



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

NATIONAL STANDARDS CURRICULUM

RESOURCE AND TECHNOLOGY

GRADES 9 APSE I



NATIONAL STANDARDS CURRICULUM GUIDE

GRADE 9

RESOURCE & TECHNOLOGY

Business Basics • Family & Consumer Management • Agricultural Science • Engineering & Mechanisms

A C K N O W L E D G E M E N T

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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- Mrs. Janice Latty-Morrison – Former Assistant Chief Education Officer, Technical & Vocational Unit, who completed the process.
- Mr. Anthony Gray – Assistant Chief Education Officer, Technical & Vocational Unit
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INDUSTRIAL EDUCATION	BUSINESS EDUCATION	HOME ECONOMICS EDUCATION	AGRICULTURAL SCIENCE EDUCATION
Mr. Ray Taylor, Senior Education Officer, Industrial Education	Mr. Conrad Valentine, Senior Education Officer, Business Education	Mrs. Vivene Jones-Robinson, Senior Education Officer, Home Economics	Mr. Ruel Service, Former Senior Education Officer, Agricultural Science Education
Mr. Everett Riley, Education Officer, Industrial Education	Mrs. Winsome Mills-Neil, Education Officer, Business Education	Mrs. Shereen Davy-Stubbs, Education Officer, Home Economics Education	
Mr. Glenroy Hemmings (Late), Education Officer, Industrial Education		Mrs. Maxine Hills, Education Officer, Home Economics Education	
Mr. Oneil Lalor, Education Officer, Industrial Education		Ms. Judith Moore, Education Officer, Home Economics Education	
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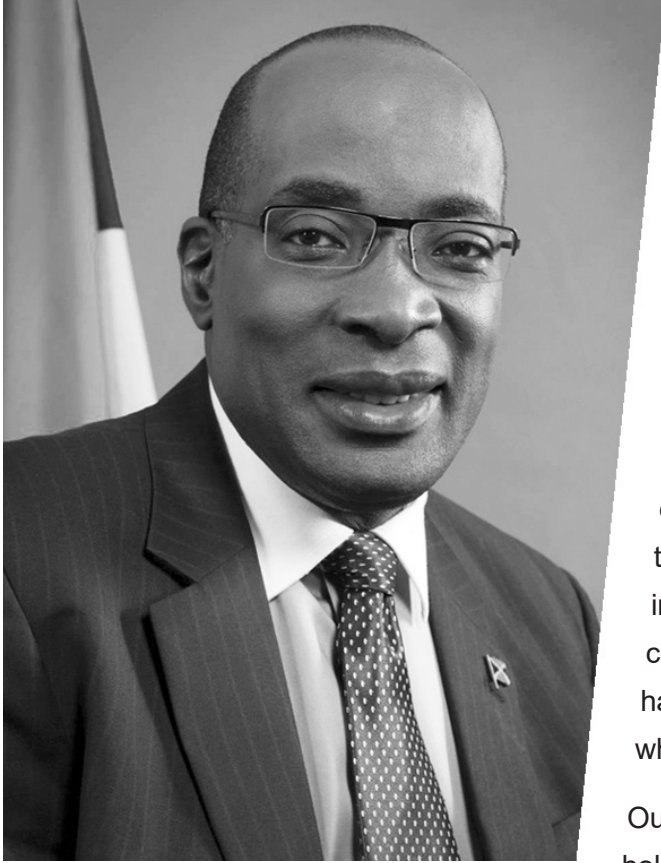
- Principals/ school administrators, lecturers, teachers and other resources persons who participated in the writing process
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Education has always been pivotal to societal and economic development. It is for this reason that Jamaica remains unshaken 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



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



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



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.

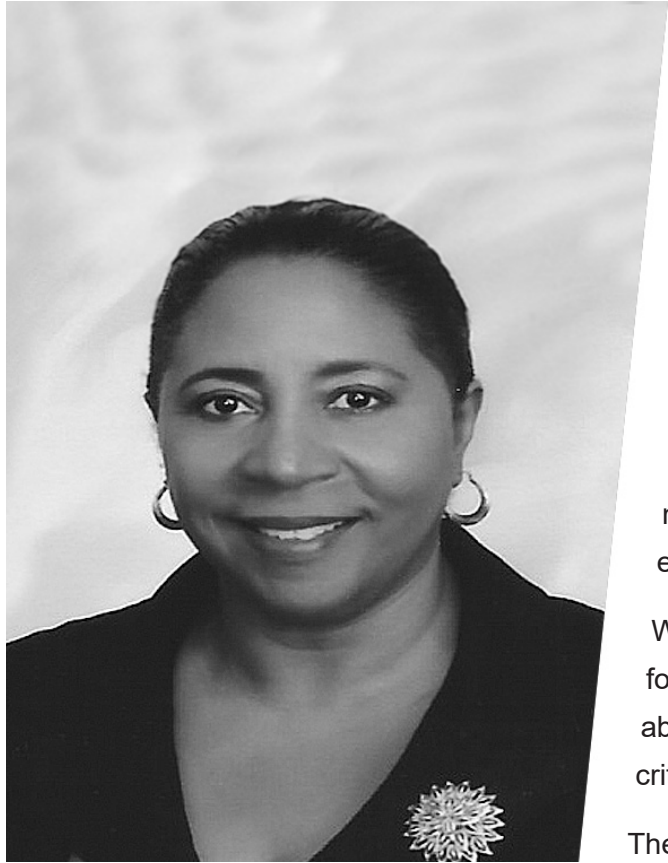
Today, we are indeed proud that, the curriculum development teams have succeeded in crafting a curriculum which has met these expectations. Under the National Standards Curriculum (NSC) focus will be given to project-based and problem-solving learning, with an integration of Science, Technology, Engineering 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



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



The National Standards Curriculum (NSC) rests on the belief that all learners are endowed with the capabilities, gifts and talents to fulfil their divine purpose. These attributes are to be further enhanced or improved in a nurturing, inspiring and inclusive environment; one that caters to the whole person (soul, spirit and body - spiritual, emotional, social, physical and mental). As learners assume their roles and responsibilities individually and as communities of learning in such an environment, they become critical-reflexive thinkers, creative problem solvers, effective communicators and natural collaborators.

A curriculum design of this nature, calls for transformative change at the societal level (Elkind, 2004)¹ and not just at the school and classroom levels. This is a call for all stakeholders, as users of the curriculum, to adopt a critical -reflective and reflexive stance and join learners in the quest for meaning, purpose and stability as they help to shape the world. By integrating principles from various disciplines and their related methodologies, learners who interact with the curriculum are provided with enriching experiences, opportunities for creative expressions and authentic exploration of problems from a classical standpoint as well as in the context of workplace learning. This is due to the fact that the NSC recognizes the importance of each discipline in the problem solving process and in development.

Assessment as an element of the curriculum becomes primarily a learning process for charting progress through self-corrective measures that are informed by feedback from peers and teacher-facilitator. By providing assessment criteria statements in the curriculum, teachers are encouraged to facilitate learners functioning as self and peer assessors. This approach should see the learner developing self-direction with

the support of mentors and coaches and forming an intrinsic desire to succeed. These attributes prepare them to face high stakes assessment as problems to be confronted with courage, a sense of readiness, insight and creative prowess.

These features of the NSC have the potential to influence learners' profile as Jamaicans who are gratified by an identity of cultural excellence that embodies moral obligations, intellectual rigour, innovativeness, environmental stewardship and productivity. The curriculum echoes the sentiments of our National Anthem, National Song and Pledge and serves as rich and credible source of the values and virtues that are woven together to convey the Jamaican identity. I wish for our school administrators, teachers, students and other stakeholders much success as they work with the document.

Dr Clover Hamilton Flowers

Assistant Chief Education Officer, Core Curriculum Unit, Ministry of Education, Youth & Information

¹ Elkind, D. (2004). The problem with constructivism. *The Educational Forum*, 68(4), 306–12.



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 during the 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	<p>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.</p> <p>Formal assessment may be conducted with the aid of instruments (e.g. via written 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.</p>
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.

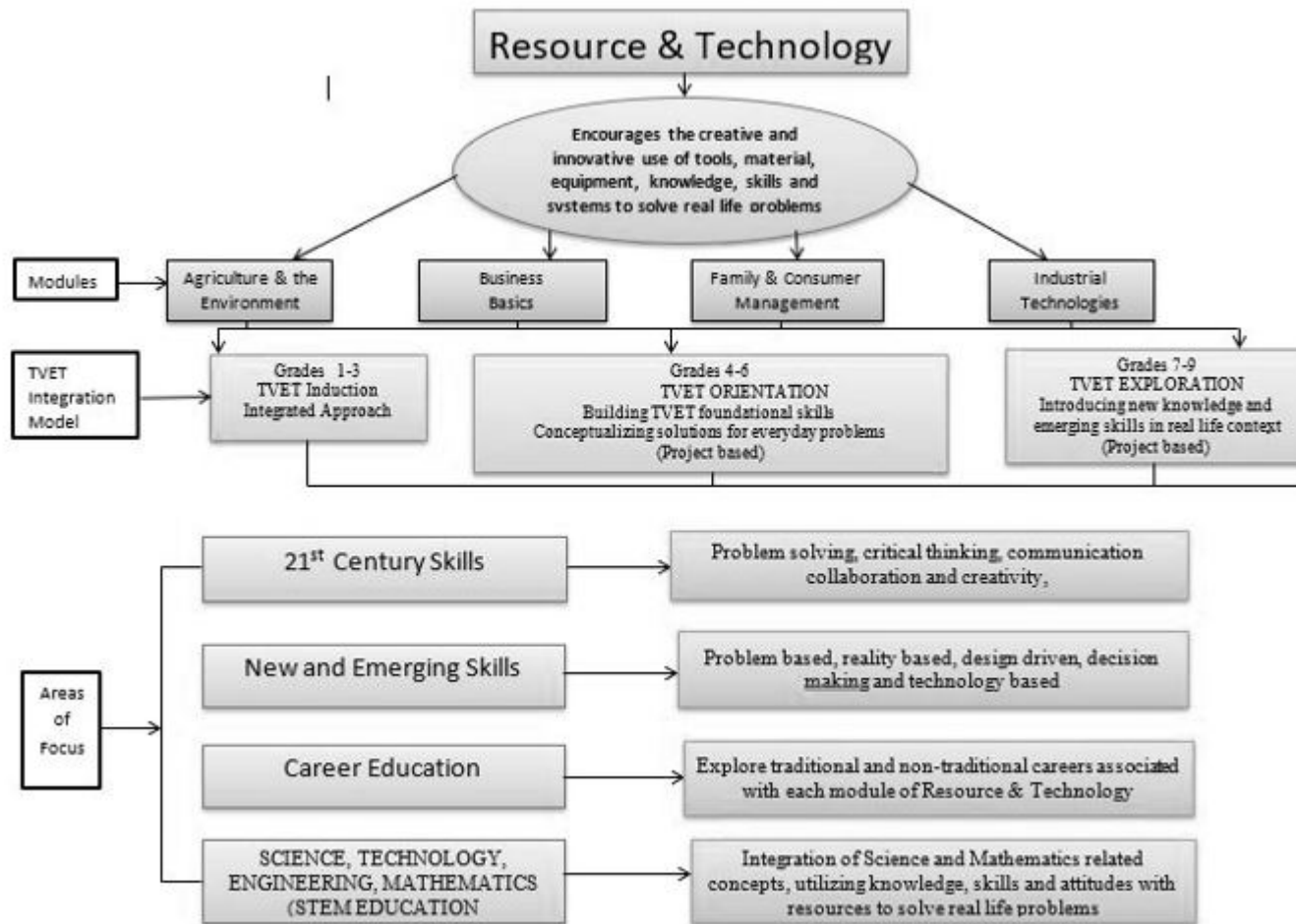
The Resource and Technology curriculum has been revised at Grades 7-9 and succeeds the previous curriculum which was first introduced in the education system in 1989 with a second review conducted in 1999. The revised Resource and Technology programme has been developed as a working document at the primary 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 strands, attainment targets. Teachers may design or modify the projects to suits the needs of the local environment.

