature

Key Vocabulary

Wardrobe, Accessories, Figure type, Measurement, Image Consultation, Personality, Modesty, Identification, Brand names, Debate, Advertisement, Inventory

Links to other subjects

Language Arts:

- Write and communicate ideas to clients

Mathematics:

- Perform mathematical computations related to the fashion designing
- Use geometric concepts access clients image
- Show proficiency in measuring and using measures to analyze figure type
- Demonstrate knowledge of computers in the apparel and personal decision.

ICT:

- Use computer for information processing

Visual Arts:

- Identify, manipulate, and combine various techniques to develop details.
- Students understand a broad range of vocations in the field of visual arts, including those involved in creating, performing, exhibiting, and promoting.
- Develop connections between the ways ideas, themes, and concepts are expressed through the visual arts and other disciplines in everyday life.

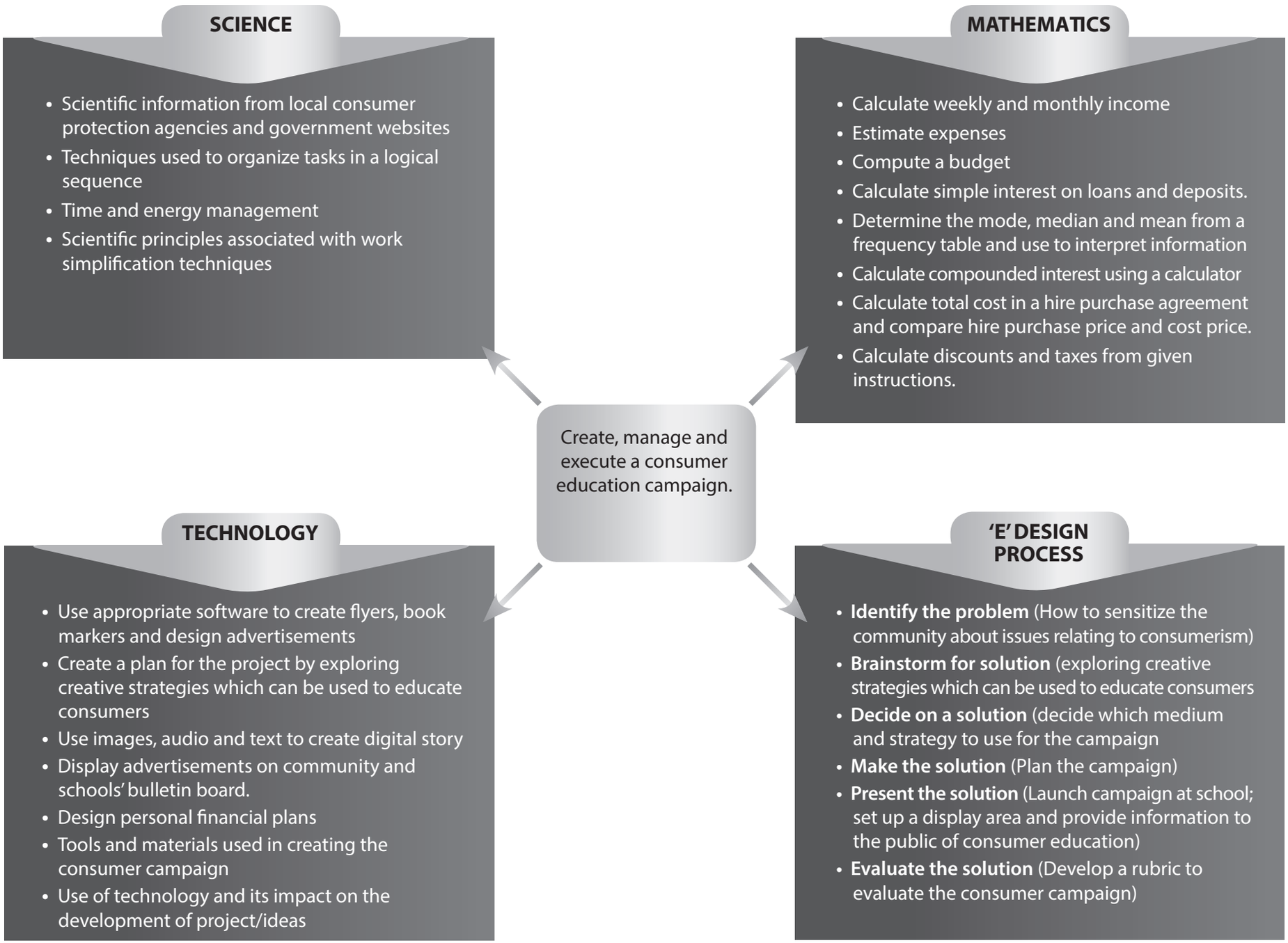
GRADE 8

RESOURCE & TECHNOLOGY

CONSUMER EDUCATION

TERM 3

TERM 3 PROJECT: STEM INTEGRATION – CONSUMER EDUCATION



The key concepts, skills and knowledge students will learn in this unit are:

- Processes of Management
  - Resources of Management
  - Time Management
- Work Simplification
  - Work Simplification Techniques
- Money Management
  - Reasons for preparing a budget
  - Steps in preparing a budget
- Consumer Education
  - Consumer wants and needs
  - Methods of payment for goods and services
  - Consumer rights and responsibilities
  - Consumer credit
- Advertising
  - Purpose and Methods of advertising
  - Advertising Techniques
  - Effects of Advertising on the consumer and manufacturer
- Career Pathways

About the Project

In this unit students will create, manage and execute a campaign which allows them to apply time and management skills along with work simplification techniques, in order to educate consumers on issues relating to consumerism. The proposed project may be designed as a 'Youth Consumer Education Campaign' The concept may/may not be the start-up of a business enterprise but must involve a project where the offering of a service or training is involved. The students should be encouraged to give careful consideration to conservation and the maximum utilization and satisfaction of resources for the benefit of individuals and families.

Guidance for the Teacher

The 'Youth Consumer Education Campaign' aims to help consumers assess the quality of information they receive in regards to the goods and services they receive. In carrying out this project, students should work in groups. Each group gets one topic to prepare for the campaign; students can decide which medium and strategy they will use for the campaign, (E.g. media campaign, internet campaign, march or a display at a community event).

UNITS OF WORK | **TERM 3** | **11 Hours (11 X 1 Hour)**

PROJECT TITLE: Family and Consumer Studies

Prior Learning

Check that students:

- Understand who is a consumer and have experience making purchases

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation
Attainment Target 1

Through a project based approach students will be able to apply creativity and innovation in the solution of problems.

Strand 2: Explore Methods and Procedures
Attainment Target 2

Through a project based approach students will be able to explore Methods and procedures in solving problems related to Consumer Education.

Strand 3: Apply Solution
Attainment Target 3

Through a project based approach students will be able to apply appropriate strategies in finding solutions to identified needs.

Strand 4: Career Awareness
Attainment Target 4

Through a project based approach students will develop an awareness of a range career pathways in consumerism..

OBJECTIVES
Students will:

- Demonstrates efficient use of management processes.
- Formulate solutions that reflect the effective use of time and energy.
- Demonstrate appropriate work simplification techniques
- Develop realistic budgets
- Examine factors that determine consumer wants and needs
- Discuss the effects of advertising on the consumer
- Display samples of advertisements
- Identify the principles of effective communication
- Solve consumer problems relating to obtaining correct and sufficient information.
- Research employment and entrepreneurial opportunities in consumer and resource management.

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

Science Standards

Exploring science and the environment: Students should learn practically about the key processes of scientific investigation. They should learn to set up their ownInvestigations to test hypotheses and be able to analyse data. They should learn about the importance of the environment to all living things on earth and the need to act responsibly towards it. Students should also learn about climate change and its impact
on the environment and on life forms.

Mathematics Standards

- **Number:** Use the basic operations, number relationships, patterns, number facts, calculators and software to compute and estimate in order to solve real world problems involving fractions, percentages and decimals**.**
- **Measurement :** Use the correct units, tools and attributes to estimate, compare and carry out the processes of measurement to given degree of accuracy
- **Statistics:** Collect, organize, interpret and represent data and make inferences by applying knowledge of statistics.

Technology Standards

- Students will develop an understanding of engineering design

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: **STRAND 1: Creativity and Innovation** **Week 1-2** View advertisements giving information about a consumer product or service. For example an advertisement on cellular phone calls rates. Discuss information presented in the advertisement and use personal experiences to indicate what problems they encountered with the information presented. How do advertisements affect consumer behaviour? How can I assist consumers in acquiring the correct information in order to make informed choices? Analyze societal issues/ problem affecting consumers who buy into these advertisements or products. Brainstorm to find solutions to reduce individual, family and consumer related problems. Note: The major issues in the scenario/advertisements above are consumer related issues. As a result the students could embark on a 'Youth Consumer Education Campaign', to sensitize the school and wider community about the issue relating to consumerism and provide strategies and solutions to the problem.	Conceptualize solutions to problem Critical thinking Plan activities Discuss possible alternatives	Assess students' view of the problem.
STRAND 2: Explore Methods and Procedures **Week 3** **Processes of Management** Use the jigsaw classroom to present information on resources and processes of management. Use hypotethical scenarios and apply management processes to individual and family related activities, giving clear indication of time and energy management. In projects groups, plan strategies to be used in Consumer Education Campaign. Design a rubric (e.g. a workflow chart) to outline the planning stages of the campaign.	Communicate information Research and Collect information Report(verbal and written) Explore ideas Observe	Assess students application of the concept and skills in creating the blog

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Week 4 **Work Simplification** Conduct field visits e.g. factories, hotels etc. and interview workers to gather information on techniques used to organize tasks in a logical sequence. Use images, audio and text to create digital story and present to the class. Role-play hypothetical scenarios in which several techniques may be used in managing individual tasks and family activities. In project groups, organize activities for the campaign.	Use multimedia sources Dramatize skills Organize activities	
Week 5-6 **Money Management** Record personal expenditure over a period and use it to determine reasons and steps in preparing a realistic budget. Design a personal financial plan and have classmates critique the plan. **Analyse budget from various sources and group according to type.** Create realistic budgets for individuals and families using spreadsheet software Create an estimate of the expenses for the campaign and present information on a spreadsheet	Data analysis	Test for knowledge of the principles of management.
Week 7 **Consumer Education** In groups, collect consumer information from local consumer protection agencies and government websites. Display information collected on bulletin/poster board for other students to view. Use multimedia presentation to create and present information on consumer rights and responsibilities.		

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Week 8 **Advertisements** Analyze a group of advertisements collected over a certain time perioid. Which advertisement gives factual information? Which techniques/appeals are used? Prepare a log of advertisements for certain time period (Saturday morning, afternoons, and weekday evenings). Compare the types of products advertised and the techniques used to influence consumer behaviour. Display samples of actual advertisements according to the technique used. (These can be from magazines, newspapers or coupon advertisement). Discuss the effects of advertisement on the consumer and manufacturers. Use appropriate software to design an advertisement for the 'Youth Consumer Education Campaign'. Display advertisements on community and schools' bulletin board	Create documents Create multimedia presentation	Peer assessment of advertisements • Most informative • Most persuasive • Best image • Best slogan
Week 9-10 **Applying Solutions** In project groups, establish a committee and assign different tasks such as planning, advertising etc. to group members. Use appropriate software to create flyers, book markers etc. to be distributed to participants during the campaign. Establish a BLOG/ or suggest internet link that individuals can visit to obtain information on consumer education. Launch the campaign at school; set up a display area and provide information to the public on consumer education. Design an instrument to assess and report on the campaigns' success.	Create a blog Implement solutions Construct report and record findings	Blog and records gives evidence of the success of project
STRAND 4: Career Education **Week 11** Research online/offline and present on careers in Consumer Education	Conduct electronic research	

Learning Outcomes

Students will be able to:

- Demonstrate efficient use of time and energy
- Apply management skills and processes to organizing tasks within the family, school and community.
- Use work simplification techniques to simplify work
- Appreciate the need for personal and family financial planning
- Develop realistic budgets as an instrument for managing family resources.
- Make choices to satisfy individuals and family needs and wants
- Educate consumers about issues relating to consumerism
- Analyze the impact of consumer advertising on the choice of goods and services..

Points to Note

- It is important that safety is reinforced throughout the implementation of the activities planned for campaign.
- The teacher must emphasize the project based approach in the planning of the activities for the campaign.
- Students should be encouraged to demonstrate appreciation for the protection of the environment.
- It is important to highlight career development in the execution of the project.
- Students should be encouraged to practice safe behaviour when using digital media or searching for information on the internet.

Extended Learning

Investigate Consumer Protection Agencies in other Caribbean territories and compare the services offered.
Students can collaborate with local consumer protection agencies and plan a Parish Campaign.

Resources

Books, computers, billboards, Printing paper, Internet, Multimedia devices, Community facilities

Key Vocabulary

Consumerism, advertising, money management, resources, work simplification, plan, organize, implement, control, evaluate

Links to other subjects

Language Arts: Demonstrate competence in speaking to advocate on behalf of consumers.
Visual Arts: Design and create graphics in advertising.
ICT: Demonstrating competencies in using a variety of multimedia/audio-visual equipment.
Business: Apply business principles in the planning and implementation of the campaign.