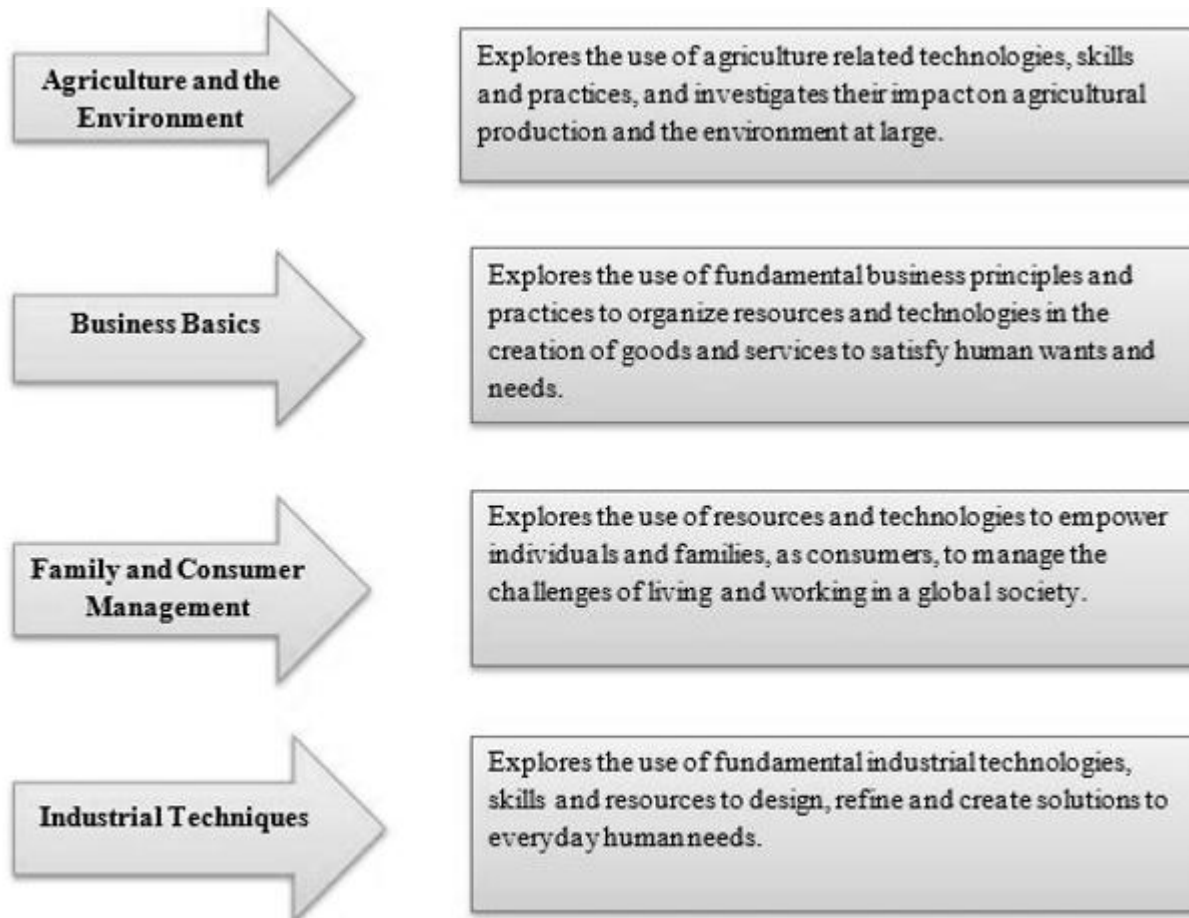
The project-based learning approach has been adopted to introduce content, skills and attitudes and is the instructional approach built upon authentic learning activities that engage student's interest and motivation. At all grades levels the content is presented using real life contexts resulting in 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 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.



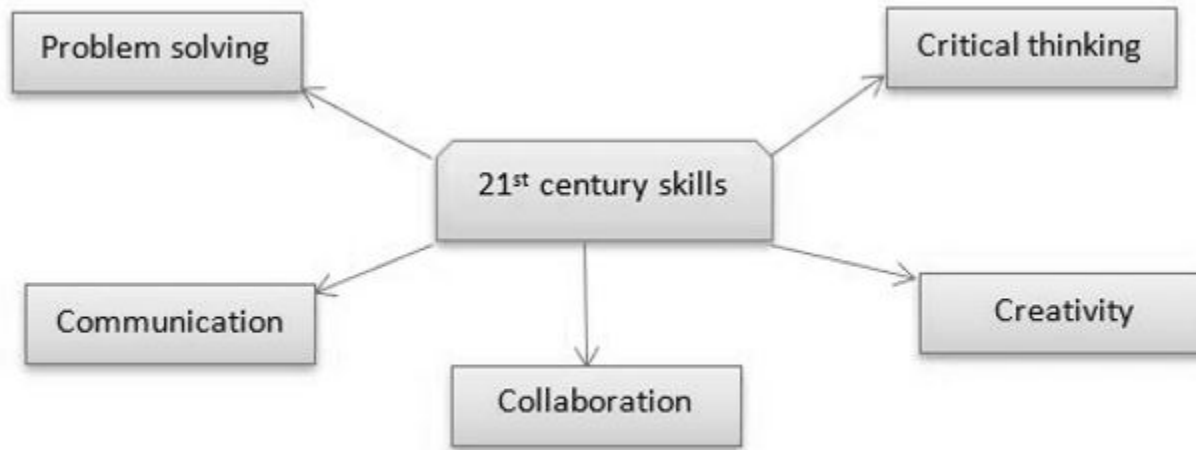
Module Synopses

P H I L O S O P H I C A L S T A T E M E N T

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



NSC

RESOURCE AND TECHNOLOGY

GRADE 9 PROJECTS:
AGRICULTURE AND THE ENVIRONMENT



NSC

AGRICULTURE AND THE ENVIRONMENT PROJECT 9.1

GROW CROPS IN CONTROLLED OR OPEN FIELD ENVIRONMENTS USING INTEGRATED PEST MANAGEMENT PRACTICES

Aim of Project

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 focused career options

The scope of this overview is based on the target to grow crops in controlled or open field environments using Integrated Pest Management Practices.

COMPLETE OVERVIEW OF SUBJECT CONTENT

PROJECT 9.1

RESOURCES AND TECHNOLOGY

TERM 1

Grow crops in controlled or open field environments using Integrated Pest Management Practices.

TERMS 2& 3

Mini-enterprise to reflect real life decision making, job techniques, careers and professional development.

There are four (4) strands within Resource & Technology

**STRANDS 1:****Creativity & Innovation**

Students will be able to apply creativity and innovation in the solution of problems

STRANDS 2:**Exploring Methods and Procedures**

Students will be able to Explore Methods & Procedures in solving problems.

STRANDS 3:**Applying Solutions**

Students will be able to apply appropriate strategies in finding solutions to identified needs.

STRANDS 4:**Career Pathways**

Students will develop awareness of a range of career pathways.

STRANDS 1

Explore a range of problem solving situations and develop ideas for solutions utilizing new technologies.

STRANDS 2

Use the design process in executing solutions for an identified problem.

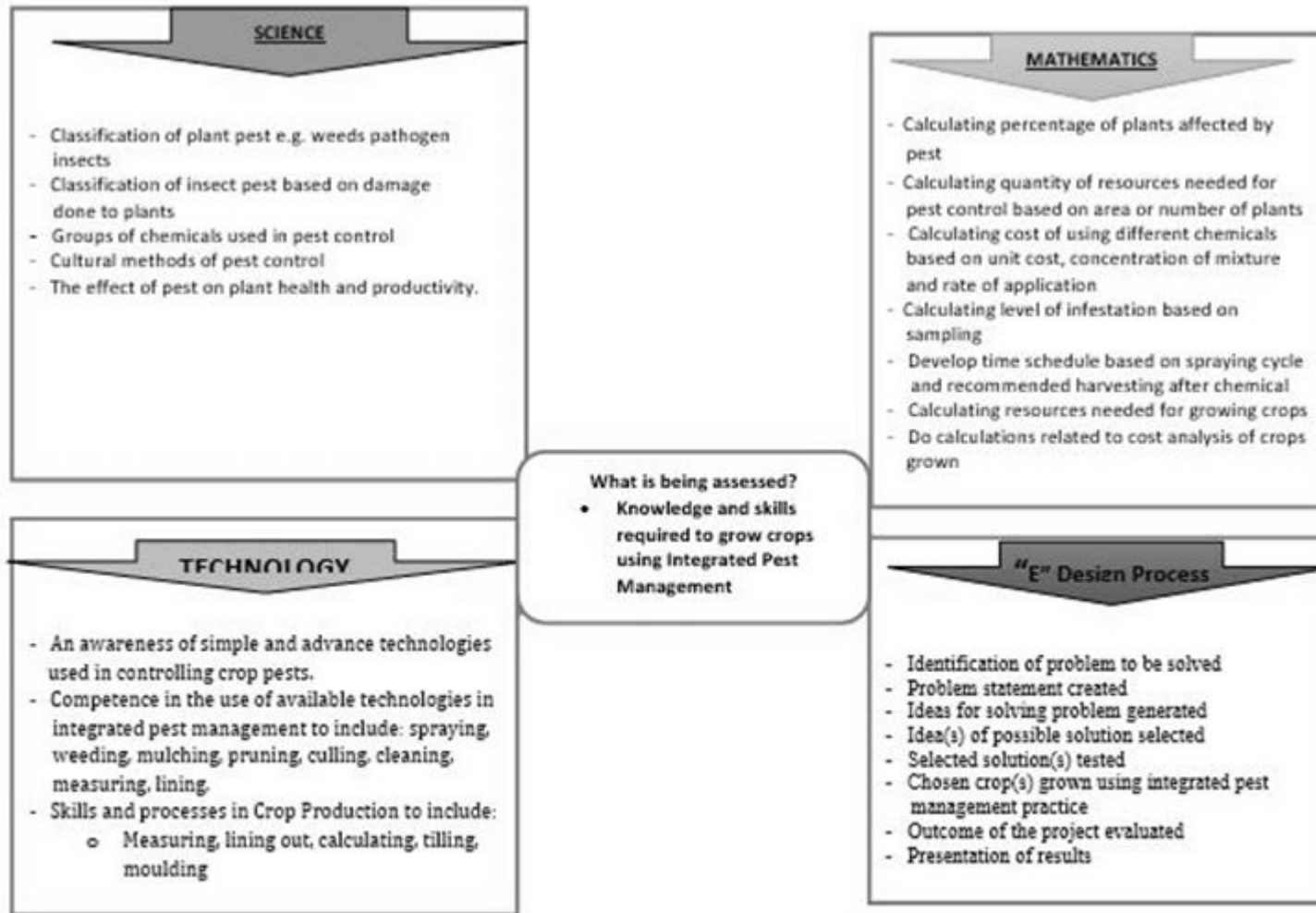
STRANDS 3

Operate tools and equipment with increasing competency and appropriate safety and hygiene consideration.

STRANDS 4

Build skills relevant to the world of work and the areas of occupational interest.





Range of Content**Key concepts, skills and knowledge students will learn in this Project**

Students will develop key concepts and skills for growing crops using integrated pest management practices by learning to:

- Apply technical approach to the use of integrated pest management to grow crops.
- Use terminologies associated with integrated pest management in a given context
- Select and implement integrated pest management practices for a given situation
- Select and use correct resources with due consideration to the environment
- What is integrated pest management
- Different methods used in integrated pest management
- Benefits of using integrated pest management
- Conditions to consider when using integrated pest management
- Use of chemicals in the environment
- Advantages and disadvantages of using agriculture chemicals

About the Project

In this project students will learn about the development, implementation and use of integrated pest management programme in growing crops in controlled or open-field environments (or both).

Guidance for the Teacher

- Research local, national, regional, and international applications of controlled environment agriculture
- Apply Agricultural Business principles and practices to this project
- Establish student groups that facilitate organizational structure and scheduling of duties
- Procure suitable and adequate resource in a timely manner
- Where possible, ensure sufficient scale of the projects that allow for reasonable marketing potential
- Organize market for the output of the mini-enterprises
- Avoid projects holding over through major holidays as a precaution against praedial larceny
- Resources should include those for labelling of individual projects
- 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
- Research!! Research!! Research!!



NSC

AGRICULTURE AND THE ENVIRONMENT PROJECT

GRADE 9: TERM 1

Check that students can:

- Aware that agriculture is a serious business
- Aware of pest and their effects on Agriculture produce
- Aware of different methods of pest control
- Aware of the need to carry out pest control management

PROJECT 9.1: Growing of Crops In Controlled or Open Field Environments Using Integrated Pest Management Practices

ATTAINMENT TARGET(S)

- 1 Students will be able to apply Creativity & Innovations in applying design principles to the use of available resources to grown crops with emphasis on integrated pest management.
- 2 Students will be able to apply Explore Methods & Procedures in developing a garden, and determine from a range of options the design and the plans to grow crops with emphasis on integrated pest management.
- 3 Students will be able to Apply Solutions in grow crops with emphasis on integrated pest management through the application of the design principles and basic crop growing practices.
- 4 Students will be able to demonstrate awareness of a range of Career Pathways related to crop production and pest management, which include direct agriculture-based careers/occupations, as well as, careers/occupations associated with the supply of goods and services to produce crops and manage crop-related pests.

OBJECTIVES

Create and apply design principles to grow crops using integrated pest management practices

Explore methods and procedures for effective crop production using integrated pest management.

Apply design solutions and principles to the use of integrated pest management to grow crops.

Develop an awareness of career pathways related to the growing of crops in open and controlled environment using integrated pest management practices.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

The ability to:

Introduction to the Project

- Discuss advantages/disadvantages of growing crop in open field environment
- Discuss advantages/disadvantages of growing crop in controlled environment
- Identify and make a list of resources needed to grow given crops in open field environment
- Identify and make a list of resources needed to grow given crops in controlled environment
 - Identify types of records to be kept
 - Budget
 - Inventory
 - Income & Expenditure
 - Profit & Loss
 - Crop Rotation
 - Crop Protection (treatment)
 - Production
 - Research crop pest management measures and develop strategies suitable for IPM, and make presentation to class
- Outline characteristics of common pests
- Demonstrate knowledge of the life cycle pests
- Discuss stages of infestation of crops

- Measure dimensions of cropping unit
- Calculate area of cropping unit
- Conduct research
- Present research findings
- Keep records accurately
- Identify pest damage to crop

- Advantages/disadvantages of growing crop in open field/controlled environment clearly explained
- Resources needed to grow given crops in open field/controlled environment listed
- Samples of important records created

Project Design

- Select crops to be grown in open field and/or in controlled environments
- Design forms for daily record keeping
- Research, develop Inventory record form
- Design the proposed growing area
- Create a list of resources required to implement the design growing
- Develop a budget
- Use ICT software application to represent budgets

The ability to:

- Prepare a work plan for project/given tasks
- Select crops to be grown according to design
- Identify appropriate resource options
- Develop production/recordkeeping forms

- Required resources selected from available resources options
- Projected production levels calculated accurately according to enterprise/industry standards
- Projected budget done
- Spread sheets used to generate required records

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

- Develop a schedule for performance of major tasks
- Use spread- sheet to develop and present schedule of tasks
- Create a basic Cash Flow
- Use spread-sheet to develop and present basic Cash Flow
- Develop a safety plan
- Create and display charts depicting safety or hazardous symbols for using pesticides
- Select pest management measures to be implemented based on need and available resources
- Labels designed according to enterprise requirements
- Select the resources to grow crops in open field and/or controlled environment
- Investigate available crops which can be used for insects control
- Select resources needed from available resources to carry out the project
- Develop a projected and actual budget for the crop to be produced
- Use spread sheet to develop records/schedules of:
 - Planting date
 - Crop mortality
 - Inventory
 - Cultural activities
 - Weed and insect pest present in area
 - Pest damage to crops
 - Types of pest management practices performed
 - Beginning and ending of pest management programme
 - Observations made before, during and after integrated pest management programme
 - Projected and actual yields
 - Develop conclusion and recommendation based on findings
- Develop marketing proposals and decide on suitable marketing strategies
- Examine harvesting and packaging procedures in keeping with market requirements.

The ability to:

- Develop basic budgets and cash flow
- Basic analysis/ interpretation of records
- Develop and apply safety plan
- Research/analyze market factors/ requirements for crops to be grown
- Select appropriate treatment for pest

- Identify possible pest based crop damage observed
- Pest management selected and justified
- Schedule of tasks presented on spreadsheet(s)
- Accurate budget projections done for de signed projects
- Basic Cash Flow developed
- Crops to be grown baed on planting environment correctly selected
- Record sheets designed
- Mechanical pest and disease control procedures developed
- Pest management plan for implementation designed
- Integrated pest management programme developed
- Safety charts created
- Marketing plan developed
- Harvesting and packaging procedures developed to suit market requirements

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Project Implementation

- Keep accurate records of
 - ✓ Sowing/planting date
 - ✓ Transplanting
 - ✓ Spraying cycle
 - ✓ Chemical used
 - ✓ Cultural practices
 - ✓ Yield
- Carry out cultural practices in a timely manner
- Manage or eliminate pest and disease outbreak by
 - ✓ cultural practices
 - ✓ biological control
 - ✓ chemical control
 - ✓ physical or mechanical
- Integrated Pest Management (I.P.M.)
 - ✓ Control weed by:
 - Physical or mechanical control
 - Chemical control
 - Integrated Pest Management (I.P.M.)
- Accurately calculate and measure chemicals
- Demonstrate the use of sprayer
- Apply pesticides at the appropriate time and correct manner
- Harvest crops
- Conduct post harvesting procedures
- Demonstrate planting of crops in open or controlled environment
- Demonstrate development of records to capture data involved
- Carry out daily maintenance of crops
 - ✓ Ensure all cultural practices are carried out on crops (irrigation, pruning, staking, tying, mulching)
 - ✓ Select and demonstrate safe use of tools and other resources
 - ✓ Proper sanitation of materials and equipment
 - ✓ Control possible pest transfer to and from cultivated and uncultivated areas
 - ✓ Recognize invasion of weed and insect pest and implement corrective measures based on integrated pest management principles.

The ability to:

- Follow instructions
- Prepare a work plan for project/given tasks
- Keep simple related records
- Report and record pest activities on the crop
- Perform related calculations
- Demonstrate land preparation, crop establishment, crop maintenance, harvesting, packaging, marketing
- Identify insect pests and diseases
- Measure and dispense resources needed
- Maintain field sanitation
- Carry out basic costs
- Analyses of project
- Use equipment safely and effectively according to manufacturer's recommendation
- Mix chemicals
- Spray crop with pesticides
- Label cropping unit
- Calculate required resources
- Organize materials and equipment and use resources
- Reduce pollution
- Prevent pollution
- Work in an environmentally safe manner
- Work as a team
- Crops successfully planted in the selected environment
- Record sheets used to capture data
- Records accurately kept
- Labelling of production unit installed according to enterprise standards
- Cultural practices done according to teacher's instructions
- Appropriate tools selected and safely used
- Tools and equipment are prepared and used according to instructions
- Treatments for pests are prepared and applied according to teacher's and manufacturer's instructions
- Chemical containers and unused chemical properly disposed
- Mechanical pest and disease control procedures carried out and recorded
- Integrated pest management used to eliminate weeds and other pest
- Integrated pest management successfully implemented and documented
- Material and equipment properly sanitized to control pest and disease transfer.
- Crop successfully harvested using appropriate techniques
- Post harvesting activities done according to instructions
- Safety Charts created with correct symbols.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

The ability to

Careers Associated with Project Content

- A. Conduct research in groups to investigate the different career pathways in connection with the growing of crops using integrated pest management principles.
- ✓ Through research, create flow charts/tree of related careers
 - ✓ Identify qualifications and institutions that provide training for at least four (4) related careers
- B. Discuss outcomes of research with class

- Investigate and make presentation on careers associated with crop production using Integrated Pest Management (IPM)

- Outcome of research undertaken demonstrates understanding of careers in connection with project
- Career Flow Chart/Tree created
- Qualification for at least four (4) related careers identified

Evaluation of Project

- Using documented information, compare crop yields and highlight any challenges
- Carry out basic Cost Analysis of project
- Write a basic End of Project Report

- Analyze basic records
- Do basic Cost Analysis
- Write an End-of-Project report

- Successful implementation of project evidenced
- Analysis of crop produce used to evaluate success of project
- Records used to compare each project's success and challenges identified
- Cost analysis done
- Final report on project written

Learning Outcomes

Students will be able to:

- ✓ Discuss the advantages and disadvantages of each method of pest and disease control
- ✓ Discuss the advantages and disadvantages of each method of weed control
- ✓ Explain the benefits of integrated pest management
- ✓ Select and use appropriate weed, pest and disease control measures
- ✓ Carry out cultural practices required to grow crops
- ✓ Accurately calculate chemical need
- ✓ Select and use appropriate PPE
- ✓ Safely mix and apply pesticide
- ✓ Store tool, equipment and chemical safely
- ✓ Demonstrate use of sprayer
- ✓ Maintain sprayer
- ✓ Dramatize bad effects and benefits of chemicals
- ✓ Create a career flow chart/tree linked to the project
- ✓ Identify at least four (4) careers and the qualifications required for further training
- ✓ Dramatize correct harvesting techniques
- ✓ Conduct post harvesting techniques
- ✓ Compare yield of crops grown in both open field and protected environment
- ✓ Write a basic cosy analysis
- ✓ Analyze quality and quantity crop produce to evaluate success of project
- ✓ Write an end-of-project report

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 by applying them to crops grown at home, in community, school and other environments to control the effects of weed and insect pests.

RESOURCES

Spraying equipment, Computer, Personal Protective Equipment (PPE), Measuring tools, Irrigation equipment, Pesticides (Biological), Hose, Plastic apron, Markers, Garden Tools, Cartridge paper, Mulch, Record sheets, Stake Instruction manual, fertilizer, Multi-media projector, Videos, Projection screen

KEY VOCABULARY

Hydroponics, Coir, Bulk mix, Mould, Perlite, Insects, Vermiculite, Soil, Fungicide, Pesticide, Weed, Herbicide, Agronomy, Fungus, Systemic insecticide, Cultural practices, Pruning, Nematicide Soil Scientist, Weedicide, Selective herbicide, Soil less media, Insecticide, Primary tillage, Mechanical control, Contact herbicide, Secondary tillage, Chemical control, Systematic herbicide, Non-selective herbicide, Integrated pest management

LINKS TO OTHER SUBJECTS

Maths: Measuring/calculations

Science: Living processes

CAREER

Farmer, Soil fertility expert, Extension officer, Biochemist, Soil scientist, Teacher, Agro-chemist, Agriculture technician, Agro sales manager

A black and white photograph of a market stall displaying pumpkins. In the center, a tall wooden stand holds several pumpkins on its tiers. In the foreground, a large number of pumpkins are arranged in a circular pattern on the ground. To the left, a table is covered with more pumpkins. In the background, there are trees, a building with a tiled roof, and a large umbrella. The text 'NSC' is overlaid in the top left corner.

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AGRICULTURE AND THE ENVIRONMENT PROJECT 9.2

MINI-ENTERPRISE

Aim of Project

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 focused career options

The scope of this overview is based on the target to establish a mini-enterprise to reflect real life decision making, job techniques, careers, inter-personal relationships, and professional development.

COMPLETE OVERVIEW OF SUBJECT CONTENT

PROJECT 9.2

RESOURCES AND TECHNOLOGY

TERM 1

Growing of crops in controlled environment or open field environment using Integrated Pest Management Practices

TERM 2

Mini-Enterprise
(To be determined by school)

TERM 3

Mini-Enterprise
(May be done or continued into Term 3 if absolutely necessary)

There are four (4) key Attainment Targets within Resource & Technology

**STRANDS 1:****Creativity & Innovation**

Students will be able to apply creativity and innovation in the solution of problems

STRANDS 2:**Exploring Methods and Procedures**

Students will be able to Explore Methods & Procedures in solving problems.