NSC

RESOURCE & TECHNOLOGY

INDUSTRIAL TECHNIQUES

GRADE 8 UNITS OF WORK

TERM 1

Unit 1:
Resources

- Origin of materials
- Structure of materials
- Classification of materials
  - Woods
  - Metals
  - Plastics (Polymers)
  - Aggregates
  - Water and Gases
  - Aggregates and cementitious materials
  - Smart Materials
  - Composites

Unit 2
Construction Planning /Procedures

- Basic drafting and design (Simple sketches & Introduction to computer aided drafting and design)
- Use of tools of equipment
  - Layout tools (measuring tools)
  - Cutting/modifying/ fabrication
  - Joining and assembling
  - General finishing

Unit 3
Fasteners and Fittings

- Adhesives
- Metal Fastener
- Accessories
- Pipe and cable fittings

TERM 2

Unit 4:
Sources and Use of Energy

- Sources of energy
- Forms of energy
- Conversion of energy

Mechanical, heat, sound, light (solar), electrical and chemical

Unit 5
Principles of Automation

- Electrical
- Mechanical
- Controllers and Circuits
- Hydraulics
- Pneumatics (Air)
- Sensor systems
- Robotics an introduction (basic info)

TERM 3

Unit 7:
Waste Management

- Classification of waste
- Proper waste disposal
- Waste recycling (sustainability)
- Proper storage of waste (toxic & non-toxic)
- Biodegradable/non-biodegradable material

Unit 8
Resource Management

- Quality Assurance
- Estimating costs & quantities
- Technological applications

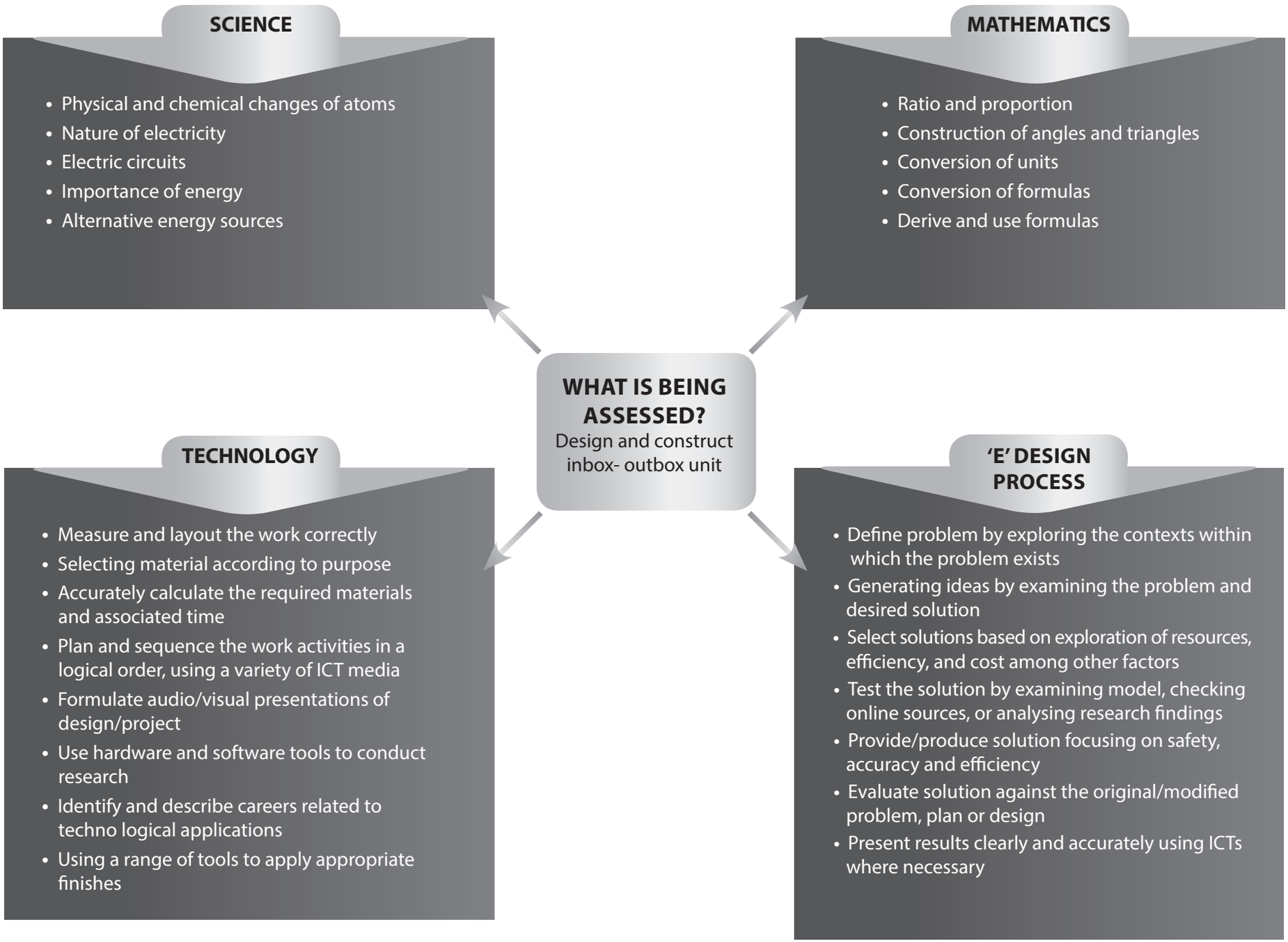
GRADE 8

RESOURCE & TECHNOLOGY

INDUSTRIAL TECHNIQUES

TERM: 1 PROJECT: 1

Inbox-Outbox Unit


SCIENCE
• Physical and chemical changes of atoms
• Nature of electricity
• Electric circuits
• Importance of energy
• Alternative energy sources
MATHEMATICS
• Ratio and proportion
• Construction of angles and triangles
• Conversion of units
• Conversion of formulas
• Derive and use formulas
WHAT IS BEING ASSESSED?
Design and construct inbox- outbox unit
TECHNOLOGY
• Measure and layout the work correctly
• Selecting material according to purpose
• Accurately calculate the required materials and associated time
• Plan and sequence the work activities in a logical order, using a variety of ICT media
• Formulate audio/visual presentations of design/project
• Use hardware and software tools to conduct research
• Identify and describe careers related to techno logical applications
• Using a range of tools to apply appropriate finishes
'E' DESIGN PROCESS
• Define problem by exploring the contexts within which the problem exists
• Generating ideas by examining the problem and desired solution
• Select solutions based on exploration of resources, efficiency, and cost among other factors
• Test the solution by examining model, checking online sources, or analysing research findings
• Provide/produce solution focusing on safety, accuracy and efficiency
• Evaluate solution against the original/modified problem, plan or design
• Present results clearly and accurately using ICTs where necessary

PROJECT 1

Title: Inbox-Outbox Unit
Duration: 12 Weeks (at 1 hr. per week)
Associated units: Unit 1 - Exploring resources
Unit 2 - Construction Planning/Procedures
Unit 3 - Fasteners and Fittings

"The Inbox/Outbox Project"

Description of the Project

The 4-H club at Green Acres High school has decided to adopt the community children's home as part of their outreach programme. At a visit to the home to conduct a needs assessment, the manager requested assistance in creating a system where the children can store their toys and other miscellaneous items. At school, the Department of Resource and Technology decided to host a design challenge for the most creative and innovative solution to meet the need. The Challenge: Design and build an Inbox/Outbox Miscellaneous Item storage unit for children. The solution should provide a safe, convenient, cost effective and space saving storage unit for toys, books and stationery, gadgets and other miscellaneous items that children use in their everyday lives.

The project should involve the use of whatever materials are at the students' disposal, bearing in mind that the solution must be cost effective and environmentally safe. This activity is intended to expose students to the possibilities that exist in the field of designing and environmental protection, while developing student's basic manipulative skills when the processes of cutting, fitting and overall assembly of the solution are carried out. It is also expected that students will begin to realize or see the direct link between scientific principles, mathematical calculations, technological infusion and the application of research in determining basic solutions to everyday tasks, problems or needs.

The key concepts, skills and knowledge students will learn in this unit are:

- Origin and production of common physical resources, for example, plastic, wood, metals.
- Classification of common physical resources.
- The importance of technology in the development of projects or ideas.
- Environmental considerations relating to the selection and use of common physical resources.
- The use of ICT's in design, drafting and communication.
- Drafting and designing principles.
- Classification of hand and power tools.
- Health and safety procedures in the work environment.
- Care and maintenance of tools and equipment.
- Assembly and fitting procedures and principles giving consideration to:
  a. Efficiency in the use of time and resources
  b. Waste management procedures
  c. Safety and housekeeping practices
  d. Production and market standards
- Basic operating standards and principles, giving consideration to:
  a. Care and maintenance of tools and equipment.
  b. Use of tools and equipment.
  c. Safety in the work environment
- The career and entrepreneurial opportunities associated with the development of projects.

About the Project

In this project students will design and construct a device for organising/storing miscellaneous items, equipment or stationary for the home, school, office. The proposed device should be constructed using a range combination of materials, for example; plastic, wood, metal. The device may be a multi-purpose one that is designed to fit adequately into the required, identified or intended space. The focus of the task or solution is to design an item that effectively utilizes available space, material and other resources.

UNITS OF WORK | **TERM 1 PROJECT 1** | **12 Hours (12 X 1 Hour)**

PROJECT TITLE: Inbox-Outbox Unit

Prior Learning

Check that students have a working knowledge and understanding of:

- Materials
- Basic design principles
- Basic use of hand tools

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation

- Create drawings or designs to communicate solution for the Inbox-Outbox Unit that reflects an understanding of a client's/market needs.
- Evaluate the Inbox-Outbox Unit based on cost, quality and efficiency in production/assembly.

Strand 2: Explore Methods and Procedures

- Demonstrate competence in the selection and use of material and equipment to produce the Inbox-Outbox Unit, after giving due consideration to quality efficiency and environmental factors.
- Demonstrate appropriate techniques in the execution of relevant tasks associated with construction the Inbox-Outbox Unit.

Strand 3: Apply Solution

- Apply a sequenced approach to the development and construction of the Inbox-Outbox Unit.

Strand 4: Career Awareness

- Discriminate among known and emerging career opportunities that are related to the inquiry and problem solving processes for the furniture and domestic industry.

OBJECTIVES

Students will:

- Conduct basic research to determine client/market needs regarding the proposed solution.
- Sketch a design solution for the problem or concept using freehand appropriate sketching principles.
- Create two and three dimensional drawings of the proposed concept.
- Create working drawings of the proposed concept illustrating major dimensions
- Evaluate designs using the design process
- Modify designs if necessary after evaluation exercises
- Identify and select available and/or smart resources needed to complete assigned tasks.
- Use context to select the most appropriate resources with consideration to project needs/problem and environmental considerations.
- Examine the range of materials within the environment which may be useful to aid in completing the project.
- Evaluate the basic physical and chemical properties of common material choices.
- Justify the choice of materials and other resources with due considera tions for the environment.
- Classify materials according to their physical properties and application to the development of the project.
- Select the appropriate hand tools to be employed in the completion of tasks.

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

DIGITAL CITIZENSHIP - Recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Science Standards

Appreciate how substances can be classified by their chemical nature (acids, alkalis , salts etc.) and how this relates to the way they react.
Understand physical and chemical changes and know that chemical changes take place through the rearrangement of atoms.

Mathematics Standards

- Construct, using appropriate geometric instruments:
  (a) angle bisectors
  (b) angles of 90, 45 60,30
  (c) triangles

Technology Standards

- Students will develop the abilities to apply the design process
- Students will develop an understanding of and be able to select and use construction technologies

OBJECTIVES

Students will:

- Demonstrate competence in the appropriate use of tools and equipment.
- Select appropriate portable power tools that may be employed in the completion of the task.
- Use tools and equipment safely and follow all necessary personal and general safety guidelines.
- Apply appropriate dimensions/measurements for the project solution.
- Examine the range of fasteners and fittings that are applicable to the completion of the project.
- Identify the appropriate accessories that re applicable to the development of the project.
- Assemble components in a logical sequence to complete the project.
- Use appropriate communication and information technologies to illustrate design and construction processes.
- Compare a finished product with other products to determining the cost, value and quality.
- Identify current technological applications/trends in society
- Identify career pathway associated with completing this project.

Work individually or in groups to undertake the project or activity.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: **Planning** • Brainstorm solutions and derive a concept for the Inbox-Outbox Unit by: - Viewing and discussing videos, photographs and working drawings of sample storage units - Exploring available resources (wood, metal, plastics) at their disposal or within their environment. - Justifying the choice of resource based on considerations such as: a) Environmental impact b) Safety of use c) Availability d) Workability • Selecting the most appropriate and efficient technologies that are available for producing the device (measuring, cutting, joining, finishing, computer aided design software's). • Create and use evaluative instruments (e.g. .checklists, rating scales or work flow charts and graphs) to track their own progress in designing and developing the product.	Conceptualize solutions through group discussions and exploration of material and resources. Discuss possible alternatives Investigate possible environmental impact. Organize work activities sequentially and efficiently. Use Search Engines. Collaborate with peers and supervisors. Calculate accurately with respect to material, time and associated costs. Plan	Group/Peer interaction/activities Observed to ascertain effectiveness of teamwork and group dynamics. Checklists/Rating scales used to qualify systematic and logical planning skills among students.
Designing • Create a design of the product through: - producing basic sketches in orthographic views - Examining basic working drawings using pictorial and orthographic sketches. - Introduction to brainstorming principles and practices - Examination of the principles of design - Exploration of CAD Applications - Team collaboration simulation exercises • Create a material list of the resources needed to complete the project to include description of the part, quantity and dimensions. - Exploration of the use of Computer applications such as Word, Excel and Powerpoint	Design and draw sketches Read and interpret drawings Conceptualize solutions to problems Use of online and offline resources Use simple CAD resources, eg. Google Sketch up, Visio Calculate accurately with respect to material, time and associated costs Compute Create simple workplans Research Internet	Students observed individually or in groups executing design and drafting exercises as well as critiquing or justifying designs. Portfolio gives evidence of agreed criteria for designing and drafting

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Designing • Create a (physical or electronic) portfolio to include designs and modifications based on pre-established criteria. - Use internet to acquire all necessary web based tools to aid designs. • Discuss careers in drafting, design and engineering that are associated with the furniture and domestic industry. - Engagement in mini-career expo • Critique and justify their designs in peer groups (based on the elements of design) culminating in a re-modelling or revision if necessary. • Measure and layout the parts or components of the design solution and make modifications where necessary as they evaluate their own progress. - Create and use evaluation checklists and rating scales Introduction to mass production techniques	Conceptualize solutions through group discussions and exploration of material and resources	Group/Peer interaction/activities Observed to ascertain effectiveness of teamwork and group dynamics. Checklists/Rating scales used to qualify systematic and logical planning skills among students.
Executing • Execute practical operations with tools provided, using the following steps: - Indicate dimensions or points on material where cuts or other processes will be done using appropriate measuring, marking and layout tools. - Make the necessary cuts in the material, avoiding unnecessary wastes. - Assemble the parts/components (without fasteners or adhesives) to verify accuracy of the dimensions or cuts made. - Evaluate assembled project and make modifications if/where necessary - Re-assemble or the project using the necessary fasteners, adhesives and appropriate fittings. - Apply the necessary finishes or finishing to the assembled project. • Formulate workflow chart to track individual or group progress in constructing the inbox-outbox. - Use ICT applications and traditional means to track progress and workflow	Measure and layout work accurately Calculate accurately with respect to material, time and associated costs Evaluate progressively during execution of tasks Make decisions	Observations indicate students' competence in: • Use of tools and equipment • Practice of health, safety and environmental protection habits • Evaluating and modifying as work progresses • Finishing given tasks to approved standards