STRANDS 3:**Applying Solutions**

Students will be able to apply appropriate strategies in finding solutions to identified needs.

STRANDS 4:**Career Pathways**

Students will develop awareness of a range of career pathways.

STRANDS 1

Conceptualize, plan and execute innovative entrepreneurial enterprise in selected occupational contexts.

STRANDS 2

Make informed decision in the selection of materials, tools and equipment and demonstrate increasing skill in the execution of task.

STRANDS 3

Build practical skills and the technical competencies necessary for affecting a solution for affecting a solution/outcome.

STRANDS 4

Select a career pathway and develop a career plan that outlines the academic and technical requirements for accessing the selected pathway.



Range of Content

Key concepts, skills and knowledge students will learn in this Project

Students will develop key concepts and skills for the establishment of mini enterprise by learning;

- **Technical approach to the use of the decision making process to make decisions in the enterprise**
- **To use terminologies associated with Agriculture Business Management in a given context**
- To select and implement management practices for a given situation
- To select and use correct resources to achieve positive business outcomes

Students will develop knowledge and understanding by learning:

- What is decision-making
- The decision-making process
- Steps in decision-making process
- How to identify business opportunities in agriculture
- The importance of market research/feasibility study to the success of an agricultural enterprise
- Factors to be considered when planning/establishing an agricultural enterprise
 - o Available market for produce
 - o Management
 - o Available capital
 - o Financing (source of financing, budgeting and cash flow)
 - o Infrastructure requirement and availability (e.g. water, road, transportation and electricity)
 - o Labour requirement and availability
 - o What is decision-making
- Benefits of environmentally sustainable practises in Agricultural Enterprises
- Sources of job opportunities
- Factors to be considered when seeking employment
- Definition of career portfolio
- Resume and job application

About the Project

In this Project students will articulate what was learned about the establishment and management of an Agriculture enterprise, through the application of relevant principles and practices under the general guidance of the teacher.

Guidance for the Teacher

- Apply Agricultural Business principles and practices to Mini-Enterprises
- Establish student groups that facilitate organizational structure and scheduling of duties
- Procure suitable and adequate resource in time
- Where possible ensure sufficient scale of the projects that allow for reasonable marketing potential
- Organize market for the output of the mini-enterprise
- Avoid projects holding over through major holidays as a precaution against praedial larceny
- Resources should include those for labelling of individual projects
- As much as is possible provide physical protection for the students' enterprise including secured fence/gate
- Promote a culture of technically-sound agricultural practices
- Promote/reward the observance of practices which sustain and/or enhance the environment
- Research!! Research!! Research!!



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AGRICULTURE AND THE ENVIRONMENT PROJECTS

GRADE 9: TERMS 2 & 3

Check that students can:

- Aware of the decision-making process

PROJECT 9.2: Mini-Enterprise

ATTAINMENT TARGET(S)

- 1 Students will be able to apply Creativity & Innovations in applying design principles to the use of available resources to operate a mini-enterprise in agriculture.
- 2 Students will be able to Explore Methods & Procedures in developing a garden, and determine from a range of options the design and the plans to operate a mini-enterprise in agriculture.
- 3 Students will be able to Apply Solutions to operate a mini-enterprise in agriculture. Through the application of the design principles and basic crop growing practices.
- 4 Students will be able to demonstrate awareness of a range of Career Pathways related to operating a mini-enterprise in agriculture, which include direct agriculture-based careers/occupations, as well as, careers/occupations associated with the supply of goods and services to operate a mini-enterprise in agriculture.

OBJECTIVES

- Create and apply design principles to establish and manage an Agriculture enterprise.
- Use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.
- Explore methods and procedures for effective establishment and management of the enterprise
- Use digital tools to design and develop creative multimedia products to demonstrate their learning and understanding of basic technology operations
- Use design solutions and principles to establish and manage an Agriculture enterprise
- Use appropriate digital tools and resources to plan and conduct research, and critical thinking, manage projects, solve problems and make informed decisions.
- Develop an awareness of career pathways related to the establishment and management of agricultural enterprises.
- Recognize 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

Introduction to the Project (Creativity and Innovation)

Students will:

Create an agricultural project idea from an observed problem or need

- Design a mini-business concept to solve the problem or satisfy the need.
- Carry out a feasibility study/market survey of the project to be completed. Use online search tools to aid investigation and research
- Formulate a management committee that will oversee the operations on the project
- Develop forms for keeping record of mini-enterprise using appropriate software
- Discuss complete and partial budget and develop one of each for the enterprise
- Use software tools to prepare flow charts to show major factors to be considered for a chosen agriculture career
- Identify creative means of sourcing capital (funding) for the project
- Plan a step by step outline of how the project will be executed
- Identify a project that can be completed within a term
- Create and display charts depicting the steps in the decision making
 - process using appropriate display media
- Display a written plan for the selected project/enterprise
- Develop a list of all resources needed and use this list to determine projected expenditure for the project
- Prepare a partial and a complete budget for the project (projected income and expenditure)
- Use spreadsheet software to develop records showing:
 - ✓ Starting date
 - ✓ Termination date
 - ✓ Management activities and principles involved in managing enterprise
 - ✓ Resources used
 - ✓ Observations and changes made during project
 - ✓ Income and expenditure
 - ✓ Production levels
 - ✓ Harvesting schedule
 - ✓ Marketing/distribution

Key Skills

The ability to:

- Determine the type and extent of data to be collected to establish a business enterprise.
- Design a simple, 'virtual' production project from an observed need
- Collect and input data
- Evaluate data
- Develop business documents
- Format documents electronically
- Conduct electronic search for data
- Design a simple production project from an observed need
- Analyse and interpret data
- Establish a management committee
- Identify the resources necessary to operate a given enterprise
- Perform mathematical computations
- Prepare basic partial and complete budgets
- Create simple business documents, especially for record keepings
- Develop a plan/schedule of activities for an enterprise

Assessment Criteria

- Daily record sheets designed to collect relevant data
- Budgets developed; guided by outcome from discussions.
- Flow charts developed and created
- Charts showing steps in decision making process created and displayed
- Capital (funding) successfully raised
- Management committee overseeing project formed and installed
- Step by step methods and procedures to be executed and outlined.
- Project identified
- Written plan
- Outlining step by step methods and procedures done
- Resources identified and selected
- Budget prepared
- Spreadsheet used to develop an appropriate record sheets

Suggested Teaching and Learning Activities

Project Implementation

Students will:

- Implement the project using step by step methods and procedures outlined
- Carry out steps and procedures in a timely manner e.g. daily, weekly.
- Keep accurate records on computer or other electronic device:
 - ✓ Inventory
 - ✓ Material used
 - ✓ Chemical used
 - ✓ Income and expenditure
- Keep accurate journal entries of all aspects of the project
- Monitor, take corrective actions or implement contingency plans where things go wrong
- Recognize shortfalls and excess of resources and implement corrective measures.

Key Skills

The ability to:

- Communicate verbally regarding the project
- Use materials, tools and equipment
- Demonstrate safe working practices.
- Plan and manage time
- Implement schedule of production activities
- Respond to problems as they develop
- Keep appropriate records
- Handle/use hazardous substances
- Maintain enterprise, industry and manufacturer's standards
- Select, check, use and maintain personal protective equipment (PPE)
- Work with organizational structure
- Maintain a clean and efficient work environment
- Operate in a manner that improves environmental work practices
- Carry out harvesting and post-harvesting activities

Assessment Criteria

- Related farm activities are carried out to required standards
- Project successfully implemented
- Steps and procedures done in a timely manner in tandem with design.
- Accurate records kept
- Activities accurately recorded in journal
- Corrective action taken or contingency implemented

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Careers associated with Project content

Students will:

- Conduct research in groups to investigate the different career paths in connection with the enterprise (project)
- Use the research to create and display a flow chart to highlight the careers that evolve from this enterprise.
- Select a career pathway and develop a career plan outlining the academic requirements necessary to access this career path.

The ability to:

- Investigate and present/ display a picture-based career portfolio, based on the enterprise.
- Design a pie/flow chart of career paths that can evolve from a mini-agriculture enterprise.

- Outcome of research undertaken demonstrates understanding of careers in connection with project
- Flow chart created and displayed
- Career pathway developed and academic requirement stated

Evaluation of Project

Students will:

- Use actual records to evaluate the success of the enterprise
- Analyse projected and actual income and expenditure
- Evaluate the management team

The ability to:

- Analyze basic enterprise records
- Do basic cost analyses of project
- Write an end-of-project report

- Records used to evaluate project success
- Analysis of income and expenditure
- Evaluation of management team done

Learning Outcomes

Students will be able to:

- ✓ Discuss the advantages and disadvantages of establishing the mini-enterprise
- ✓ Discuss the steps of the decision making process
- ✓ Explain the benefits of budgeting
- ✓ Create complete and partial budget
- ✓ Build a career portfolio as evidence of their professional development
- ✓ Dramatize good and bad decision making and their outcomes
- ✓ Successful implementation of similar projects
- ✓ Impartially assess management and others

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 activities.

EXTENDED LEARNING

Students can use methods learnt by applying them to future development of agriculture enterprises to provide income, individual livelihood and employment for others in the agriculture sector of the country.

RESOURCES

Resource personnel, computer, charts, video, pamphlet, magazines, multi-media projector, videos, internet, projection screen, Capital, input, land or location, labour, market

KEY VOCABULARY

Push pass, drag, flick, Indian dribble, push dribble, volley, volleyball, hockey, stick, forearm pass (dig), overhead pass, underhand serve, stop

LINKS TO OTHER SUBJECTS

Maths: Measuring/Calculations

Business Basics

Nature of Entrepreneurship

Marketing Activities

Planning and Organizing Production



NSC

RESOURCE AND TECHNOLOGY

GRADE 9 PROJECTS:
FAMILY AND CONSUMER MANAGEMENT



NSC

**FAMILY AND CONSUMER
MANAGEMENT PROJECT 9.1
FASHION DESIGN AND MERCHANDIZING**

Aim of Project

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 focused career options

COMPLETE OVERVIEW OF SUBJECT CONTENT

PROJECT 9.1

RESOURCES AND TECHNOLOGY

TERM 1

The Fashion Design Cycle

Introduction
Rise
Culmination/Peak
Decline
Rejection

Fashion Terminology

Style
Designs
Fashion
Fads
Taste
Other related designing terms

Fashion Sketching

Fashion tools and equipment
Using the croquis to create flat sketches/designs
Creating fashion sketches for different garments

Basic Pattern Drafting

Fashion Merchandising

Careers in Fashion Designing

TERM 2

Pastry Making

Terms associated with pastry making
Choice and function of ingredients
Guidelines for making short crust pastry

Cake Making

Creaming Method
Ingredients
Method of mixing
Faults, causes and remedies

Food Preservation

Reasons for preserving foods
Principles of food preservation
Methods of food preservation

Product Development

Stages of Product Development
Packaging and labeling

TERM 3

- Develop business ideas
- Conducting market surveys
- Develop business plans
- Identify expenses related to starting and operating a small business
- Prepare a market plan
- Select business name and develop a business logo
- Keep records for business
- Identify components of production (e.g., work force, training, sequence of production, supplies, equipment, etc.)
- Developing flow chart, time schedule, and work sequencing for a business
- Operate a business
- Liquidate the business
- Evaluating the entrepreneurial experience

There are FOUR strands and key Attainment Targets within Resource and Technology -Home and Family Management

**STRAND 1:****Creativity & Innovation**

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

STRAND 2:**Exploring Methods and Procedures**

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

STRAND 3:**Applying Solutions**

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

STRAND 4:**Career Pathways**

Through a project base approach students will develop awareness of a range of Career Pathways.

ATTAINMENT TARGET 1**Creativity & Innovation**

Conceptualize plan and execute innovative entrepreneurial enterprise in selected occupational context

ATTAINMENT TARGET 2**Exploring Methods and Procedures**

Make informed decision in the selection of material tools and equipment and demonstrate increasing skills in the execution of tasks.

ATTAINMENT TARGET 3**Applying Solutions**

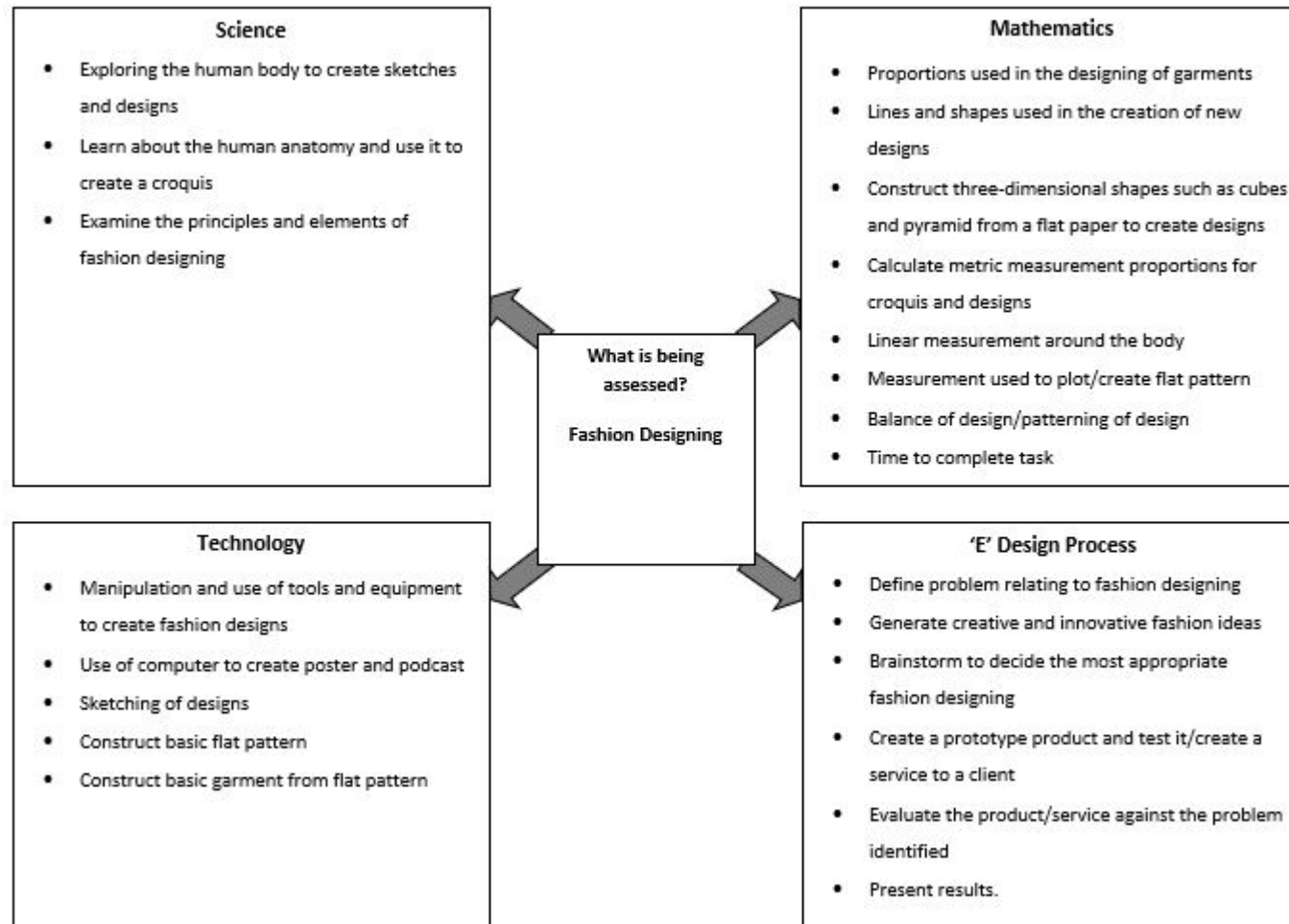
Build practical skill and the technical competencies necessary for effecting a solution/outcome.

ATTAINMENT TARGET 4**Career Pathways**

Select a career pathway and develop a career plan that outlines the academic and technical requirements for accessing the selected pathway.



Family and Consumer Management – Stem Mapping Grade 9 Term 1



PROJECT 9.1 / FASHION DESIGN AND MERCHANDIZING

Range of Content

The Fashion Design Cycle

Fashion sketching

Crocquis

Fashion Terminology

Figure types

Basic Pattern Drafting

Fabric selection

Sewing Techniques

Opening and Fastening

Finishing Necklines

Finishing armhole

Working Hems

Fashion Merchandizing

Career in Fashion Designing

About the Project

This unit introduces students to the concepts of fashion design and merchandising. It focuses on developing and understanding concepts, skills and knowledge associated with fashion design and merchandizing. Students interpret design brief and come up with creative and innovative solutions to fashion related problems. They will sketch designs for garments, draft basic patterns, construct simple garments and organize and present them in a fashion show. It also allows students to explore careers pathways and skills associated with the fashion industry.

Guidance for the Teacher

This unit is an introductory fashion designing and merchandising projects to expose students to the field of fashion. Students are not expected to display high levels of skills and competence in the areas, the focus is on identifying and creating solutions to fashion related problems, and practicing the fashion design process via the project. Provide as much assistance and support as possible through video and face to face demonstration, then allow students to practice. Involve the community by employing skills and expertise where applicable. Allow students as much freedom to choose their design brief. Some of the work will have to be completed out of class or as extracurricular activities. Encourage students to conduct online research and watch video clips in order to develop the skills independently.

The main tool of assessment will be a portfolio. A portfolio is simply a compilation of student projects and assignments. Envelopes, files, binders, or folders may be used to compile information over the term. Each student should have a portfolio representing his or her work during the term. By keeping track of this material, students are able to monitor their level of achievement. Additions to and revisions of the portfolio should be done at the end of each topic. At the end of the term the student will turn in the portfolio for grading. Where group research and presentations are used teaches must provide other opportunities for practice and reinforcement by preparing work sheets and short quizzes



NSC

FAMILY AND CONSUMER MANAGEMENT PROJECT

GRADE 9: TERM 2

Check that students can:

- Students will be familiar with some local fashion designers.
- Student will be familiar with pattern making, use of the sewing machine and safety from grade 8 which will help them in constructing garments/accessories.

PROJECT 9.1: Fashion Design and Merchandizing

ATTAINMENT TARGET(S)

- 1 Through a project based approach students will be able to apply Creativity & Innovations in the solutions to fashion problems.
- 2 Through a project based approach, students will be able to Explore Methods & Procedures in solving problems relating to fashion designing.
- 3 Through a project based approach students will be able to Apply Solutions by designing sketches and construct garments for the fashion industry.
- 4 Through a project based approach students will develop awareness of a range of Career Pathways in Fashion Designing.

OBJECTIVES

- Explain the fashion design process/cycle
- Explain fashion terms such as fad, fashion, styles, designs and other concepts related to fashion designing
- Identify tools and equipment used in fashion designing and pattern drafting
- Draw a croquis for flat sketches/designs
- Explore sketching techniques to create fashion illustrations
- Manipulate the tools and equipment to complete fashion sketches and designs
- Understand the principles of basic flat pattern drafting
- Discuss Fashion Merchandising
- Investigate careers related to fashion industry (fashion designing, illustrator, others)

ICT ATTAINMENT TARGETS:



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



RESEARCH, CRITICAL THINKING, PROBLEM SOLVING 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.

STEM ATTAINMENT TARGETS:

SCIENCE - Students should learn practically about the 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.

TECHNOLOGY - Students will develop the abilities to apply the design process.

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

Strand 1: Creativity and Innovation

Students will:

Week 1

In groups brainstorm to identify creative and innovative ideas to solve the problem outlined in the brief.

Your friend in grade 11 turned-up at her graduation ball (prom) all excited in what he/she considered a very special suit/gown found in a speciality store. To his/her surprise there were two other persons at the ball dressed in the same outfit. What can you do to ensure that this does not happen to you or other students?

Conduct research and create a design that is functional, aesthetic creative and innovative. Look at fabrics, objectives, scenery or people who will be the inspiration for the creation of a new piece of clothing/garment. Search online or in magazines for current or retro trends to in-cooperate into the new designs. Create a mood board that will showcase the new design(s) with the use of fabric swatches, notions and information/pictures from research which could form the basis for the whole piece.

- Brainstorm fashions ideas
- Research fashion needs
- Create mood boards
- Interpret and solve problems
- Create client profile

Assess design idea

Strand 2: Exploring Methods and Procedures

Weeks 2-3

Fashion Terminology

Identify and explain terms related to fashion designing (e.g., fashion, fads, styles, designs, taste and other related terms. In portfolio, use and label pictures to help explain the terms.

Fashion Design Cycle

Illustrate and define the five phases of a fashion cycle – introduction, rise, culmination decline and obsolescence/rejection. In groups conduct research on, select garments and demonstrate the five phases of the fashion cycle to classmates or create a multimedia presentation of the five phases of the cycle and share with classmates.

Fashion Sketching

- **Tools and equipment:** Identify tools and equipment used in fashion designing/pattern drafting, collect pictures placed in portfolio and label. Assign tools and equipment to groups and allow students to conduct in class research about their use. Set up display of tools and equipment and do presentation to classmates. Podcast or video presentation may be done to discuss and demonstrate the use and possible care of each tool and equipment.
- **Creating a croquis** - Watch a you tube video to help draw a croquis for basic flat design. Using specific proportions of the fashion figure and the grid sketch a female and/or male croquis. Incorporate simple gestures using arms and leg variations. Practice drawing figures for use in fashion illustrations.

Find fashion photograph showing the entire figure. Complete a fashion sketch from the photograph. Using geometric forms and lines, design an outfit on the croquis from the inspiration from Strand 1. Practice designs and sketches for a sporting, drama, dancing, cheerleading or gymnastics performance. Apply the principles and elements of fashion designs to your new designs. Places designs in your portfolio.

- Sketch croquis
- Draw rough sketches of body parts
- Draw simple gestures
- Create fashion sketches

Assess sketches

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Weeks 5 to 7

Basic Pattern Drafting

In groups explore, demonstrate and make a flat pattern for a fashion illustration that was create in previous class. Use appropriate software or drafting tools and equipment create a simple/basic garment from one of the designs created. E.g. sleeveless blouse or sheet dress. Include the relevant pattern symbols such as grainlines, centre back, notches and seam and hem lines. Watch video to assist in basic pattern drafting

- Create multimedia presentation

Week 8

Fashion Merchandizing

Understand basic marketing terms and principles related to fashion. List and identify sources a buyer has to choose from in selecting his/her merchandise.

Research and identify the type of fashion promotion, including advertising. In groups create a virtual promotion to introduce your new designs/styles to consumer.

Describe the following types of retail stores:- department stores, branch stores, flagship stores, chain store, speciality store and other related stores and type of merchandize sold by each.

- Draft flat pattern

Assess Oral presentation and Handout

Strand 3: Applying Solution

Weeks 9 - 10

A retail store has contracted your fashion designing company. Working in teams design four garments for the retail store to select from. Create a story board for the fashion designs, using selected fabric samples, colours, and season inspirations.

Simulate an online fashion show with fashion narration and stream to the retail store manager. Evaluate the virtual fashion show and make the necessary adjustment to suit your client. Draft and construct one of the simple/basic designd garment and have someone model this for the retail store.

Develop a promotional and marketing plan for the garments/fashion design.

- Assemble garments
- Record fashion show
- Create timeline
- Create storyboard
- Plan, organize and implement a fashion show.
- Work in teams
- Post recordings online

Fashion line

Fashion show

Strand 4 : Career Pathway**Week 11**

Watch video clip about Fashion Careers.

Select a fashion design careers. Complete an aptitude and interest survey to determine suitability for the career. Investigate where required education and training could be obtained. Identify employment opportunities Suggest related work experience opportunities.