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
• Collaboration and communicate between groups using appropriate, emergent technologies to share ideas .e.g. (smart phones, tablets e-readers.	Collaborate effectively in teams	
Evaluating • Test project for accuracy and workability using instruments (checklists, rating scales) developed in class. • Evaluate project (in peer groups) against design criteria using checklist and rating scale to measure the quality of the completed project. • Observe the rules and procedures of working within the environs of the classroom/lab alongside their peers. • Discuss the importance of efficiency of operations, quality assurance, aesthetic appeal, patent of design and product marketing. - Explore Quality control in industries - Introduction to bureau of standards regulations • Assess system(s)/practices used in managing available resources.	Analyze material and processes Discuss/debate alternatives Interpret drawings Predict possible logical outcomes	Observations indicate students' competence in: • Finishing and decoration • Evaluating, critiquing and modifying work individually or in peer groups • Finishing given tasks to approved standards

Learning Outcomes

Students will be able to:

- ✔ Explain the importance of resources in design and manufacturing.
- ✔ Recognise the difference between the types of resources and how their use impacts the environment
- ✔ Classify non-renewable and renewable resources according to characteristic features.
- ✔ Choose appropriate technology to provide efficient, effective and environmentally friendly solutions to situations, problems or needs.
- ✔ Assess the impact of modern technology to the development of modern society and suggest ways in which technology may enhance production.
- ✔ Examine the importance of resource conservation in sustaining development. Demonstrate the importance of following standard safety practices in the use of technology
- ✔ Appraise the alignment of safety programmes within the working environment to established standards
- ✔ Follow standard safety procedures in the use and maintenance of tools and equipment
- ✔ Differentiate between types of tools with respect to :

- Power source
- Efficiency
- Characteristics
- Purpose

- ✔ Choose the most appropriate and efficient tools to carry out given tasks
- ✔ Manipulate tools to carry out basic practical operations with increasing efficiency
- ✔ Use inventory control systems to manage the use and storage of material, tools and equipment.
- ✔ Read and interpret symbols and conventions of working drawings
- ✔ Produce working and design drawings to communicate dimensions and assembly processes.
- ✔ Layout the design of projects on materials and manage waste effectively
- ✔ Use information from charts, maps graphs to find predictable patterns and relationships.
- ✔ Evaluate projects against design criteria and market trends/needs
- ✔ Collaborate effectively in teams, demonstrate leadership skills and contribute to group dynamics
- ✔ Examine a range of career opportunities associated with learned and demonstrated skill sets.
- ✔ Organize activities in logical sequences to ensure efficiency in the use of time as well as human and non-human resources.

Points to Note

- Teacher must emphasise the design process and the design brief in the development and construction of the project.
- It is important that safety is reinforced and demonstrated throughout every activity.
- Students should be encouraged to demonstrate appreciation for the protection of environment as they design and construct solutions.
- Students should be exploring a wide range of ICT's in the, selection of resources, development of designs and project ideas.
- Students should be encouraged to constantly assess their progress and evaluate solutions with respect to efficiency, environmental considerations and cost effectiveness.
- It is important to highlight career development and entrepreneurship in the development and marketing of projects and ideas.
- Peer assessment, cooperative learning and collaboration are essential in the development of proper working habits and essential skills
- Demonstrate their understanding of concepts of plagiarism and copy right, and how these apply to their own work.

Extended Learning

The development of skills and attitudes can be further augmented by the following:

- Educational excursion
- Research projects
- Site visits
- Collaborative and cooperative team interactions and assessment
- Exploration of the development and use of ICT's in generating and communicating ideas
- Inquiry based instruction and academic development – Learning by doing
- Use of resource personnel in the related fields (subject matter experts)
- Design and construct scaled models (especially of ideas too large to be constructed in real-life)

Resources

Blank paper, Hand tools, power tools, lumber/ sheet metal, PVC plastic, Computer Aided design Software, computers, cartridge paper, Drawing tables, Internet access, fasteners and fittings, Model-Making material and equipment

Key Vocabulary

Design, drafting, construction, modelling, drafting, conservation, inventory, marketing, product development, technology, safety, accidents, resources, power, career, occupation, environment, maintenance, dimension, assemble, fasteners, adhesives, evaluate, collaborate, assess, market, production, CAD, Inquiry, fabrication, lubricate, electricity, estimate

Links to other subjects

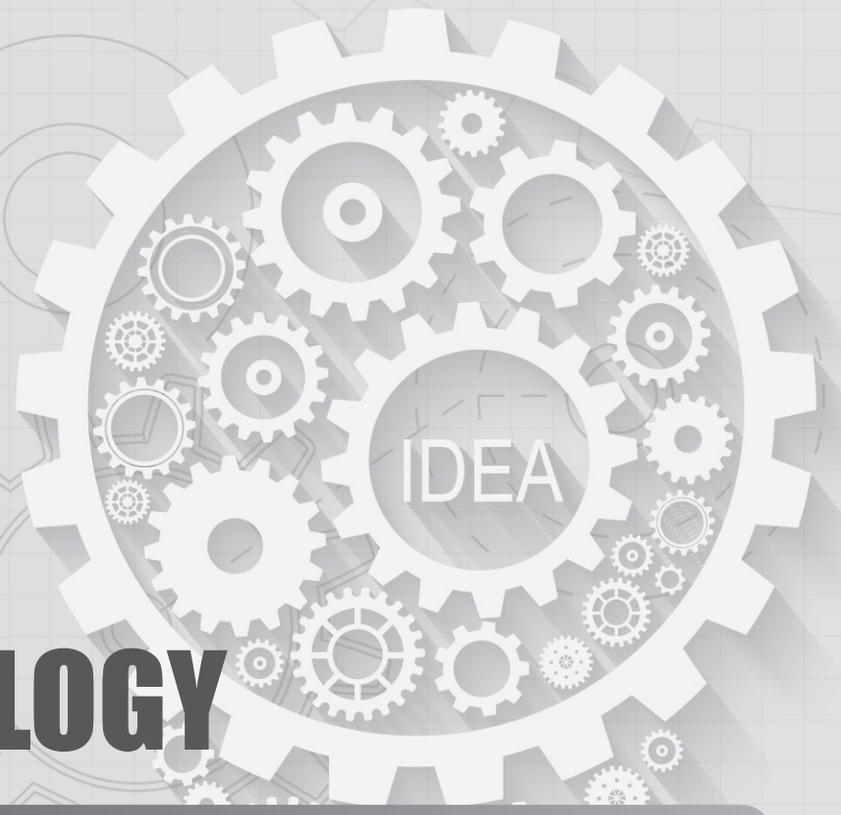
The elements of this project and the associated units may be linked with the following subject areas and attainment targets:

Mathematics : A.T. 2 – Measurements
A.T. 3 - Geometry

Visual Arts: A.T. 1 – Create and Develop
A.T. 2 – Plan and Design

Science: A.T. 1 – Exploring Science and the environment

Information and Communication Technology: A.T. 1 – Communication and collaboration
A.T. 2 – Designing and Producing



GRADE 8

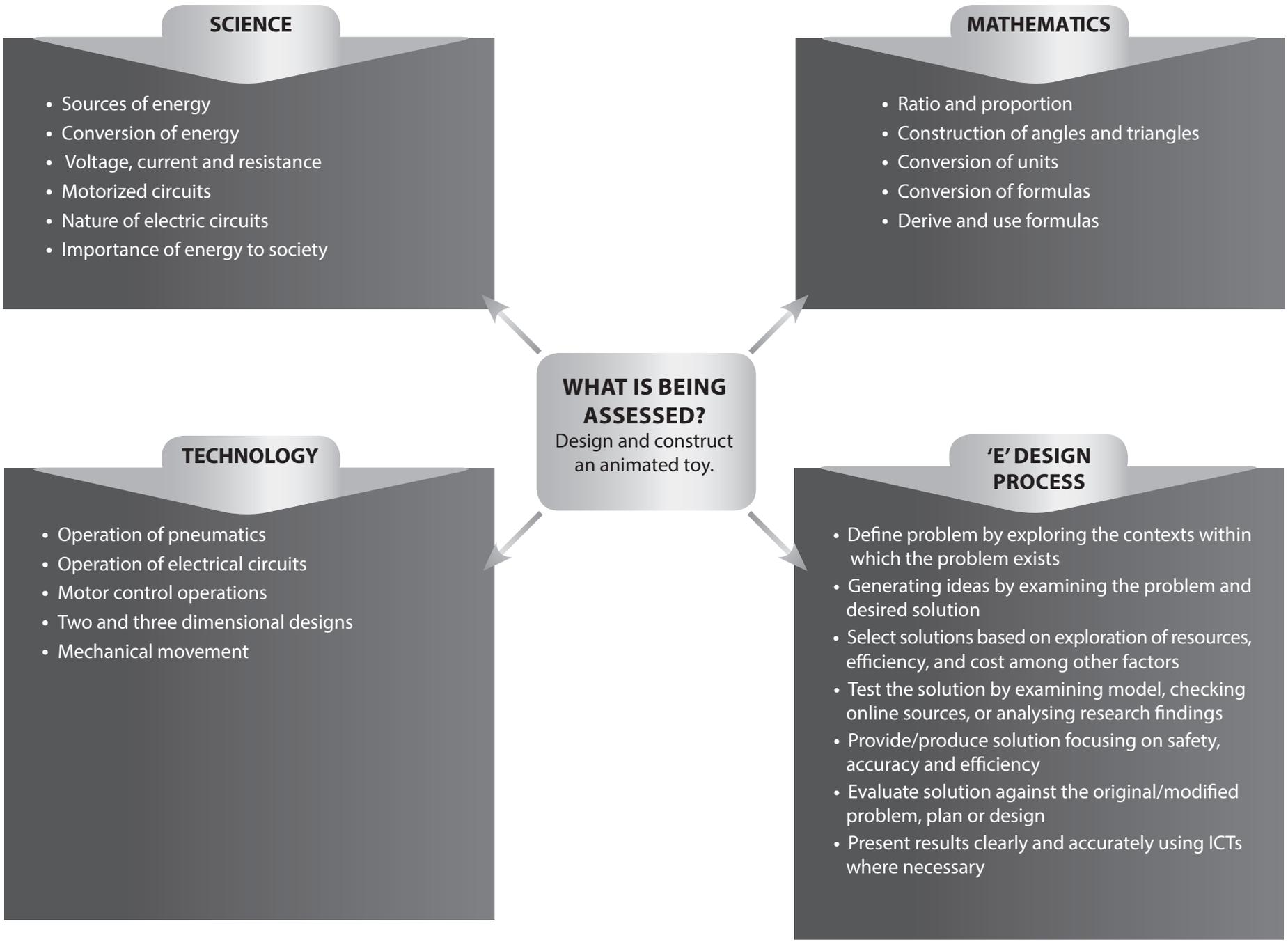
RESOURCE & TECHNOLOGY

INDUSTRIAL TECHNIQUES

TERM: 2 PROJECT: 2

Animated Toy

TERM 2 PROJECT 2: STEM INTEGRATION – ANIMATED TOY



PROJECT 2

Title: Animated Toy
Duration: 9 Weeks (at 1 hr. per week)
Associated units: Unit 1 - Exploring resources
Unit 2 - Sources and Use of Energy
Unit 3 - Principles of Automation
Unit 4 - Decorating and Finishes

"The Animated Toy Project"

Description of the Project

The Ministry of Science, Technology, Energy and Mining in collaboration with the Ministry of Education is embarking on a drive to engage grade eight students in large communities to participate in a competition called 'Creativity and Innovation". The aim of this competition is geared towards getting students to develop critical thinking and problem solving skills. The task for this competition is to design and construct an Animated Toy which will form part of the Robotics in schools initiative for the new school year.

Through guidance and supervision of their teachers, students should focus on applying the principles and elements of design; principles of energy transfer/conversion; basic principles of automation. The students will explore simple forms of animation or movement through basic mechanisms (pulleys, cams, gears, levers or springs) and/or basic motorized circuits and principles of decoration and application of finishes. It is also anticipated that guidance in using tools and equipment and careful observance of standards of safety and environmental procedures in the work environs will be acutely facilitated through the planning and execution of the tasks associated with construction of the animated toy.

The students will examine a range of design concepts along with the associated properties and characteristics of available materials and explore the most suitable and practical design solutions.

The key concepts, skills and knowledge students will learn in this unit are:

- Understanding the importance of health and safety when working with resources.
- Basic principles of work, energy and automation.
- Forms and conversion of energy.
- Relationship between energy, force and work.
- Designing components with hinged and/or pivoted joints.
- Producing two and three dimensional representations of design solutions.
- Using tools and equipment giving considerations to:
  a. Safety and environmental considerations
  b. Accuracy and efficiency
- Team work and group dynamics.
- Career opportunities in the field of design and automation
- Application of finishes.
- Quality assurance and evaluation.

About the Project

In this project students will design and construct a small animated toy. The students will explore simple forms of animation or movement through basic mechanisms (pulleys, cams, gears, levers or springs) and/or basic motorized circuits. The students will examine a range of design concepts along with the associated properties and characteristics of available materials and explore the most suitable and practical design solutions.

Through the guidance and supervision of their teachers, students should focus on applying the principles and elements of design; principles of energy transfer/conversion; basic principles of automation and principles of decoration and application of finishes. It is also anticipated that guidance in using tools and equipment and careful observance of standards of safety and environmental procedures in the work environs will be acutely facilitated through the planning and execution of the tasks associated with construction of the animated toy. The project does not need to be complex but should illustrate an understanding of the basic principles associated with the afore-outlined units.

UNITS OF WORK | **TERM 2 PROJECT 2** | **9 Hours (9 X 1 Hour)**

PROJECT TITLE: Animated Toy

Prior Learning

Check that students:

- Have some knowledge and understanding of materials and the use, sources and forms energy
- Possess some knowledge of the use of hand tools and planning and modification procedures
- Aware of safety practice when working with tools and others in a school lab

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation

- Create drawings or designs to communicate solution for the Animated Toy that reflects an understanding of a client's/market needs.
- Evaluate the Animated Toy produced based on cost, quality and efficiency in production/assembly.

Strand 2: Explore Methods and Procedures

- Demonstrate competence in the selection and use of material and equipment to produce the Animated Toy, after giving due consideration to quality efficiency and environmental factors.
- Demonstrate appropriate techniques in the execution of relevant tasks associated with construction the Inbox-Outbox Unit.

Strand 3: Apply Solution

- Apply a sequenced approach to the development and construction of the Animated Toy.