Prepare a résumé and cover letter applying for the position) Share info with class/ post on class wiki

Conduct online/offline research and review in groups on the roles and functions of the fashion designer, fashion illustrator.

- Research career pathways

- Rubric for career pathway
- presentation
- Description
- Certification required for employment
- Entry level requirement for training
- Training (where, cost, duration)
- Employment opportunities

Learning Outcomes

Students will be able to:

- ✓ Create fashion sketches
- ✓ Draft pattern using the flat pattern method
- ✓ Construct simple garments
- ✓ Plan, organize and implement a fashion show
- ✓ Exhibit professionalism through high quality presentations
- ✓ Work cooperatively as a design team
- ✓ Record events using webcam or other recording devices
- ✓ Post recordings to the internet
- ✓ Evaluate design sketches and garment construction processes
- ✓ Examine career path in fashion designing

Points to Note

The following are some Fashion terms to be used in lessons but not limited to:

Fashion - the currently accepted, prevailing style. (Vogue is defined the same way.)

Fad - a fashion that suddenly bursts into popularity but is usually short lived

Style - a distinctive form of dress that exists independent of fashion (hippie, gothic, cowboy)

Classic - a fashion that retains general acceptance over an extended period of time

Design - a specific version of a style

Avant-garde - ahead of its time, comes straight off the runway

Trend - fashion that always changing and is related to fads. Fashion trends usually span 3-7 year cycles.

Identify basic garment styles: Dress. Skirt. Shirt, coat and jacket. pant
To determine the clothing details that are used to recognize, understand, and interpret fashion cycles and silhouettes.

Identify basic garment parts: neckline styles, collar styles, sleeve styles, pocket styles

Extended Learning

- Use the internet to further investigate the latest types of and feature in CAD fashion design software
- Use computer software to draw designs
- Student can operate their own small business by designing and making clothing and accessories for **individuals/clients**

RESOURCES

Drafting paper, Fashion magazines, Scissors, Glue, Computer/projector, Pencils/erasers, Sketch pad, Fabric, Metre stick, Internet access, Sewing machine, Dress form

KEY VOCABULARY

Fad, Fashion, Styles, Classic, Avant Garde, Fashion sketching, Texture, Harmony, Silhouette, merchandizing

LINKS TO OTHER SUBJECTS

Language Arts

- Apply the reading process to analyzing information.
- Demonstrate competence in speaking to provide, distribute or find information

Visual Arts

- Identify, manipulate, and combine various techniques to develop design sketches
- Print and design patterns for fabrics

Mathematics

- Use geometric concepts to create fashion sketches
- Calculate production and item costs and profits
- Show proficiency in calculating measurements for pattern drafting

Technology

- Demonstrate knowledge of computers in the apparel and textile industry
- Identify awareness of computer-aided design technology (CAD/CAM)
- Search for and present information

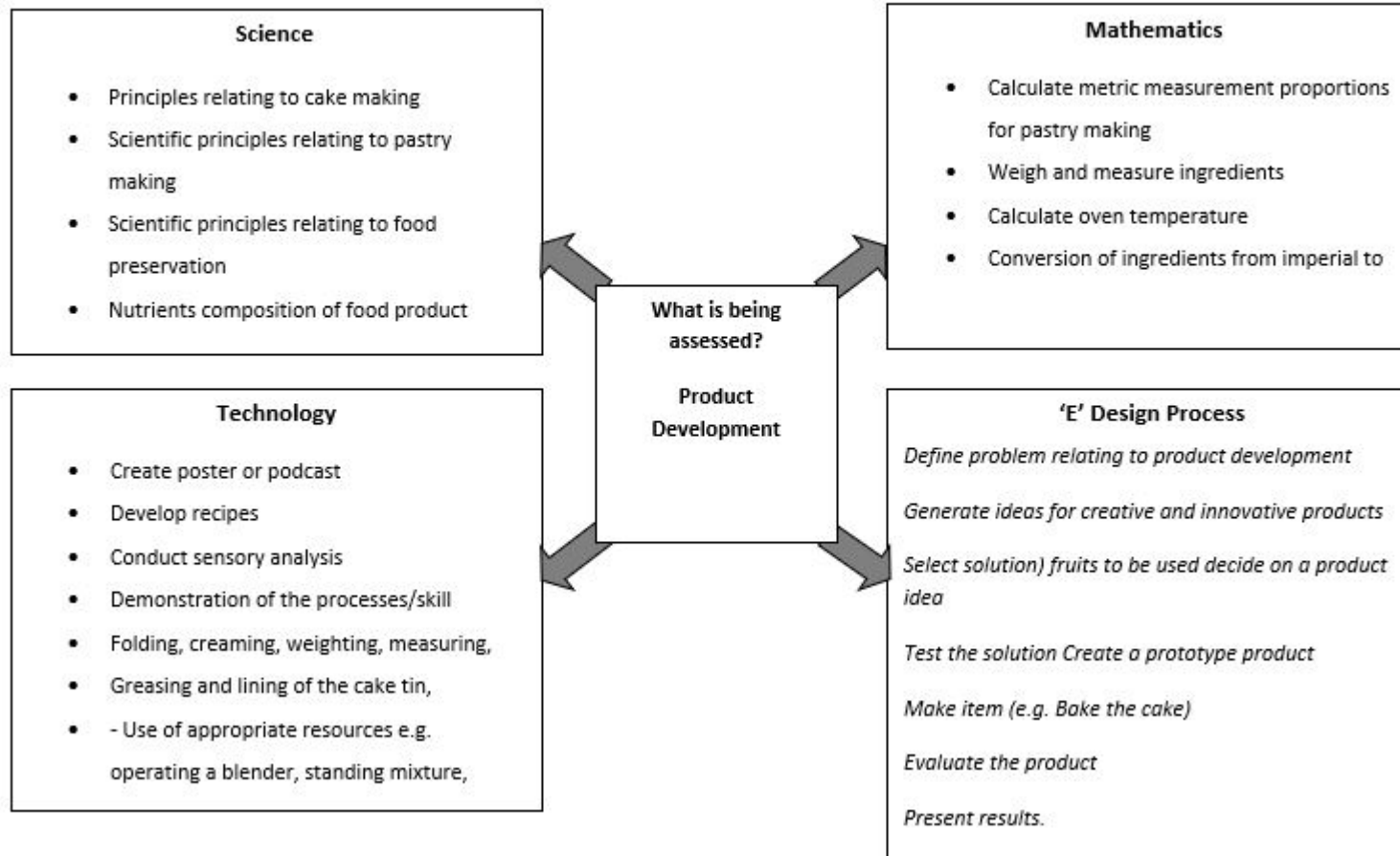


NSC

**FAMILY AND CONSUMER
MANAGEMENT PROJECT 9.2**
FOOD PRODUCT DEVELOPMENT

*Call
me
Cake*

Family and Consumer Management – Stem Mapping Grade 9 Term 2



Range of Content

What are the key concepts, skills and knowledge students will learn in this project:

Pastry Making

- Types/ proportion of Ingredients
- Terms associated with pastry making
- Choice and function of ingredients
- Guidelines for making short crust pastry
- Faults, causes and remedies

Cake Making – Creaming Method

- Choice and functions of ingredients used in cake making
- Proportion of ingredients used in the creaming method
- Techniques used in preparing cakes by the creaming method
- Faults in cake making

Cake Decorating

- Methods
- Tools/equipment
- Types of decorations
- Procedures for applying designs

Food Preservation

- Definition
- Reasons for preserving foods
- Principles of food preservation
- Methods of food preservation
 - o Drying
 - o Freezing
 - o Chemical - sugar, salt, vinegar and other preservatives.

Range of Content***Product Development***

- Definition
- Stages of Product Development
- Market Research
- Advertising

Packaging and Labelling

- Reasons for packaging food items
- Types of packaging materials
- Procedures to following when packaging food items
- Information on a food label

About the Project

In this project students will learn about the process of product development from the design brief and planning stages to prototype, production, packaging, labelling, marketing and evaluation of the final product. Students will also explore new and emerging practices in food production development, food preservation, cake making and decorating and pastry making.

Portfolio Assessment

A portfolio is an organizer of student projects and assignments. Envelopes, files, binders, or folders may be used to compile information over a term for each student. Each student should have a portfolio representing his or her work during the term. Students may construct portfolios in which to keep their work and assessments throughout the term. Two portfolios may be valuable: a “working portfolio” to collect ideas observations, notes and critiques, and a “presentation portfolio” to maintain completed work. By keeping track of this material, students are able to monitor their level of achievement. Additions to and revisions of the portfolio should be done at the end of each module. At the end the term the student will turn in their portfolio for grading. A daily journal may also become a part of a working portfolio. This will provide the student with a focus for self-directed or independent learning as well as an anecdotal record for part of the student’s evaluation. A portfolio related to Clothing, Textiles and Fashion may contain: sewing samples, fashion design illustrations, and photos of completed sewing projects.

Guidance for the Teacher

- When undertaking the delivery of this unit, teachers should refer to the skills already taught in Grades 7 and 8 Resource and Technology and must also adhere to the guidelines to the development of a new food product.
- Through a series of classroom activities, and project assignments, students will, learn the stages of product development and apply this knowledge to the development of an original food item.
- Project Development is a long term project that can be adapted to fit within the normal class schedule in order to maximize the potential of the project.
- Students MUST work in groups for all major activities.

PACKAGING MATERIAL TESTS

Bursting Strength - to see how much pressure will cause the package to burst.

Compression Strength - to determine how many items can be stacked before damage occurs.

Impact Strength - to determine what happens to a package when it is dropped.

Penetration of Fats - to determine if fats will seep through the container.

Seal Integrity Tests - to determine if packaging materials will hold printed inks and will not bleed, fade or rub off.

Stiffness Test - to determine how much force is needed to push an object that will not yield.

Tear Force - to determine force necessary to pull a package apart.

Transmission of Water - to determine if the material will allow the leakage of water from the package.

Vacuum Testing - to determine if seals will hold or if they are defective.

Check that students have prior knowledge in:

- Interpreting basic recipes and understand basic food preparation skills.

PROJECT 9.2: Product Development

ATTAINMENT TARGET(S)

- 1 Through a project based Students will conceptualize, plan, develop and execute creative and innovative new products.
- 2 Students will make informed decisions in the selection of materials, tools and equipment and demonstrate increasing skill in the execution of tasks in product development.
- 3 Students will build practical skills and the technical competencies necessary for effecting a solution/outcome.
- 4 Students will select a career pathway and develop a career plan that outlines the academic and technical requirements for accessing the selected pathway.

OBJECTIVES

- Recognize the variety of fruits and vegetables grown locally and develop creative an innovative product from local fruits and vegetables
- Identify the different methods in pastry making.
- Explore the techniques to be used in the creaming method of cake making.
- Demonstrate a range of skills used in pastry
- Analyse a variety of techniques food preservation.
- Demonstrate knowledge of and apply the principles of food preservation.
- Conduct sensory evaluation for food products.
- Demonstrate food safety and sanitation procedures
- Develop new food products.
- Use food packaging and labels according to production guidelines.
- Evaluate product outcomes
- Select a career pathway and outline the academic and technical requirements to accessing it.

ICT ATTAINMENT TARGETS:



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



RESEARCH, CRITICAL THINKING, PROBLEM SOLVING 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.

STEM ATTAINMENT TARGETS:

SCIENCE - Students should learn practically about the 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 well-being.

TECHNOLOGY - Students will develop the abilities to apply the design process

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

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

AT 1 - 1 week

Project Introduction

Discuss the range of fruits and vegetables grown locally and the amount of waste that occur each year.

Crave an inventory of locally grown fruits and vegetables and brainstorm creative ways to better utilize the foods. In groups choose a local fruit or vegetable and decide on an innovative product that can be marketed. Use creativity checklist to evaluate product creativity.

- Problem solving
- Creativity
- Explore
- Describe
- Plan
- Design
- Discuss
- Critical thinking

Portfolio Assessment:

Inventory of Local fruit or vegetable.

New product chosen should show creativity, innovation novelty, innovative, effective etc...