Strand 4: Career Awareness

- Discriminate among known and emerging career opportunities that are related to the inquiry and problem solving processes in automation, robotics and the toy making industry.

OBJECTIVES

Students will:

- Apply appropriate safety procedures in the execution of the sequence of work
- Define the terms 'energy' and 'work'
- Explain the relation between energy and work
- Identify forms of energy used for everyday solutions
- Classify the forms of energy according to their sources
- Explain how energy can be converted from one form to another
- Explain how the different sources of energy can be utilized to support human development
- Assess how the application of work/force can be optimized in order to operation/function the project
- Identify types of simple machines
- Examine how the principles of simple machines can be combined to produce motion of simple mechanism
- Compare the operations of simple machines using the correct technical terminology
- Animate a selected part of the project using the cam principle or any other simple machine principle
- Design a toy using given parameters/guidelines
- Apply appropriate safety practices/precautions in the execution of a sequence of tasks
- Use context to select the most appropriate material(s) to make the various parts of the project
- Organize a list of hand/portable tools to be used at each stage of the project

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

Science Standards

- Understanding the importance of energy to society, and how alternative energy sources are harnessed.
- Appreciate the nature of electricity and understand the different types of electrical circuits.
- Understand physical and chemical changes and know that chemical changes take place through the rearrangement of atoms.

Mathematics Standards

- Derive an use the formulae for the area of(a)parallelograms,(b)triangles
- Sketch different views (top, side, etc.) of solids making use of dotted line store present unseen lines.
- Construct, using appropriate geometric instruments:
  (a) angle bisectors
  (b) angles of 90, 45 60,30
  (c) triangles
- Read, interpret and construct pictographs, bar charts, pie charts and line graphs

Technology Standards

- Students will develop an understanding of engineering design
- Students will develop an understanding of and be able to select and use energy and power
- Students will develop an understanding of and be able to select and use construction technologies

OBJECTIVES

Students will:

- Create/interpret a set of working drawings to guide the process of completing the project in a specified time
- Create a three dimensional representation of at least one part/ component of the project using an accessible software
- Outline the steps to a functional project (toy)
- Use a range of hand tools correctly in executing each process or operation associated with the construction of the project
- Explain the engineering processes associated with design and construction of the project
- Formulate an appropriate assessment system/method to check for correctness and suitability of each part or component of the project prior to final assemble
- Assemble the various parts/components of the project using the most suitable fasteners and or adhesives
- Select and use the most appropriate finishing techniques for the product's end use
- Critique the final project for neatness, functionality and aesthetics appeal
- Identify career pathway associated with completing this project.
- Work individually or in groups to undertake the project or activity.

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: **Planning** • Discuss with their teacher the events in history or the scientific discoveries in relation to the use of energy that has significantly contributed to human development and the way we now live. - Students will watch videos relating to energy and how it has evolved overtime. - Discuss the impact of energy and its contribution to general developments in our society. • Prepare/create a digital storyboard to illustrate the relationship between energy, work and force in human development. - Discuss and define the terms energy, work and force and say how these terms are related to each other. - Identify different forms of energy and their uses in everyday life. • Use the internet and other information sources to investigate the ways simple machines operate in executing simple tasks. - Use online sources to understand the operations of simple machines and their uses • View pictures/video of a number of toys produced/ manufactured within the past hundred (100) years and ask students to write down the similarities and differences with the toys, for example, material used, size, power source, simplicity/complexity of design and colour. - Students share the data gathered with the class. - Students will analyse the data and select the most suitable toy to construct based on the resources available. • Observe the design and operation of a modern toy and ask students to determine/explain how energy is used or can be used to improve or enhance how the toy operates/ functions. - Use online sources to view various toy designs - Form groups and analyse the selected designs and suggest how it can be improved.	Probe range of materials and design solutions Categorize materials according to suitability of use Discuss design solutions with team Organize work sequentially for efficiency Use of internet Make video, Create Tables, enter text	Digital storyboard shows evidence of understanding of concepts

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
• Use rubric /design checklist to guide the development of an outline, which indicates steps to be taken/followed to create a functioning toy that will utilize a simple machine principle to automate the toy. • Produce a list of safety guidelines to be observed, when using hand tools and materials at varied stages of the project's execution and final evaluation. - Prepare a list of tool that will be used to construct the project - Explore all safety procedures for each tool before use. • Create multimedia presentation which incorporate text, audio, images, videos and link to external resources to present learning and original work.	Conceptualize solutions through group discussions and exploration of material and resources	Rubric will determine if guidelines developed for the observance of safety rules, adequately covers the considerations for: personal safety, use of tools and equipment, safe movement in the lab and environmental concerns.
Designing • Create a unique design of a toy or redesign an existing toy to utilize one or more principles of a simple machine so that at least one or more part/component of the toy moves in a specific predetermined direction. - View various types of designs and modify to achieve specific outcomes. - Carefully analyse the modifications and make adjustments where necessary. - Produce the final design for the toy • Select the most suitable material(s) for the construction of the project, giving due consideration to the strength, workability and durability of the material. - Explore the advantages and disadvantages of selected materials for the project. • Formulate evidence to support the use of specific elements and principles of design that will improve the functionality of the project so that the project is balanced in design and function. • Create a system to track their progress towards completing al l the required steps/processes in the construction of the project within a specific timeframe. - Create a design checklist to track all stages of the project.	Assess design solutions for accuracy and efficiency Evaluate designs against design requirements or criteria	Designs created adhere to the principles and elements of a quality design Observation of students individually or in groups as they critique and justify the concept for their design and complete drafting exercises

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
• Create a system to track their progress towards completing al l the required steps/processes in the construction of the project within a specific timeframe. - Create a design checklist to track all stages of the project. • Draw a pictorial sketch of the project and create basic working drawings (using traditional and/or CAD applications) to aid in the successful construction of the project. - Pictorial views - Orthographic views - Suitable dimensions • Produce a three dimensional drawing of one part/ component of the project using either a manual or digitized format to create the images for the component part. - Pictorial view - Exploded view • Discuss careers in design, drafting and engineering that are associated with the toy manufacturing and set/stage design industry. • Use internet to acquire all necessary web based tools to aid designs.	Design and draw sketches Use hardware and software tools	
Executing • Use the outline and drawings developed to determine the types of hand tools and portable power tools required to complete the project. • Follow the outlined (or similar) series of steps to complete the construction of the project using a range of hand tools and portable power tools to carry out practical operations and processes in a timely manner: - Draw and interpret the related drawings for each part/ component of the project. - Indicate dimensions or points on material where cuts and other modification processes will be made using the appropriate layout, measuring and marking tools.	Critique Select appropriate tools and materials Analyse Make Decision Represent ideas Measure and layout accurately Cut materials to appropriate sizes (minimizing waste)	Observations indicate students' competence in: • Using tools and equipment • Practicing health, safety and environmental protection habits • Evaluating and modifying as work progresses • Finishing given tasks to approved standards

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
- Make the necessary cuts and other processes e.g. bending, shaping, on the material(s), to optimize the full benefits of the material to curtail wastes and procedural errors. - Employ the necessary design/construction techniques to animate a selected part, component or accessory of the project based on one or more principle of a simple machine investigated - Assemble the parts/components to ascertain fitness and accuracy of the dimensions, cuts and other modifications made without fasteners or adhesives - Check assembled project and apply modifications where and if applicable - Make modifications to the workflow of the project and working (design) drawings only where necessary. - Re-assemble and apply the necessary fasteners and adhesives to the project using the most suitable methods and techniques accessible - Prepare the project for the finishing process. - Apply the most suitable/cost effective finishing application to the assembled project to add aesthetic value to the project.	Collaborate with teams to produce solutions Construct Observe safety rules in the execution of tasks Use hand tools skilfully and safely Interpret drawings to produce solution Apply Finishes	
Evaluating • Compile a portfolio (manual or electronic) summarizing the activities, steps and procedures involved in creating a fully functional project. • Test project for neatness, accuracy and operability (work ability/functionality). • Critique the project against the design criteria individually and in peer groups. • Evaluate/justify the importance of quality assurance, aesthetic appeal, patent and product marketing.	Evaluate solution against original or modified design Critique process and make recommendations Assess Redesign Test solution for accuracy, durability and market readiness	Portfolio gives evidence of agreed criteria for: • Finishing and decoration • Evaluating, critiquing and modifying work individually or in peer groups • Finishing given tasks to approved standards

Learning Outcomes

Students will be able to:

- ✔ Understand that properties and characteristics of materials are critical to the functional design of a project.
- ✔ Define key terms and concepts associated with principles of energy and work.
- ✔ Understand that energy efficiency is important to human development.
- ✔ Apply the basic principles of how simple machines work to solve practical problems.
- ✔ Carry out basic operational processes (e.g. cutting, measuring, and laying out).
- ✔ Produce pictorial design on paper and/or digital platforms.
- ✔ Use simple technical terminologies to explain the processes performed.
- ✔ Identify and use basic hand/portable power tools safely.
- ✔ Construct/assemble solution to meet design criteria/specification.
- ✔ Formulate an appropriate assessment system/method to check for correctness and suitability of each part or component of the project prior to final assembly.
- ✔ Critique their own work and make minor adjustment on projects

Points to Note

- Number of students to be engaged in the activities (determine whether major task will be done individually or in groups
- Identify limitations with respect to size and overall capacity of the project
- Range and availability of resources to be used
- Safety of students working with materials, tools and among peers
- Channelling students' creative ability into the necessary design tasks
- Use of applied ICTs and CAD application in designing and communicating solutions
- Demonstrate their understanding of concepts of plagiarism and copy right, and how these apply to their own work.

Extended Learning

The development of skills and attitudes can be further augmented by the following:

- Research projects on the development of simple machines
- Collaborative and cooperative team interactions and assessment
- Exploration of renewable energy source in the Caribbean

Resources

Material, for example: wood, plastic, glass
blank paper, related hand/portable tools, computers, drawing tables, work table, internet, protective gears, fasteners and adhesives, Computer Aided design Software

Key Vocabulary

Automation, fossil, fuel, work, force, animate, method, pulley, levers, cams, mechanical, conversion, optimize, function, Simple Machines, principle, illustrate, gears, springs,

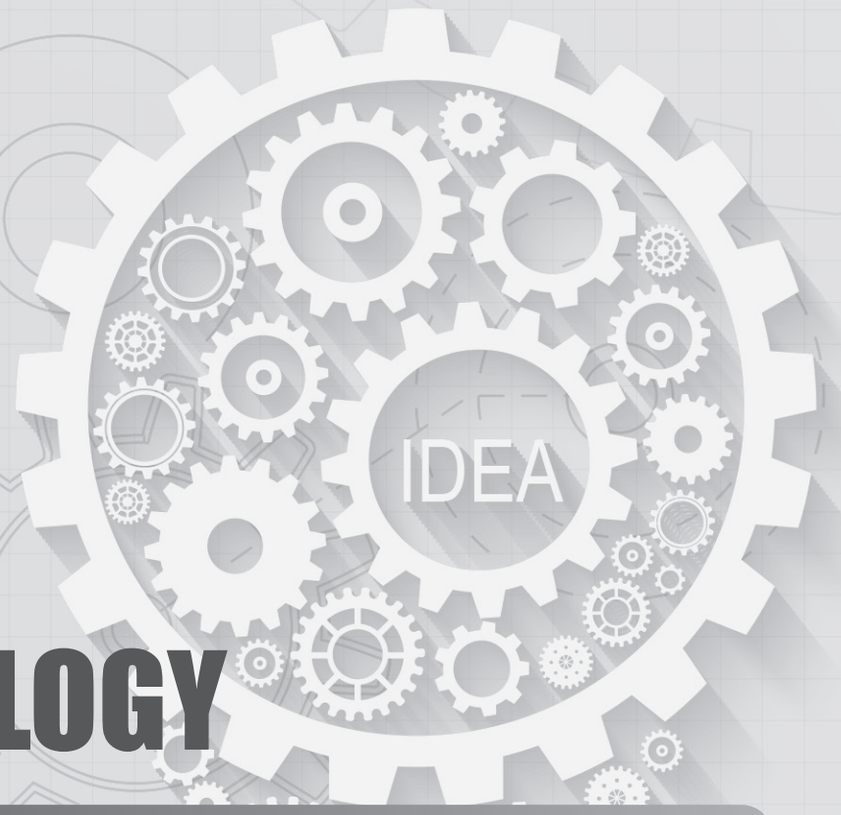
Links to other subjects

The elements of this project and the associated units may be linked with the following subject areas and attainment targets:

Mathematics : A.T. 2 – Measurements
A.T. 3 – Geometry

Visual Arts: A.T. 1 – Create and Develop
A.T. 2 – Plan and Design

Science: A.T. 1 – Exploring Science and the environment



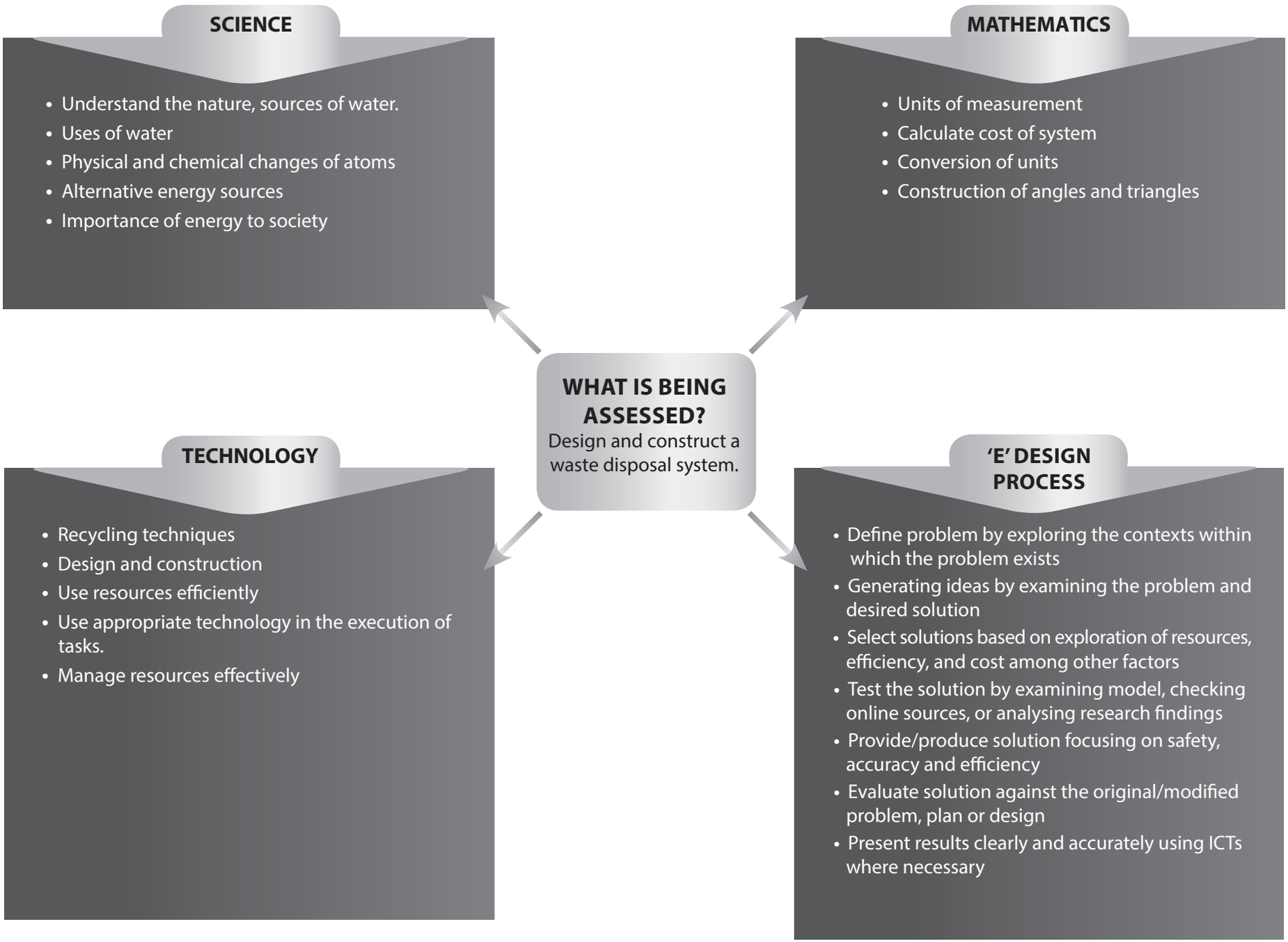
GRADE 8

RESOURCE & TECHNOLOGY

INDUSTRIAL TECHNIQUES

TERM: 3 PROJECT: 3

Waste and Resource Management


SCIENCE
• Understand the nature, sources of water.
• Uses of water
• Physical and chemical changes of atoms
• Alternative energy sources
• Importance of energy to society
MATHEMATICS
• Units of measurement
• Calculate cost of system
• Conversion of units
• Construction of angles and triangles
WHAT IS BEING ASSESSED?
Design and construct a waste disposal system.
TECHNOLOGY
• Recycling techniques
• Design and construction
• Use resources efficiently
• Use appropriate technology in the execution of tasks.
• Manage resources effectively
'E' DESIGN PROCESS
• Define problem by exploring the contexts within which the problem exists
• Generating ideas by examining the problem and desired solution
• Select solutions based on exploration of resources, efficiency, and cost among other factors
• Test the solution by examining model, checking online sources, or analysing research findings
• Provide/produce solution focusing on safety, accuracy and efficiency
• Evaluate solution against the original/modified problem, plan or design
• Present results clearly and accurately using ICTs where necessary

PROJECT 3

Title: Waste Management Programme
Duration: 9 Weeks (at 1 hr. per week)
Associated units: Unit 2 - Construction Planning/Procedures
Unit 7 - Waste Management
Unit 8 - Resource Management

"The Waste Management System Project"

Description of the Project

Effective storage and disposal domestic waste is an on-going challenge in the community of Mooreville in your parish. The local parish authority has decided to launch a "Community Waste Disposal Campaign" to treat with this environmental challenging situation in the community. To complement the public educational programme the local parish authority has decided to distribute home waste disposal units to hundred homes under a pilot programme initiative. Your high school have been approached to design and construct a prototype of the disposal units to be distributed to the house (in the scale 1:5). The unit should be constructed to fit two standard size garbage bins, approximate dimensions for the bins are as follows:

- Height: 82.8cm 32.6"
- Width: 50.3cm 19.8"
- Depth: 59.2cm 23.3"

Bin design requires a raised floor to maintain the height required for automated collection. One bin should facilitate the safe disposal of biodegradable waste and other the recyclable waste. The unit should be enclosed to prevent insects, small pests or rodents and children from accessing the units, also the construct should facilitate ease cleaning and maintenance.

The key concepts, skills and knowledge students will learn in this unit are:

- Classification of resources.
- The importance of technology in the development of projects or ideas.
- Environmental considerations relating to the selection and use of resources.
- The use of ICT's in planning, designing and communication.
- Basic collaborative/team work principles.
- The importance of good management practices.
- Classification/ types of wastes.
- The standard health and safety practices associated with waste management.
- The standard procedures and practices in the maintenance and management of a sustained programme.
- The principles of resource management
- The use of various operational and procedural techniques in completing the project.
- The importance of considering:
  a. Efficiency in the use of time and resources
  b. Waste management procedures
  c. Safety and housekeeping practices
- The career and entrepreneurial opportunities associated with the development of projects.
- The principles in on-going assessment of processes during designing, implementing and execution of solutions
- The steps in modifying existing work plans to accommodate changes in design and execution.

About the Project

In this project, students will design or modify a system or programme to effectively manage wastes by recycling or reusing the waste material or resource. The proposed system should be designed for the school, home or work environment and should feature prominently, in its design and construction, the standard environmental protection, health and safety as well as waste management practices. The concept may/may not involve the physical construction of an instrument/item/device but must involve the careful planning of a waste management system that is comparable to established systems within society. The student should be encouraged to give careful consideration to environmental protection, health and safety, cost and available resources.

UNITS OF WORK | **TERM 3 PROJECT 3** | **9 Hours (9 X 1 Hour)**

PROJECT TITLE: The Waste Management System Project

Prior Learning

Check that students:

- Materials and their properties
- Classification of waste
- Potentially harmful impact of solid waste

STRANDS & ATTAINMENT TARGET(S)

Strand 1: Creativity and Innovation

- Conceptualize a programme that will effectively manage the use, reuse, and /or recycling of resources and disposal of wastes.
- Derive solutions that reflect an understanding of resource and waste management, due considerations for the environment, as well as the promotion of health and safety.

Strand 2: Explore Methods and Procedures

- Identify required materials and resources after giving consideration to quality, efficiency and environmental factors.
- Demonstrate appropriate techniques in the execution of relevant tasks in solving the problem giving consideration to standard safety procedures /practices in the use of tools and equipment.

Strand 3: Apply Solution

- Demonstrate increasing competence in resource and task management for the proposed programme.
- Develop and apply a sequenced/ systematic approach in managing resources using relevant technologies.

Strand 4: Career Awareness

- Demonstrate acceptable behaviour in working individually and in teams.
- Demonstrate awareness of career choices/occupations associated with design, management and marketing activities
- Discriminate among known and emerging career opportunities that are related to the inquiry and problem solving processes.

OBJECTIVES

Students will:

- Classify waste according to toxicity and renewability
- Examine the effects of improper waste management in the environment.
- Design guidelines for the execution of the project/programme under taken
- Formulate strategies for the sensitization of persons about personal and environmental safety
- Identify biodegradable waste commonly used in the work environment
- Outline applications for reusable waste from common resource
- Design systems for the recycling of common resources
- Design storage systems for resources and various waste materials
- Construct practical items from waste material
- Explore and adopt alternative methods of using waste materials within the environment
- Assess the feasibility of reusing waste material as opposed to discarding it
- Design systems/programmes for the management of resources within the environment
- Appraise the safety concerns with regards to recycling and waste disposal
- Employ the use of technology to aid in the recycling and disposal of waste materials
- Estimate cost of material from design specifications
- Perform basic calculations/computations of quantities of resource material needed in the execution of the system/programme
- Rate the finished product with respect to quality and cost
- Apply on-going quality control evaluation strategies to the project
- Practice acceptable time and resource management strategies
- Identify career pathway associated with completing this project.

Work individually or in groups to undertake the project or activity.

ICT ATTAINMENT TARGETS:

COMMUNICATION AND COLLABORATION - Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING - Use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

Science Standards

- Understand the nature, sources and uses of water. Know the percentage composition off air and understand how carbon and oxygen are cycled in the atmosphere.
- Appreciate how substances can be classified by their chemical nature (acids, alkalis, salts etc.) and how this relates to the way they react..

Mathematics Standards

- Read, interpret and construct pictographs, bar charts, pie charts and line graphs
- Establish formulas and, estimate and calculate the volume and capacity of cubes, cuboids, prisms, cylinders, and composite objects.

Technology Standards

- Students will develop an understanding of the effects of technology on the environment
- Students will develop an understanding of the attributes of design
- Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Students will: **Planning** • Brainstorm the problem, need or situation and derive a concept for the solution by: - Exploring the human and non- human, as well as renewable and non-renewable resources available to the students. - Discussing and selecting the most appropriate and efficient technologies that are available. - Exploring various categories of wastes. - Exploring the range of resources needed to complete the project or solution. • Students will the funding from their investigation and share the results with their peers. Teacher will provide feedback to students based on the finding shared with other group members. • Develop a rubric (e.g. workflow chart) to outline the planning and execution of the proposed resource and waste management system.	Conceptualize solutions individually or in teams Discuss solutions and justify arguments Organize and plan for efficient production of solutions Collaborate with teams to arrive at workable solutions Calculate accurately with respect to time, resources and associated costs	Evidence through questioning techniques used to determine students' ability to conceptualize and communicate solutions effectively. Rubric (checklists/rating scales) used to qualify systematic and logical planning skills among students.
Designing • Watch a video or read information on the benefits of effective waste management. Special focus should be on the amount of accumulated garbage produce by an individual, household, classroom, community or country. While watching the video or reading the information provided, students will record the type(s) of waste produced by the aforementioned group identified and determine the effects of those types of waste on the environment by conducting further research using both online and offline sources.	Read and interpret working drawings Designing and drafting of applicable solutions Conceptualize solutions through collaboration and teamwork	Rubric (rating scales) used to qualify students' competence in designing, planning and execution

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
• Conduct a research investigation by counting how many fill bins of garbage your class/grade level /school produces or disposed of each day/week. Students will also classify the items thrown in the bins according to recyclables and non-recyclables or biodegradables and non-biodegradables. Students will then be tasked to design a system or procedure to safely separate the waste before it is throw away or disposed of.	Research appropriate resources and technologies Calculate accurately with respect to time, resources and associated costs	

How many full bins of garbage does the classroom fill each week?	_____ full bins
How much does a full bin of garbage weighs	_____ lbs/grams
How many plastics plastic bottles (or other such items) were found in each full bin	_____ lbs/grams

- Create a plan using a systematic approach and outlining the proposed solution using:
  - sketches and/or concept maps
  - equipment and/or resource needs
- Create a material list of the resources needed to complete the project. The teacher will assist students in finalizing the material list generates to reflect accessibility and level of competence
- Discuss careers in planning, design and engineering and associate the careers discussed with the design and execution of the project.
- Discuss and critique project designs in peer groups and class discussions and justify their proposals where neces sary.
- Layout the various phases of the plan and to make modifi cations where necessary as they evaluate their own progress.
- Create a portfolio of the designs and modifications made in completing the design for the resource and waste management system

Portfolio gives evidence of agreed criteria for the design of a resource and waste management system

Suggested Teaching and Learning Activities	Key Skills	Assessment Criteria
Executing • Using the appropriate safety gears students will tag/label non-biodegradable items from the classroom or lab disposable bins according to their chief material composition. Students will then carry-out a research in groups to ascertain the length of time these items take to break down (decompose). Students will produce individual graph/comparative graph to illustrate the decomposition rate of the materials over time. • Execute planning using the following steps: - Indicate parameters/limitations of the system to be proposed - Indicate advantages and disadvantages of the system/ programme to be employed - Create a graphic representation of work to be done and a timeline to accomplish the tasks - Carry out simulation exercises for standardization - Carry out sensitization exercises - Institute the recommended programme to incorporate persons involved	Measure and layout accurately Calculate accurately with respect to time and resources Modify progressively where necessary Make decisions during process of observation and execution of tasks Collaborate effectively with others to produce solutions	Observations indicate students' competence in: • Practicing health, safety and environmental protection habits • Evaluating and modifying as work progresses • Finishing given tasks to approved standards • Project planning • Accuracy in calculation and computations
Evaluating • Test project for accuracy and workability. • Evaluate project against design criteria using a prescribed rubric • Observe the rules and procedures of working within the environs of the classroom/lab alongside their peers. • Discuss the importance of efficiency of operations, quality assurance, aesthetic appeal, patent of design and product marketing. • Assess system(s)/practices used in managing available resources.	Analyze work done and modify as is necessary Observe processes and align with environment and safety standards Predict outcomes after careful observation and evaluation Plan for future activities	Rubric (checklists and/or rating scales) demonstrates students' competence in: • Planning and execution • Evaluating, critiquing and modifying work individually or in peer groups • Complete programme to acceptable standards

- Participate in land or beach clean-up activity organized at the level of the class, school, community and special NGO. After completion of the day's activities, students will be asked to write a reflective piece on how the day's activities would have impacted their thinking in light of the potential impact of improper waste disposal. Students will also be asked to capture "before and after" photos of the clean-up site(s) visited and base their reflective logs on the experience gained.

Learning Outcomes

Students will be able to:

- ✔ Effectively communicate the results of their research findings and analysis to fellow classmates in an oral presentation
- ✔ Explain the importance of resources in design and manufacturing.
- ✔ Recognise the difference between the types of resources and how their use impacts the environment
- ✔ Classify non-renewable and renewable resources according to characteristic features.
- ✔ Choose appropriate technology to provide efficient, effective and environmentally friendly solutions to situations, problems or needs.
- ✔ Assess the impact of modern technology to the development of modern society and suggest ways in which technology may enhance production.
- ✔ Examine the importance of resource conservation in sustaining development.
- ✔ Demonstrate the importance of following standard safety practices in the use of technology
- ✔ Appraise the alignment of safety programmes within the working environment with respect to established standards
- ✔ Follow standard safety procedures in the use and maintenance of tools and equipment.
- ✔ Differentiate between types of tools with respect to :
  - Power source
  - Efficiency
  - Characteristics
  - Purpose
- ✔ Choose the most appropriate and efficient tools to carry out given tasks
- ✔ Manipulate tools to carry out basic practical operations with increasing efficiency
- ✔ Use inventory control systems to manage the use and storage of material, tools and equipment.
- ✔ Read and interpret symbols and conventions of working drawings
- ✔ Produce working and design drawings to communicate dimensions and assembly processes.
- ✔ Layout the design of projects on materials and manage waste effectively
- ✔ Evaluate projects against design criteria and market trends/needs

- ✔ Collaborate effectively in teams, demonstrate leadership skills and contribute to group dynamics
- ✔ Examine a range of career opportunities associated with learned and demonstrated skill sets.
- ✔ Organize activities in logical sequences to ensure efficiency in the use of time as well as human and non-human resources.

Points to Note

- Teacher must emphasise the design process and the design brief in the development and construction of the project.
- It is important that safety is reinforced and demonstrated throughout every activity.
- Students should be encouraged to demonstrate appreciation for the protection of environment as they design and construct solutions.
- Students should be encouraged to constantly assess their progress and evaluate solutions with respect to efficiency, environmental considerations and cost effectiveness.
- It is important to highlight career development and entrepreneurship in the development and marketing of projects and ideas.
- Peer assessment, cooperative learning and collaboration are essential in the development of proper working habits and essential skills.
- Demonstrate their understanding of concepts of plagiarism and copyright, and how these apply to their own work.

Extended Learning

The development of skills and attitudes can be further augmented by the following:

- Educational excursion
- Research projects
- Site visits
- Collaborative and cooperative team interactions and assessment
- Exploration of the development and use of ICT's in generating and communicating ideas
- Inquiry based instruction and academic development – Learning by doing
- Use of resource personnel in the related fields (subject matter experts)
- Design and construction of scaled models (especially of ideas too large to be constructed in real-life)

Resources

Blank paper, hand tools, power tools, lumber/ sheet metal, PVC plastic, Computer Aided Design Softwares, Computers, Drawing tables, Internet access, Fasteners and fittings, Model-Making material and equipment

Key Vocabulary

Design, drafting, construction, modelling, conservation, inventory, marketing, product development, technology, safety, accidents, resources, power, career, occupation, environment, maintenance, dimension, assemble, fasteners, adhesives, evaluate, collaborate, assess, market, production, CAD, Inquiry, fabrication, lubricate, electricity,

Links to other subjects

The elements of this project and the associated units may be linked with the following subject areas and attainment targets:

Mathematics : A.T. 2 – Measurements
A.T. 3 – Geometry

Visual Arts: A.T. 1 – Create and Develop
A.T. 2 – Plan and Design

Science: A.T. 1 – Exploring Science and the environment

Information and Communication Technology: A.T. 1 – Communication and collaboration
A.T. 2 – Designing and Producing

RESOURCE & TECHNOLOGY

APPENDICES

GRADE 8

SUBJECT GLOSSARY: RESOURCE & TECHNOLOGY

TERM	MEANING/DEFINITION
Technology	Means by which knowledge, tools, equipment and materials are creatively utilized to solve practical problems
Module	A component or portion of the subject which can be taught independently of the other components, but is an integral part of the whole subject
Resource	The means or material available to solve a problem
Design Process	A strategy that is utilized to solve a problem or meet a need
Skill	Specific ways and means of using knowledge, tools and materials – things learnt to do
Knowledge	Theoretical and practical understanding of what was taught – new things learnt
Attitudes	Positive behaviours that are displayed e.g. following instructions, working harmoniously with others
System	A set of related parts which work together to accomplish some purpose
Student's Log	An on-going self-assessment record of student's own experiences while working through the subject
Aesthetics	Area of design concerned with how a product looks. Also concerned with making products look attractive
Prototype	An accurate, detailed, working model of a product, showing what the design will look like and sometimes, how it will work

SUBJECT GLOSSARY: BUSINESS BASICS

TERM	MEANING/DEFINITION
Assets	Assets are the economic resource (tangible or intangible) owned by the business
Automation	Automation is the use of machines and technology to make processes run on their own without manpower.
Capital	Refers to wealth that is set aside to further production machines, equipment used in the production of goods and services or money
Cash-Book	The Cash book is a combination of a cash account and a bank account in one book. It is used to record the receipt and payment of cash and cheque
Cheques	Is a document that orders a bank to pay a specific amount of money from a person's account to the person in whose name the cheque has been issued.
Contra-Entry	A Contra entry is a transaction for which the entire double entry is completed in the cash book as it involving transfer of money between the cash account and the bank account
Credit note	A credit note is a document sent by the supplier to the customer notifying the customer that he or she has been credited a certain amount due to an error in the original invoice or other reasons.
Creditor	A creditor is a person or business enterprise that has lent money or owed for goods supplied to the business.
Debit note	A debit note is a document sent by a buyer to a seller, when returning goods received on credit. This notifies that a debit has been made to their accounts
Debtor	A debtor is a person or business enterprise that owes money to the business for goods bought on credit.
Domestic production	Goods and services produced within a country using local inputs to satisfy the needs and wants of the population

TERM	MEANING/DEFINITION
Invoice	An invoice is a document issued by a seller to a buyer, relating to a sale transaction and indicating the products, quantities, and agreed prices for products or services the seller had provided the buyer.
Journal	A Journal is an accounting record that is used to record the different types of transactions in chronological order or date order.
Liability	These are money owing for goods supplied to the business or loans supplied to the business.
Mechanization	The process of using machines to do something that was previously done by hand.
Primary Production	This involves extracting and utilising raw materials from the land that are later used to create goods and services. Examples: Bauxite mining and cultivating sugar cane.
Production	This is the process of converting raw materials into finished products. It is the creation of goods and services to satisfy the needs and wants of consumers.
Receipt	A receipt is a written acknowledgment that something of value has been transferred from one party to another
Secondary Production	Manufacturing and processing raw materials to create finished goods using the outputs from the primary sector. Example, sugar cane used tomake refined sugar
Subsistence production	The provision of good and services to meet the basic needs for survival, there is no excess.
Surplus production	Production of goods and services in excess of what is needed to satisfy the needs of a country. The excess is usually sold to other countries and known as export.
Tertiary production	This is the provision of services to consumers, example, healthcare, education, utilities, tourism and transportation

ALTERNATIVE PATHWAYS TO SECONDARY EDUCATION (ASPE)

The 21st century is a time of rapid technological growth and social change. The school curriculum must, therefore, ensure that young people are well prepared for the challenges and opportunities that they will meet as adults in this century. The MoEYI is making every effort to provide for the multiple intelligences of our children and cater to their diverse needs in order to fully maximize their capabilities. Hence, the MoEYI has created alternative pathways to receiving an education at the secondary level.

Providing alternative pathways will be far-reaching in carrying out the Ministry's mantra, "Every child can learn....every child must learn". Learning pathways will allow for an inclusive approach in which instruction is based on tailored curricula, enabling each learner to perform to his/her fullest potential based on aptitude, interest and ability. Alternative Pathways represent a new approach to secondary education. Secondary education in Jamaica is being reframed and re-positioned as customised, diverse, relevant, equitable, outcomes-based, and inclusive; and significantly, this approach will signal the introduction of a seven year (Grades 7-13) period of instruction for students on all secondary pathways.

Goals of the APSE

- Design the school system to offer differentiated instructional programmes, informed by the National Standards Curriculum (NSC).
- Develop individualized intervention/learning plans based on students' performance profile.
- Provide special educators as Pathway Coaches to support subject teachers of students on Secondary Pathways II and III in the delivery of instruction.
- Facilitate a functional academic approach at the secondary level characterised by response to intervention (RtI) methodology, interactive, learner-centred, project-based and problem- based learning, reflection and alternative forms of assessment.
- Foster a system for ALL students to exit the secondary level with the knowledge, skills, competences and attitudes which will have them ready for the world of work or to access tertiary level education.

Secondary Pathways I, II & III (SP I, II & III)

All students will access secondary education via the prevailing Grade Six examination. The exit examination will provide individual profiles to inform decisions for pathway access and standards for differentiation.

SPI is a 7-year programme with a curriculum based on the constructivist approach. At Grades 7-9 students will access the National Standards Curriculum (NSC), and at Grades 10, 11, 12 & 13, they will access the curricula/syllabi of the examining body.

SP II is a 2-year transitional programme with a curriculum based on the constructivist approach. Special educators/pathway coaches will work with teachers and students on this pathway. Students will be provided the required intervention and support to allow for transition. At the end of Grade 8 students will be re-evaluated through psycho-educational evaluation to determine their readiness for crossing over into either SP I or SP III.

SP III is a 7-year programme with a curriculum based on the constructivist approach. At Grades 7-9 students will access the National Standards Curriculum (NSC), and at Grades 10 & 11, they will access the curricula/syllabi of the examining body. At the end of Grade 11 SP III students will transition into the Career Advancement Programme.

At Grades 7-9 the NSC, will be modified to meet the needs of the SP III students. Students in SP III will be instructed through a functional academics curriculum in the core subjects- Mathematics, English Language, Communication, Social Studies and Science. Their instruction will be further enriched with Personal Empowerment, Technical and Vocational instruction, as well as the performing and creative arts. Pathway Coaches will collaborate with subject teachers to prepare content, ensuring differentiation in instruction for students on SP II and III. These students will also be supported through use of the Response to Intervention (RtI) methodology.

PERSPECTIVES OF SCIENCE, TECHNOLOGY, ENGINEERING, MATHEMATICS & THE AESTHETICS (STEM/STEAM) IN RELATION TO THE NATIONAL STANDARD CURRICULUM (NSC)

INTRODUCTION & BACKGROUND

The integration of theoretical principles that relate to STEM/STEAM Education in the NSC began in June 2014. This move was influenced by recommendations of the STEM Steering Committee that emphasized the need to develop learners who are not just productive, but who would also be innovative Jamaicans. STEM integration was also regarded as one of the strategic long term means of addressing the economic challenges being faced by Jamaica using education as a primary vehicle for the implied transformational change to happen, beginning from short term efforts.

Initial discussions and deliberations promoted an emphasis on STEM rather than STEAM Education. However, critical analysis of the conversations conveyed the perspective of STEM as a collection of related disciplines that all learners should have the opportunity of pursuing, to develop the competencies they offer and as a consequence be able to gain employment or become employers in STEM related areas. As stakeholders from different backgrounds processed their understanding of STEM, new meanings of the concept emerged from the discussions. One was the perspective of STEM as a methodology. There was, however, concern about the exclusion of “A” in STEM. This “A” component however, brought to the discussion, multiple meanings. In some Aesthetics as a field and was considered an important component to be included if educators are serious about issues of discrimination, holistic learning and current research on the iterative function of the brain that warrants attention to brain based learning and the role of the Arts in promoting knowledge integration to cater to multiple domains of learning. There was also discontent about neglecting the Performing Arts when related creative industries contribute significantly to economic development. The concern was that the role of the Arts to economic development was being trivialized.

The call for the integration of the Aesthetics or Art forms became more pronounced as STEM took on more national significance. This was supported by research that indicates the importance of the Aesthetics in developing values and attitudes, in promoting holistic learning and in serving as drivers of innovations. By integrating principles from STEM with those from the Arts/Aesthetics, the approach to problem solving would encourage greater appreciation for and reliance on the interdependent nature of knowledge when science and arts intersect. Additionally, STEAM as a methodology encourages the harmonizing of the cognitive and the emotional domains in the problem-solving process.

The concept of STEAM was adopted in 2015, as an integrative approach to education and a methodology that pays attention to the benefits to be derived from the inclusion of the Arts or Aesthetics with STEM related principles. These collective benefits are supported by Jolly (2014), Sousa and Pilecki (2013) and include divergent thinking; differentiated learning; Arts integration; focus on intrinsic motivation and informed decision-making.

PERSPECTIVES OF STEM/STEAM IN THE CONTEXT OF THE NSC

In the context of the NSC, STEM/STEAM is used in a number of ways. These include:

STEM/STEAM as an integrative learning approach and methodology in facilitating learning. This perspective places emphasis on STEM/STEAM as a means of helping learners become creative or innovative problem solvers and lifelong learners who rely on scientific principles (laws and theories) to address issues/concerns or to deal with observed phenomenon that are puzzling for them or that inspire interest. As an approach, the focus is on solving problems based on principles. As methodology, the focus is on the system of practical procedures to be used to translate principles into the problem - solving processes or to choose from available problem- solving models.

STEM/STEAM as an Experiential-Vocational Learning Framework that is based on problem solving through the project-based approach. Emphasis is placed on solving real life problems in a context that requires learners and their facilitators to observe work-based principles. The primary purpose for this focus is for learners to: (i) become employable (ii) prepare for further education and/or for occupational or work readiness.

STEM as types of institutions in which learning is organized as a meta-discipline as described by Morrison and Bartlet (2009). Based on this perspective, STEM facilitates the demonstration of knowledge in a manner that removes the boundaries of each discipline for application to problem as would be practised in the real world.

IMPLICATIONS OF PERSPECTIVES OF STEM/STEAM IN LIGHT OF THE NSC

Since the NSC is based on Constructivism principles, STEM/STEAM as an approach and methodology, has to be established on post-positivistic thinking. From this position, STEM/STEAM influences the kind of practice that promotes collaboration, negotiation of meaning and openness to scrutiny.

The NSC developers selected a Constructivist approach that included the deliberation, designing and development stages of the curriculum process. Evidence of the influence of Constructivism can be seen the NSC Framework Document that conveys the following emphasis:

(i) The element of objectives is presented in two forms; firstly as Learning Objectives to focus attention on process and experience rather than product. Secondly as Learning Outcomes that serve as some of the outputs of the process. They include the basic understandings, skills and dispositions anticipated from learners' engagement in the planned experiences.

(ii) The element of content is treated as contexts for learners to think critically, solve problems creatively while developing their identity as Jamaicans. Content is not expected to be treated as disciplines to be mastered but as areas that contribute knowledge, skill sets and attitudes that form the composite of competencies to be acquired from their integration in the learning situations.

(iii) The element of learning experiences (method) is presented as a set of learning activities that serves as a source of problems to be addressed as a part of the learning process. These real-life activities provide the scope of knowledge, skills and required dispositions or character traits for learners to make sense of that aspect of life or the world that they represent. They are the threads that connect all the other elements of the curriculum and allow for the integration of STEM/STEAM in the following ways:

- Identification of activities that are presented as problems to be solved using the STEM/STEAM approach based on contextual factors that include the profile of the learner, the learning conditions and the anticipated impact.
- Integrating activities to form a real problem to be solved as a short, medium or long term project to which the project based learning would be applied.
- The examination of learning activities by learners and teachers as co-learners through multiplelenses using content of science, technology, mathematics and the humanities that they have already explored to engage in the problem identification and definition processes.
- Extending learning in the formal setting to the informal by connecting co-curricular initiatives that are STEM/STEAM based that learners are undertaking at the institutional level through clubs and societies, as whole school projects or in partner ship with external stakeholders.
- Using the learning activities to review STEM/STEAM initiatives that form a part of the informal curriculum to and for reflection on action.