AT 2 - 2 weeks

Pastry Making

Use an appropriate vocabulary strategy to illustrate terms relating to pastry making, e.g. pastry, bake blind, dredge, aerate, cut-in etc.

Visit a pastry shop (virtual or real) and observe the variety of pastry products available. Sample foods made from different types of pastry and examine and discuss the differences. Investigate cut samples for colour, flakiness, texture, flavour etc. Critique pastries and suggest ways to improve the taste, flavour, variety, presentation etc.

Create multimedia presentation on the types of pastries

Conduct information search on the guidelines and procedure for making short crust pastry, including tools and equipment.

Collect online/offline recipes of various pastry dishes and compile a recipe booklet

Invite community pastry chef to demonstrate the making of short crust pastry as well as various products made from short crust pastry.

Capture the demonstration using recording devices and playback for class discussion

Preparing items from short crust pastry (coconut gizzards/tarts/ tartlets/mince pies). display products and use a digital camera to take and post pictures on a social media platform.

Include pictures and recipe in portfolio.

Use checklist/rating scale to evaluate pastry products.

- Discuss
- Observe
- Create
- Problem solving
- Investigate
- Analyse
- Demonstrate
- Research
- Critique
- Problem solving
- Interpret
- Discuss
- Research
- Explore
- Demonstrate
- Design
- Creative
- Classify

Checklist/rating scale for evaluating pastry products. Check for texture, flavour, presentation...

Recipe booklet contains at least 5 recipes from each practical skill (cakes, pastry and food preservation.). Recipes are accurate, stating ingredients and methods. well laid out, and attractively presented.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

3 Weeks

Cake making

Sample a variety of cakes and discuss the method of preparation

View and discuss presentation on the methods of cake making

Collect recipes and pictures of cakes made by the creamed method and add to recipe booklet.

Discuss choice of ingredients and tools and equipment used in cake making.

Prepare cakes using the creaming method.

Participate in a cake decorating work shop. The workshop will include the following:

Video /multimedia /oral presentation on cake decorating techniques

Observe demonstration of simple cake decorating methods by a resource person/ teacher. Watch video on selecting appropriate tools and equipment used in cake decorating

Collect recipes of cake decorations add to recipe booklet

Decorate cakes using simple cake decorating techniques such as glaze icing, frosting, butter icing, dusting, sprinkles and fruits

Use checklist to assess cake decoration

Take pictures of cake decorations for portfolio

Cake decorations should..... Look for Suitability of decoration, Colour scheme, Visibility, Harmony, Eye appeal, Use of finishing products

Assess product made from preservation look for.....

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

2 weeks

Food Preservation

Conduct online/offline research and presentation on the methods and principles of food preservation.

Collect pictures and recipes of food showing the different methods of preservation and add to recipe booklet.

Demonstrates various methods of food preservation: Drying, Freezing, Chemical- sugar, salt, vinegar etc.

Demonstrate an understanding of food preservation by preparing an item using one method of food preservation.

Food Packaging and Labelling

Test various packaging material to determine suitability for specific products. Select a packaging for the selected product.

Oral presentation of new product using oral presentation Rubric. Look for use of various ITC and digital source, fluency, clarity, accuracy of information etc.

AT 3 - 3 weeks

Product Development

View video or chart presentation on the Stages of Product Development. Create a podcast

In groups develop the idea for the "new" food product discussed in week one, using skills developed in cake, pastry making or food preservation.

Create a poster and a podcast to introduce and describe the new product to the class.

Develop a recipe for the product to be produce, (begin with a standard recipe and make modifications

In groups prepare the product, conduct a sensory analysis of the product, Modify the original recipe and repeat the preparation and analysis steps until the product is stabilize.

Determine the nutrient composition of the product, and prepare an ingredients list which would conform to labeling requirements (i.e., listing ingredients by weight).

Assess product innovation using checklist. Look for development of recipe, trial recipe, sensory evaluation, marketing, packaging and labelling

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Prepare a mini product proposal that follows the outline below.

Refine Product according to desire flavour version.

Package and label the product.

Mount a display of the various products at school and/or at an Agricultural Show, 4 H Achievement Day, Food Expo.etc.

Assess career chart for accuracy, clarity of information and presentation

AT 4:

Investigate a career available in the Food Service Industry with direct link to pastry; cake making or food preservation techniques and develop a career chart that outlines the academic and technical requirements for accessing the selected career pathway. Add career plan to portfolio

Learning Outcomes

Students will be able to:

- ✓ Compile a recipe booklets
- ✓ Make pastry and pastry products using short curst method
- ✓ Prepare cakes using creaming method
- ✓ Decorate cake using simple method of cake decoration
- ✓ Prepare products using various method of preservation
- ✓ Develop products that meet commercial standards.
- ✓ Modify recipes
- ✓ Create informative food labeling.
- ✓ Work cooperatively in groups
- ✓ Select , use and care appropriate tools and equipment used in food preparation
- ✓ Practice health and safety standards in food preparation
- ✓ Setup food product display
- ✓ Use various ITC tools to create and communicate information

Points to Note

FOOD PACKAGING – Food packaging is the development of materials and packages that contain and protect products, while also fulfilling consumer needs for convenience and communication.

Mini project proposal guidelines

- Name of New Food Product
- Product Description (2 sentences)
- Target Market (1 paragraph)
- Product Recipe (Abbreviations and brand names should not be used in the recipe.)
- List of major ingredients and their nutritive value
- Instructions for Preparation
- Description and sample of package design (1 paragraph)
- Storage and Display Plan (1 paragraph)
- Marketing Plan (1 paragraph)

...**PRODUCT DEVELOPMENT** – Product development is the process through which food scientists transform new food ideas into marketable products. When developing a new food product, product developers must decide what product will be produced, discover who will buy the product and how to make it unique, define what is in the product, develop all aspects of the product, and deploy the product into the marketplace.

PEER INTENT TO PURCHASE EVALUATION:

Product Name: _____

On a scale of 1 to 5 (1 being least likely and 5 being most likely), indicate with an “X” the likelihood that you would purchase this product if it was available for purchase.

1 _____

2 _____

3 _____

4 _____

5 _____

Extended Learning

Encourage students to:

- Use skills gained in cake, pastry making and food preservation to start and maintain a business
- Conduct further research on the other methods of cake and pastry making
- Explore how the knowledge gained can be used to further develop entrepreneurial skills.
- Field trip to food preservation plants to observe canning and packaging process
- Design a new container for any food item that is easier to open and handle and caters to an aging population.
- Visit the Bureau of Standards and view a product development process and find out what assistance they provide for product development.

RESOURCES

Internet access, computers and multimedia projectors, Food preparation facilities, ingredients, tools and equipment i.e. cake tins, pastry pans and pie dishes etc.

KEY VOCABULARY

Pastry, Cut in, Aerate, Sensory evaluation

LINKS TO OTHER SUBJECTS

Language Arts

- Reading information in recipes

Business Education

- Formulating a marketing plan

Agriculture

- Selecting and utilizing indigenous products

ICT

- Use word processing to create documents
- Use Microsoft Publisher to create label

Mathematics

- Calculate recipes, using graphs to present research information.

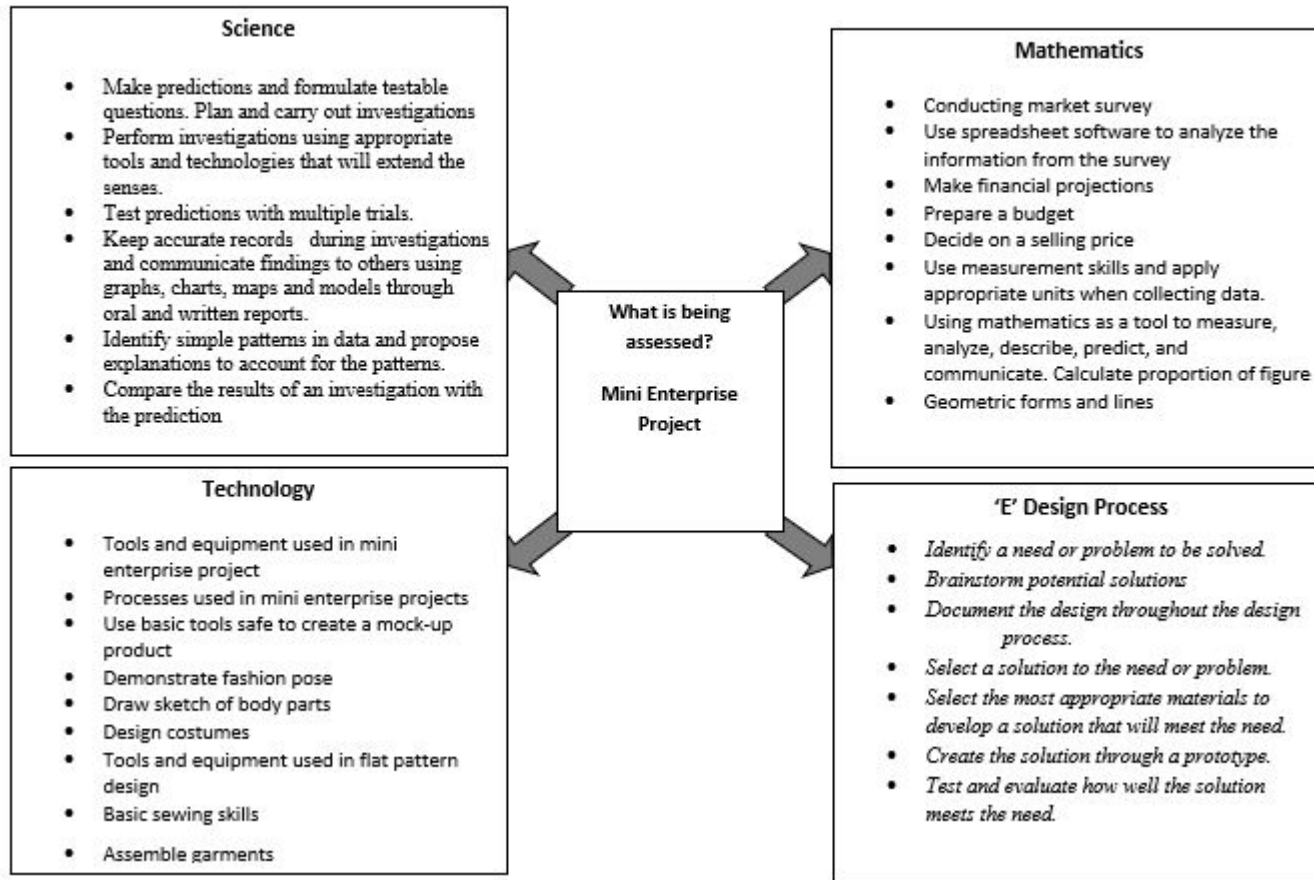


NSC

FAMILY AND CONSUMER MANAGEMENT PROJECT 9.3

MINI-ENTERPRISE

Family and Consumer Management – Stem Mapping Grade 9 Term 3



Range of Content

- Develop business ideas and establishing a business
- Conduct market surveys on specific food /clothing project
- Develop business plans
- Determine space and type of facility needed for a specific business
- Identify expenses related to starting and operating the business
- Establish product price
- Prepare a market plan
- Select advertising media and method of advertising the product
- Select business name and develop a business logo
- Plan advertising campaign
- Establish record keeping systems for business
- Outline components of production
- Develop flow chart, time schedule, and work sequencing schedule
- Operate a business
- Liquidate a business
- Evaluate the entrepreneurial experience
- Identify academic and technical requirements for accessing specific career paths

About the Project

In this Project students will conceptualize, plan and execute innovative entrepreneurial enterprises in Family and Consumer Management. They will develop skills and experience in starting, operating and liquidating a business as they practiced in a school base mini enterprise. Activities include organizing a small business, producing products and/or providing services, and managing a small business. Students come up with an innovative idea for a small business, carry out a market survey, decide on the product or service to be offered, prepare a business plan, finalizing a marketing strategy, choose their managers and team leaders, raise capital and produce or order the products. Students will sell their products or services in the school, the near community or online and keep accounts/records. At the end of the term the company goes into liquidation and students present a report on their experience.