- Using activities as springboards for reflecting on career or occupational interest in STEM/STEAM related areas.

(iv) The element of evaluation is communicated in two major ways; firstly as prior learning which serves diagnostic purpose and secondly as an on-going developmental process. This formative focus is indicated by the inclusion of explicitly stated assessment criteria that are to be used alongside the learning activities. The use of assessment criteria as counterparts of the learning activities also indicates that assessment is learner centred since it is serving developmental rather than promotional purpose and as a consequence, allows learners to self-correct as they use feedback to develop feed-forward capabilities. Evidence of learning, based on the learning outcomes, can be collected from various types of assessment methods that emphasize the learner centred constructivist orientation. This brings to the fore the need for serious consideration to be given to differentiation in assessment for fairness and credibility of claims about learners' capabilities and to inform decisions that will impact their educational journey.

In general, this integrated approach, which is the context of STEAM, is aimed at improving the quality of the educational experience for learners while influencing the achievement of the aims of education that relate to productivity and creativity as part of the profile of the Jamaican learner.

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The 5Es Overview: "The 5E Learning Cycle"

What is a 5E Learning Cycle?

This model describes an approach for facilitating learning that can be used for entire programmes, specific units and individual lessons. The NSC supports the 5E constructivist learning cycle, as it places emphasis on the processes that may be used to help students to be personally involved in the learning situation as they are guided to build their own understandings from experiences and new ideas.

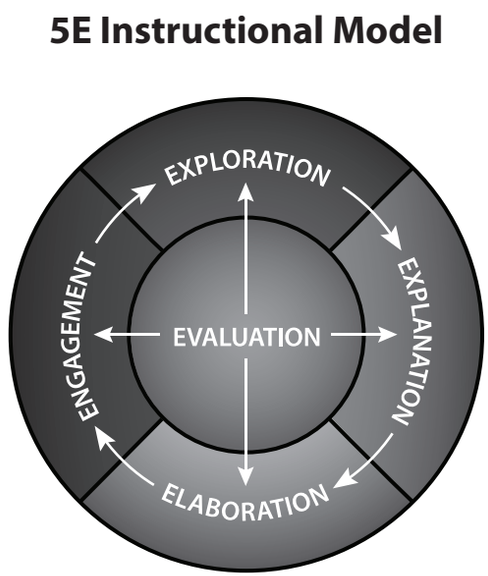

Figure 1. Illustrating one version of the 5E model that conveys the role of valuation as an interconnecting process that is at the core of the learning experience.

Figure 2, illustrating a cyclical perspective of the model with each process being given similar emphasis in contributing to the learning experience on a whole.

EXPLANATION OF THE INSTRUCTIONAL MODEL

What are the 5Es?
The 5Es represent five key interrelated processes that provide the kind of learning experiences for learners to experience the curriculum or planned learning episodes: Engage, Explore, Explain, Extend (or Elaborate), and **Evaluate**.

ENGAGE: The purpose of the ENGAGEMENT dimension is to help students to be ready intellectually, socially, emotionally etc. for the session. Attention is given to the students' interests and to getting them personally involved in the lesson, while pre-assessing prior understandings, attitudes and/or skills. During the experience, students first encounter and identify the instructional task and their roles and responsibilities. During the ENGAGEMENT activity, students make connections between past and present learning experiences, setting the organizational groundwork for upcoming activities. The engagement activity may be used to (a) help student unearth prior knowledge (b) arouse their curiosity (c) encourage students to ask questions as a sign that they have wonderments or are puzzled.

EXPLORE: The purpose of the EXPLORATION dimension is to get students involved in solving a real problem that is based on a selected context. EXPLORATION provides them with a chance to build their own understanding of the phenomenon being investigated and the attitude and skills involved for arriving at a workable solution. In exploring the students have the opportunity to get directly involved with the phenomenon and materials. As they work together in learning teams or independently, the need to share and communicate becomes necessary from the experiences. The teacher functions as a facilitator, providing materials, guarding against obstacles to learning and guiding the students to operate based on agreements. The students become inquirers and co-owners of the learning process. In exploring, they also ask questions, formulate hypothesis, search for answers or information/ data, reflect with others, test their own predictions and draw conclusions.

EXPLAIN: The purpose of the EXPLANATORY dimension is to provide students with an opportunity to assess their thinking and to use intellectual standards as critical thinkers to communicate their perspectives and/or the meaning of the experiences. They rely on communication tools and their skills as Language users to: (a) organize their thoughts so that they are clear, relevant, significant, fair, accurate etc. (b) validate or affirm others (c) self-motivate. Reflection also occurs during the process and may cause students to adjust their perspective or justify their claims and summarise the lessons being learned. Providing explanations contributes to vocabulary building and self-corrective actions to deal with misconceptions that they become aware of from feedback of their peers and/or their facilitator.

EXTEND: The purpose of this dimension is to allow students to use their new knowledge and continue to explore its significance and implications. Students work independently or with others to expand on the concepts and principles they have learned, make connections to other related concepts and principles within and/or across disciplines, and apply their understandings in new ways to unfamiliar situations.

EVALUATE: The purpose of the EVALUATION dimension is for both students and facilitator to determine progress being made or the extent to which learning has taken place based on the stated objectives or emergent objectives. EVALUATION is treated primarily as an on-going diagnostic and developmental process that allows the learner to become aware of gaps to be treated and progress made from their efforts to acquire the competencies that were the focus of the session. Examples of competencies include understanding of concepts, principles and processes and demonstrating various skills. Evaluation and assessment can occur at different points during the learning episode. Some of the tools that assist in this diagnostic and formative process include rubrics, teacher observation log, self-inventories, peer critique, student interviews, reflective presentations, displays/expositions,

portfolios, performances, project and problem-based learning products. Analysis of reflections, video recordings are useful in helping students to determine the depth of their thinking and understanding and the objectives they have or have not achieved.

Who developed the 5E model?

The Biological Science Curriculum Study (BSCS), a team led by Principal Investigator Roger Bybee, developed the instructional model for constructivism, called the “Five Es”.

The Link between the 5E model and Types of Learning Activities

The five (5) types of Learning Activities purported by Yelon (1996) can be integrated with the 5E’s so as to enrich the teaching and learning process. He noted that every instructional plan should include the following learning activities

1. Motivation Activities: Intended to help learners to be ready for the session
2. Orientation Activities: Inform students of their roles and responsibilities based the purpose or objectives of a learning episode.
3. Information Activities: Allow students to manipulate current knowledge, access/retrieve and generate new ideas
4. Application Activities: Allow for the use of knowledge and skills in novel situations
5. Evaluation Activities: Allow for reflection, corrective actions and sourcing of evidence to confirm/refute claims about learning.

These activities can be planned to serve one of the purposes of each dimension of the 5E model. For example, ENGAGEMENT may be comprised a Motivation Activity and an Orientation Activity. EXPLORATION and EXPLANATION require an Information Activity, while EXTEND requires an Application Activity. EVALUATION requires the kind of activity that will contribute to the collection of data for assessing and arriving at a conclusion about performance based on stated or expected purpose for which learning is being facilitated.

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LESSON PLAN

GRADE: 8
SUBJECT: Resource and Technology
MODULE: Business Basics
TOPIC: Types of Production
DURATION: 60 minutes
BIG IDEA: Production is the process of making goods and services available
Satisfy the needs and wants of consumers.

Purpose of the lesson

This lesson enables students to have an understanding of what is production and the importance of each type of production in the creation of goods and services.

Objectives

By the end of the lesson students should be able to:

1. Define terms such as: production: primary/extractive, secondary/construction, tertiary/services.
2. Distinguish among the three major types of production.
3. Discuss the importance of each type of production to the Jamaican economy.

Strand: Innovation and Creativity

Attainment Target 1:

Students will:

- Explore different approaches to the production of goods and services
- Understand that people create solutions to satisfy a particular need.

Strand: Apply Solutions

Attainment Target 3:

Students will:

- Explain the process or steps involved in converting raw materials to finished goods.
- Differentiate between types and levels of production

SCIENCE STANDARDS:

Students are expected to:

Understand the nature of materials: sort materials into groups in a variety of ways and explain why some materials are suited to specific purposes.

MATHEMATICS STANDARDS:

Students are expected to:

Make and explore geometric shapes and solids and apply knowledge of their properties to problem solving.

TECHNOLOGY STANDARDS:

T and T standards 1 and 5

Students will develop an understanding of the attributes of design and the abilities to assess the impact of products and systems.

Content Outline:

Production is the process of converting raw materials or semi-finished products into finished products or services, used to satisfy wants and needs of consumers.

There are three (3) main types of production, namely; Primary/Extractive, secondary/Manufacturing, Teritiary/Services.

Primary production involves the extraction of raw materials from natural resources. Eg. Agriculture, mining. Secondary production involves the use of raw materials being converted to finished products. Eg. construction, manufacturing. Tertiary production involves services which facilitate the buying and selling of goods. Eg. banking, transporting, advertising.

Key Skills:

- Research for information, make judgement
- Observe and interpret pictures/videos

Resource Materials:
Textbook, video clips (multimedia projector), pictures from magazines illustrating the different types of production.

Tools/materials/equipment
Pens, pencils, notebook,

Classroom Safety
Students will:
Demonstrate courtesy in regards to the ideas expressed by classmates and will show appreciation for the efforts of others.
Activity Highlights

TEACHING PROCEDURE

ENGAGE

Students will be stimulated by being shown a video clip (https://youtu.be/8KDxAWfMwf4) depicting concepts relating to the three different types of production. A stimulating discussion will be derived from this so that the classification of production can be ascertained.

EXPLORE

In groups, students will identify the stages the product went through during the productive process. Students will then conduct research online/textbook to define the various types of production.

EXPLAIN

Students will present their definitions and classification to classmates using various media (flip charts, cartridge paper, video etc.) to enhance oral presentation and public speaking skills.

EXTENSION

Students will conduct research to identify industries that produce goods and services for the Jamaican economy. Students will outline the benefits to the Jamaican economy.

EVALUATE

Students will identify a product, using specially designed rubric to provide answer to the following questions:

- Types of production
- Classification of production
- Usage in enhancing efficiency and productivity
- State the significance/ purpose of product to the Jamaican economy.

EXPLAIN

Students will present their definitions and classification to classmates using various media (flip charts, cartridge paper, video etc.) to enhance oral presentation and public speaking skills.

POST-LESSON REFLECTION

Project-based learning (PBL) demands excellent assessment practices to ensure that all learners are supported in the learning process. With good assessment practices, PBL can create a culture of excellence for all students and ensure deeper learning for all. Assessment should be integrated seamlessly into the projects, measuring students' understanding from the beginning to the end of the project.

Assessing Learning Outcomes

From Grades 4-9 student achievement should be one of continuous assessment and based on the learning outcomes selected for each project to ensure that students acquire the necessary knowledge, skills and attitudes. In other words, the assessment should be based on what each student can do. No more than ten learning outcomes or 'can' statements should be selected for each project of unit of work.

No more than ten learning outcomes should be selected of a project or unit of work. This will help to keep the assessment and recording process to a manageable size for the teacher.

Assessment should be developed on a four-point scale;

I	Can do with a lot of help
II	Can do with some help
III	Can do with very little help
IV	Can do independently

Assessment conducted in this manner will provide a picture of exactly what each student can and cannot do or how much assistance will be needed to develop the competencies.

This form of assessment is more informative and useful than those which grade students on a scale of 1-10 at the end of a project. Teachers and individual students should discuss the assessments and agree on the next learning steps. A record of assessments should be kept in a mark book or file set out as shown on the next page.

Supporting knowledge and understanding can be assessed in the traditional way, that is by objective tests such as multiple choice.

Assessing the End Product or System

All aspects of the Design Process are to be assessed. Teachers should observe what students do in an effort to create a solution to a need or problem. This would involve the activities such as collaborating with each other, conducting research, planning, designing and making the final product or system. Evidence of students' work throughout the project or unit work should be filed.

A sample rubric is presented below to assess the end product, article or system made for a project.

STUDENTS' NAMES	LEARNING OUTCOMES				
	Performs safe and healthy practices related to gardening functions	Can select appropriate materials and tools to create an ornamental garden	Can perform mathematical functions to design and create an ornamental garden	Perform procedures and processes for preparing an ornamental garden	Perform maintenance activities in ornamental garden
John Allen					
Rupert Bonnett					
Nayla Burnett					

KEY TO SCALE		
I	Can do with a lot of help	30-49
II	Can do with some help	50-64
III	Can do with very little help	65-79
IV	Can do independently	80-100

SAMPLE RUBRIC FOR ASSESSING END PRODUCT FOR A PROJECT

Descriptors	No progress (0)	Introductory (1)	Emergent (2)	Proficient (3)	Proficient (3)
Plan	Student's work demonstrates no understanding or progress towards achievement of the outcome.	Student does not understand problem and cannot identify data or create plan	Student understands problem but cannot identify necessary data or create plan to solve	Student understands problem but can only identify some necessary data or create a slightly inaccurate plan to	Student understands problem, identifies necessary data for solving and create an accurate plan to solve problem.
Research	Student's work demonstrates no understanding or progress towards the achievement of the outcome	Student used only the reference provided by teacher	Student used at least one credible additional sources of data collectione	Student used at least two credible additional sources of data collection	Student used at least three credible additional sources of data collection
Process	Student's work demonstrates no understanding or progress towards achievement of the outcome.	Student's work demonstrates no sequencing to achieve expected outcome	Student's work demonstrates limited sequencing to achieve expected outcome	Student's work demonstrates adequate sequencing to achieve expected outcome	Student's work demonstrates logical sequencing to achieve expected outcome
Application	Student's work demonstrates no understanding or progress towards achievement of the outcome.	Student demonstrates limited mastery of the relevant skills	Student demonstrates mastery of 50% of the relevant skills	Student demonstrates mastery of 70% of the relevant skills	Student demonstrates mastery of all the relevant skills necessary
Safety	Student work demonstrates no understanding or progress towards achievement of the outcome.	Student does not adhere to appropriate safety guidelines	Student adheres to a few of the appropriate safety guidelines.	Student adheres to most of the appropriate and relevant safety guidelines.	Student adheres to all appropriate and relevant safety guidelines.
Product/ service	Student work demonstrates no understanding or progress towards achievement of the outcome.	Product/service is complete but cannot satisfy its intended purpose	Product/service can satisfy few of its intended purpose	Product/service can satisfy most of its intended purpose	Product/service can satisfy its intended purpose

SAMPLE RUBRIC FOR ASSESSING END PRODUCT FOR A PROJECT

Descriptors	No progress (0)	Introductory (1)	Emergent (2)	Proficient (3)	Proficient (3)
Explanation/ presentation	Student demonstrates no understanding or progress towards achievement of the outcome.	Student can explain only limited aspects of the work logically	Student can explain the solution but cannot explain why the methods work.	Student can explain how to solve problem and why the chosen methods work; but did not provide alternate solution.	Student can explain thoroughly how to solve the problem and provided alternate solutions to the chosen methods.
Collaboration	Student's work demonstrates no understanding or progress towards the achievement of the outcome	Students worked independently	Students worked together on few occasions.	Students worked well together most of the times with most members making valuable contribution.	Students worked well together to achieve objectives with each member making valuable contribution.
Design	Student work demonstrates no understanding or progress towards achievement of the outcome.	Student has made an incomplete attempt to create a design, working-drawing, plan or chart of solution	Student creates design working-drawing, plan or chart that is not logical to the solution	Student creates a reasonable design working-drawing, plan or chart for the solution	Student creates a logical diagram, working-drawing, plan or chart to help solve problem.

MAINTAINING A STUDENT'S LOG

Resource and Technology must be delivered as a student centred subject. Therefore any assessment of students' performance should include their own assessment of work and progress. The student's log is one way to secure this kind of self-assessment. The next page carriers a recommended format for the student's log. Students are encouraged to note what they learnt and their overall experiences when they complete a topic and problem. They should provide their frank and honest assessment. Individual sheets of the student's log can be produced and given to students. They, in turn, should secure these in a file folder to be kept for inspection and assessment by the teacher.

Information to Students

This log is for your personal use. You are to write down what you have learnt and how you feel about each topic covered. A topic may cover more than one class. Therefore, your log should be written up at the end of the last class on each topic.

FORMAT OF A STUDENT'S LOG

PROJECT: _____

PROBLEM: _____

SKILLS	KNOWLEDGE	ATTITUDES
PERSONAL COMMENT (Verbal & or Graphics)		

NAME: _____

GRADE: _____ **DATE:** _____

a) Project-Based Approach

The content associated with each of the modules of Resource and Technology is delivered in a context as a real life problem or need to be met. Usually a scenario depicting a real life problem is developed to introduce each project. For example, in introducing the Grade 4 Agriculture project 'Create an Ornamental Garden' students could be presented with a real life situation in their school environment of an area which has become a haven for garbage presenting an unattractive and unhygienic area. Students brain-storm and research to identify and develop solutions to the named problem and then plan, design and create high-quality, authentic products and presentations using 21st century skills of critical thinking, collaboration, communication and Information Technology. Projects should be carefully planned, managed, and assessed to help students learn the content relevant to each discipline. The following features should guide the learning process utilizing project based learning:

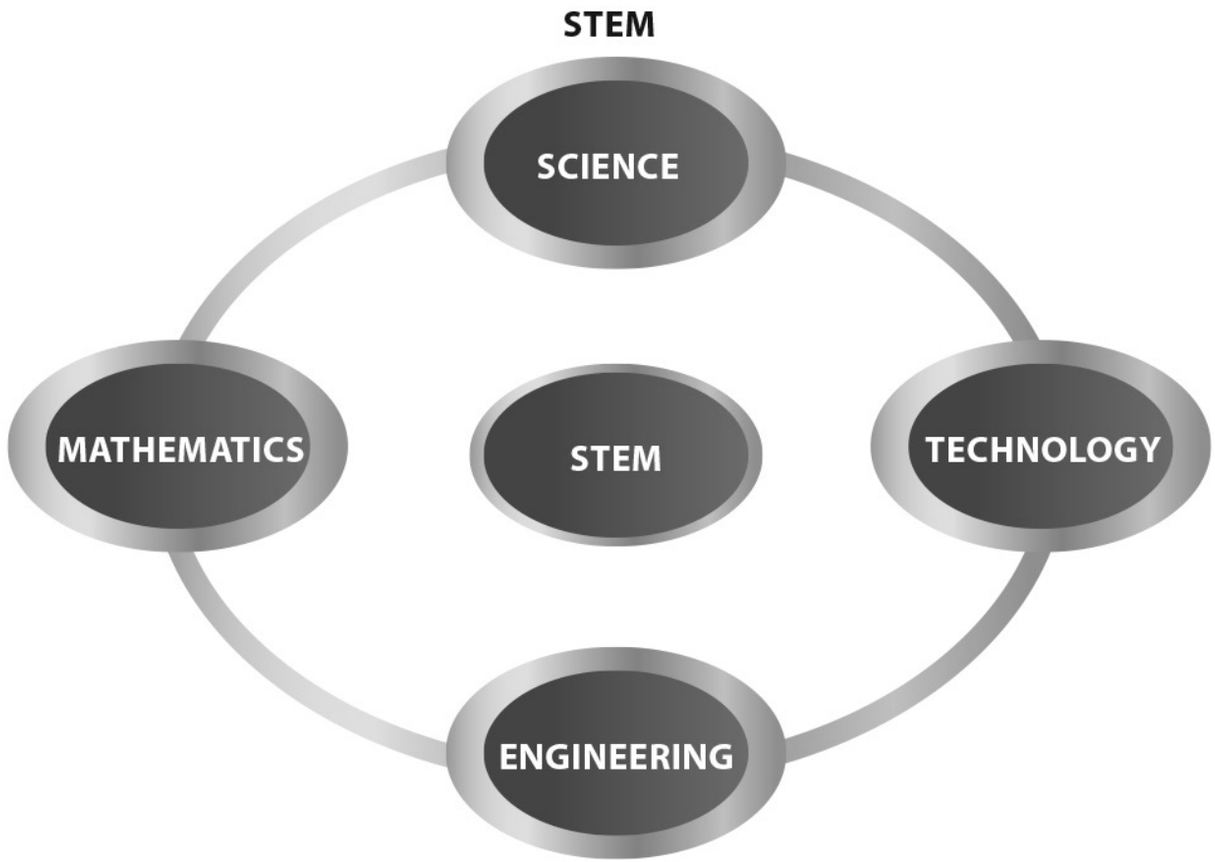
- problem-based – students develop imaginative solutions to presented or observed problems
- Reality-based – students work in real-life/world learning environments
- decision-making – students have choices about what they learn, make choices within their learning environment and set personal goals
- design driven – students develop an awareness of design principles and elements for creating their own work and interpreting the work of others
- aesthetically aware – students learn through their senses and learn to control elements/factors appropriate to the project
- technology-based – students understand the relationship between materials, systems and processes

Teachers should ensure that the problems and solutions presented are in keeping with the content/knowledge, skills and attitudes illustrated in the Teachers' Guides.

b) Integration of STEM

The integration of **STEM/STEAM** principles is utilized in the delivery of the Resource and Technology programmes. STEM/STEAM education is an approach to teaching and learning that integrates the content and skills of Science, Technology, Engineering and Mathematics. Content is delivered through action-based activities that involve the use of skills, processes, tools/equipment and materials to design and develop solutions to authentic tasks.

Designing is an important aspect of the creation of solution. Hence the emphasis on developing design layout using the elements and principles of Design Arts



EXPLANATION OF THE ACRONYM 'STEAM'

'S' – Science concepts specific to the topic to be presented is integrated in the lesson

'T' - Technology combined use of skills, attitude, knowledge and resources to create things that people need and want to make life easier and better

'E' – Engineering Design Process

'A' – the use of the **aesthetics** to create aesthetically pleasing products

'M'- Mathematical concepts specific to the lesson being taught is integrated in the lesson

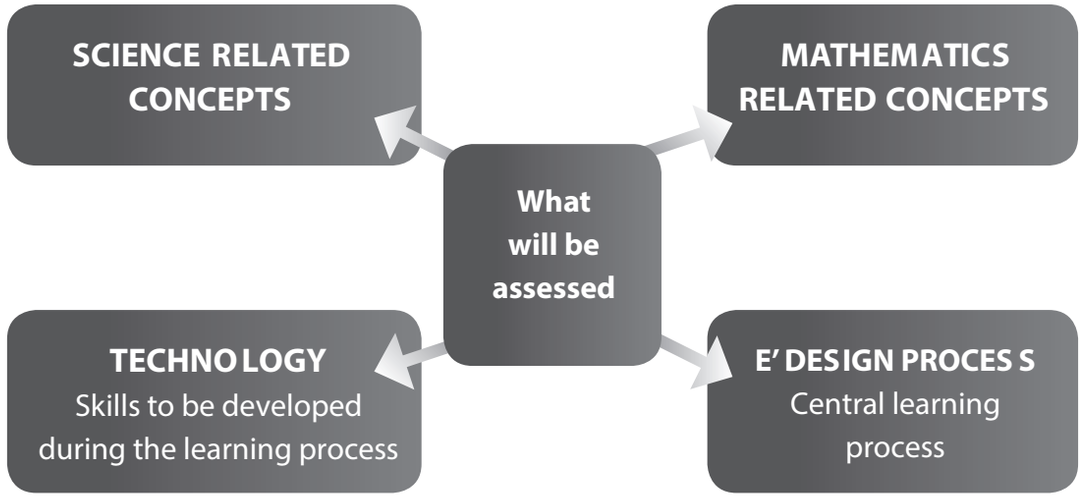


Diagram illustrating STEM/STEAM components integrated in a lesson

To ensure that the integration of STEM principles in a unit of work or project, the teacher is encouraged to design a 'STEM Map'as illustrated above. This is further illustrated and explained in the Teachers' Guide for all the projects or units of works. This model has been developed to ensure that the Science and mathematical related concepts are learnt, the skills to be utilized in the design and creation of the solution are developed and the approaches to problem solving are taught and learnt.

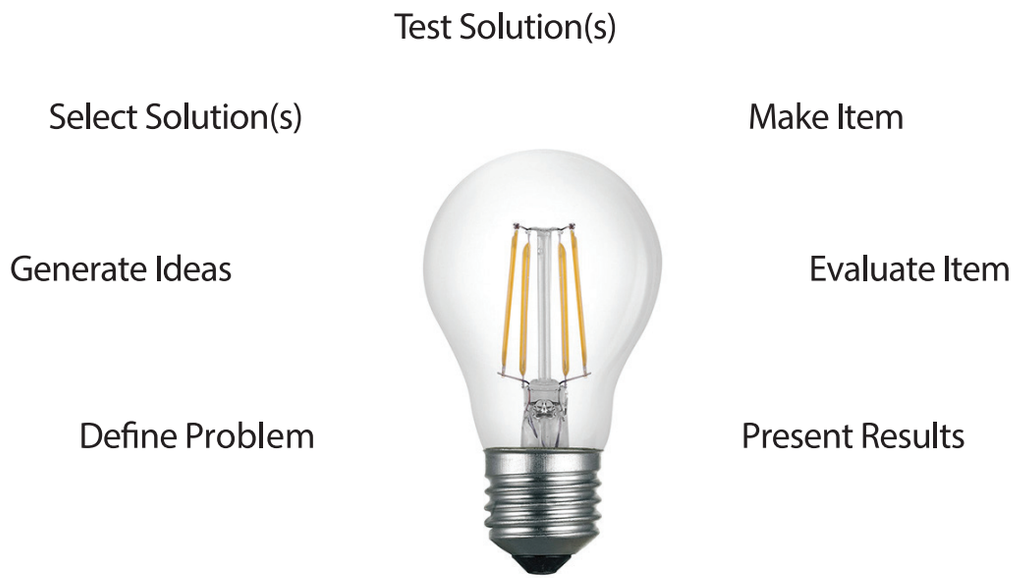
Attributes of a STEM Learning Environment

- Utilize the engineering design process ('E')
- Engage in the scientific process
- Apply mathematical practices
- Explore appropriate uses of technology
- Support collaboration and communication
- Encourages risk taking
- Align STEM lessons with real life context

c) 'E' Engineering Design Process

The Design Process is a systematic problem solving strategy which is used in the delivery of Resource and Technology programme to solve practical problems. This process is similar to other problem solving processes but this particular process was adopted because of its design feature which ensures that student will use materials, tools and equipment in problem solving

The Design Process as illustrated in the diagram below comprises seven (7) stages or aims. Students may begin with Stage 1 – define or identify the problem and continue in order to Stage seven (7)



STAGES IN THE DESIGN PROCESS

Other approaches are also valid. Students may start by:

- Evaluating an existing product/system e.g. assessing the nutritional value of a favourite snack or rules that are in place to en sure safe and hygienic learning environments and continue by
- Suggesting ways to improve the product or system
- Planning to make a new version
- Making it and
- Evaluating it against the original
- Present results (orally or written)

For younger students, the teacher might produce a partly completed product e.g. a partly completed bird house. Students could:

- Discuss how it can be developed/completed
- Plan ways of improving it
- Make their own version
- Evaluate the product
- Present results (orally or written)

It should be noted that if students are to develop problem solving skills, focus must be placed on all stages of the design process. The majority of time must not be spent of making the products/systems but equally on the knowledge, skill and attitude so that students acquire the necessary competencies related to the task or project. Given that the Design Process is seen as the central learning process for all students, the role of the teacher is to guide pupils through the process.

AIMS OF THE DESIGN PROCESS

There are seven major aims of the Design Process

Stage 1/Aim 1 Define problem	To help students identify needs or problems by observing or thinking about a range of context which affect their lives.
Stage 2/Aim 2 Generate Ideas	This stage begins with brainstorming idea, which combined with information gathered from research should arrive at possible solutions. Several possibilities can be sketched on paper. Consideration should be given to a range of resources, including those in the natural environment.
Stage 3/Aim 3 Select solution(s)	To encourage students to consider a range of resources, including those in their Natural environment, to produce alternative design proposal and develop ideas to solve a problem.
Stage 4/Aim 4 Test solution(s)	To assist students to plan their work so that it is completed on time, meet specific criteria and to set deadlines for specific tasks.
Stage 5/Aim 5 Make item	To enable students to produce a product or design a system which solves the original need.

Stage 6/Aim 6 **Evaluate item**	To assist students to evaluate the success of their solutions and the process they used to create them.
Stage 7/Aim 7 **Present results**	This is a written, oral and/or visual presentation which should provide evidence of the students' work in analyzing, planning, and designing, carrying out the practical work, evaluating and communication. The solution should be displayed at this point.