Guidance for the Teacher

Teaching Entrepreneurship Through Project-based Work:

The objective of mini enterprise project is for students to develop economic activities in which they produce and sell real products or services. These activities allow students to acquire basic entrepreneurial skills, as well as personal qualities and transferable skills that have become increasingly important in order to live and work in a knowledge society. Research has shown that through participation in the mini enterprise, students display their creativity, develop enthusiasm and self-confidence, and learn how to work in a team, become more willing to take responsibility and use their initiative, improve their communication skills, and develop enthusiasm and self-confidence.

The tool for assessment for this unit is a portfolio. A portfolio is a purposeful collection of students work. Students will select outstanding pieces of their work to present for assessment at the end of the term. The portfolio activities in this project are just suggested activities, teachers and students are free to decide which pieces of work are to be assessed.



NSC

FAMILY AND CONSUMER MANAGEMENT PROJECTS

GRADE 9: TERM 3

- Students should complete entrepreneurship unit in Business Basics and know how to write a business plan
- Students should complete agro processing, product development and Fashion design and Merchandizing in terms 1 and 2 and know how to produce marketable products and services

PROJECT 9.3: Entrepreneurship In Family and Consumer Management

ATTAINMENT TARGET(S)

- 1 Students will be able to apply Creativity & Innovations selecting a mini enterprise project.
- 2 Students will be able to Explore Methods & Procedures in developing products and services for a mini enterprise.
- 3 Students will be able to apply appropriate strategies in applying solutions to developing and managing a small business.
- 4 Students will develop the ability to analyze Career Pathways by selecting a career pathway and developing a career plan for accessing the selected pathway.

ICT ATTAINMENT TARGETS:



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



RESEARCH, CRITICAL THINKING, PROBLEM SOLVING 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.

OBJECTIVES

- Identify a Family and Consumer Management-related small business opportunities and select a product to manufacture or a service to sell.
- Develop, complete, and compile a market survey for a product or service
- Establish short-term and long-term goals for business and develop a business plan
- Decide on a price for a product or service
- Prepare a market plan
- Select a method of advertising that is appropriate for the product or service
- Develop a flow chart, time schedule, and work sequence schedule necessary to produce the product or provide the service.
- Operate a business, keep records and liquidate the business at the end of the term.
- Evaluate the entrepreneurial experience against established goals
- Select a career path and outline the academic and technical requirements for accessing the selected pathway.

STEM ATTAINMENT TARGETS:

SCIENCE - Students should learn practically about the structures and functions of the major organs and systems in living things and the scientific basis of how life is maintained and perpetuated.

TECHNOLOGY - Students will develop the abilities to apply the design process

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

Students will:

At.1 - Week 1

Discuss the characteristics of good business ideas.

Self-assess and make a list of personal interest, talent, skills. Create a small business idea bank by making a list of at least ten creative and innovative ideas for a small business in Family and Consumer Management.

Review conducting market survey; decide on a product or service for a small business. Select a survey instrument and conduct a market survey.

- Self-assess
- Employability skills
- Create business ideas
- Work as a Team

Idea bank portfolio entry should show creativity and originality of ideas.

At. 4 - Week 2

Review and discuss careers in Home and Family Management. Individually, decide on/choose a career path in Home and Family Management that they would like to pursue. Conduct research online or offline and complete a career pathway work sheet which details reasons for choice and how to access their particular career pathway. Develop a career pathway map using appropriate software and share their research with the class.

- Taking calculated risks
- Communication ideas
- Leadership skills

At.2 – Week 3

Use spreadsheet software to analyze the information from the survey. Using the survey information, decide what the product will look and feel like, make financial projections, decide on the best location for the business, identify features that make your product or service unique by comparing it with that of the competitors and decide on a selling price etc. Enter survey instrument and analysis into portfolio

- Self-confidence
- Taking initiative
- Assuming responsibilities

Portfolio entry should show include facts about the people in the market, opinion of the potential clientele, information on competitors etc.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Weeks 4 and 5

Develop or adopt a business plan template and write a business plan.

Develop a radio or newspaper advertisement to promote the business and /or develop website or social network page to advertise and market the product or services.

Organize the business activities by procuring raw materials, tools and equipment to carry out the business.

- Make Decision
- Management time
- Meet deadlines
- Set goals
- Project management
- Use of Information and Communication Technologies (ICTs)
- Public speaking
- presentation skills
- Management skills

Portfolio entry should show the components of a good business plan.

At 3 – Weeks 6

Launch the business, operate the business for 6 weeks, keep records journal the weekly activities and liquidate the business at the end of the term.

Suggested business ideas: agro processing, product development, pastry shop, preservations- jellies, candies, dried fruits, pickles, fashion merchandizing, cosmetology services, facilities management etc.

Week 1: Launch the business

Week 2: Operate the business, keep records

Week 3: Operate the business , keep records

Week4: Operate the business, Keep records

Week5: Participate in a trade fair, art and craft expo, festival competition where possible

Week 6: Liquidate the business by paying all creditors, collecting from all the debtors and share the profits among shareholders/participants. Enter business records in portfolio

Select appropriate resources and technologies/ tools for business

Observe health and safety requirements during production and when rendering services

Select environmentally friendly products and production processes

Design products using sustainable materials etc.

Portfolio entry should include advertising campaign, business records, Income and expenditure statements, Organizational chart etc.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Final Week

- Evaluate the entrepreneurial experience using focus groups
- Present an income statement
- Present a written report on the project in portfolio

Assess student's oral presentation. Using oral presentation rubric

Learning Outcomes

Students will be able to:

- ✓ Understand the roles and functions of various career positions in business
- ✓ Consider the challenges, demands and constraints involved in run a successful business
- ✓ Work effectively in a team
- ✓ Produce quality marketable end product.
- ✓ Gain skills in preparing a business plan
- ✓ Be able to develop sound business ideas
- ✓ Practice online marketing
- ✓ Understand the requirements to access various career paths

Points to Note

Focus Group Give students the assignment ahead of time so that they can think through and organizer their thoughts. Help students develop speaking guidelines to make the activity meaningful and maximize the use of time

Business Plan: Provide guidelines for writing the business plan and guide students through the proces

Extended Learning

Use computer simulation programs to develop a realistic simulation of an economic activity. E.g. business game

Collaborate with classmates and start a company/small business in your community

Develop a website for the company

RESOURCES

Multimedia Projector or overhead projector, Computers, Printer, Software – word processing, spreadsheet, Graphics etc, Internet, Television and VCR
Career work sheet, Equipment and materials for the production process

KEY VOCABULARY

Business plan, Budgeting, Finance, Shares, Sponsors, Loans, Profit, Accounting, Marketing, Advertising, Product, Service, Sales, Purchasing, Business, Contracts
Records, Organizational chart

LINKS TO OTHER SUBJECTS

Language arts:

- Students demonstrates competence in writing and editing reports using correct grammar and punctuation
- Demonstrate competence in speaking to discuss issues and arrive at solutions and making oral presentation

Business: Students will develop competence in apply business concepts to operating the mini enterprise

Maths: Demonstrate competence in calculating portions and quantities during production



NSC

RESOURCE AND TECHNOLOGY

GRADE 9 PROJECTS: INDUSTRIAL EDUCATION

The Aim of Resource & Technology:

The aim of Resource and Technology at this level is to use the principles of Science, Technology, Engineering and Mathematics (STEM) infused with the Technical Vocational standards to foster students' awareness of foundational technical skills and their relationship to future careers and occupations. In a project-based format, students use the design process for problem solving in a range of technology based design contexts. The aims of Resource and technology at this level are to enable students to become:

- Critical thinkers and problem solvers
- Confident, responsible and productive citizens
- Adaptable to changes in the world around them
- Aware of a range of future focused career options

In Grade 9 students are expected to conceptualize, operate and manage a business referred to as the Mini-Enterprise. At this point students should be guided to use the knowledge and skills acquired from Grade 7 and Grade 8 to produce a product (or set of products) or services for an identified/selected market. The teacher will inform students of all the tasks and targets they are expected to meet (whether on an individual or on a collective basis) in the grade 9 year, for successful transition into grade 10. Significantly projects developed in the Grade 9 year should be so designed that they can be reproduced in batch quantities to be sold as Mini-Enterprise items. Within this curriculum outline, students' projects will consist of three separate projects; in term one: kitchen utensils/ accessories and term two: Storage Device or Space Organizer. It is proposed that in the third term, a third project will also be designed and constructed for sale during the Mini-Enterprise series of activities. The proposed or suggested Grade 9 project for the third term will be Personalized Concept Clocks. It is advised that all the projects designed and constructed will be items produced for a surveyed target market. The Mini – Enterprise will be “the business concept” used to develop the business processes for each project designed and constructed in the Grade 9 year. It is anticipated that students will be guided in formulating their business ideas to reflect an organized business enterprise unit with a unique name and an organized business structure that is clearly discernible. Therefore, the primary outcome of this activity will be to establish and operate a successful Mini-Enterprise project by:

- conceptualizing a business idea;
- deriving branding solutions;
- designing production and logistics arrangements;
- sourcing capital to produce items for resale, and
- the eventual liquidation of the mini enterprise (business) activities towards the end of the Grade 9 year as profit margins are realized.

It is very important that students develop and pay close attention to the issues related to good and effective health and safety principles and the practical deliverables/skills associated with all the stages of the project from conceptualization to final output.

Project-Based Approach

This curriculum will employ a ‘project-based’ approach in which students learn through the completion of assigned tasks. The curriculum promotes the use of activities pivoted on a design innovation mode, in which students conceptualize their own designs and chose suitable materials and processes by evaluating what is available, affordable and usable. Students should not be limited to a particular concept, but should be encouraged to brainstorm all possibilities and use the recommended process outlined below to create the product. The students will, therefore, be guided through the design process to analyse a situation, problem or need; design a workable solution, construct, modify or implement the solution. Additionally, students should be encouraged to evaluate designs based on established standards and market trends and make modifications where necessary. The seamless integration of the Science, Technology, Engineering and Mathematics (STEM) concepts should be a major underpinning practice employed by the teachers as they guide the design process among the students. Students will be encouraged to practice safety and give due regard for the environment. Students should be orientated and organized to work effectively in teams as the activities are designed to simulate the work environment. Teacher and students should explore the career opportunities associated with the skill sets being developed and explore ways to market their products and/or skills, and also to make meaningful associations with the business community. The development of competencies in the use of tools and equipment as well as practising safe working habits is important and must be emphasized throughout every activity the students are engaged in.



TERM 1

Unit 1: Operating Power Equipment

- Portable Power tools
- Stationary Machines and equipment
- Safety in the use of machines

Unit 2: Fundamentals of Design and Drafting

- Constructing angles
- Constructing plane figures
- CAD Applications
- Marketing, drafting and design services

Unit 3. Sketch and Design

- Concept mapping and brainstorming
- Freehand sketching principles
- Two dimensional representations
- Three Dimensional representations
 - Isometric
 - Oblique
 - Perspective
- CAD Applications

TERM 2

Unit 4: Three Dimensional Drawing

- Isometric Drawing
- Oblique Drawing
- Basics of Perspective Drawing
- CAD Applications

Unit 5: Model making and Construction

- Understanding measurements and scales
- Preparation and Interpreting of working Drawing
- Selection of Materials
- Construction Process
 - Layout
 - Cutting
 - Assembly
 - Finishing* (Major Topic)
- CAD Applications

Unit 5: Model making and Construction

- Understanding measurements and scales
- Preparation and Interpreting of working Drawing
- Selection of Materials
- Construction Process
 - Layout
 - Cutting
 - Assembly
 - Finishing* (Major Topic)
- CAD Applications

TERM 3

Unit 6: Production and Marketing Techniques

- Define the term PRODUCTION
- Define the term MARKETING
- Identify production techniques used to produce projects
- Business modelling through the establishment of a mini enterprise
- Evaluation and quality assurance

Unit 7 Electrical Measurements and Calculations

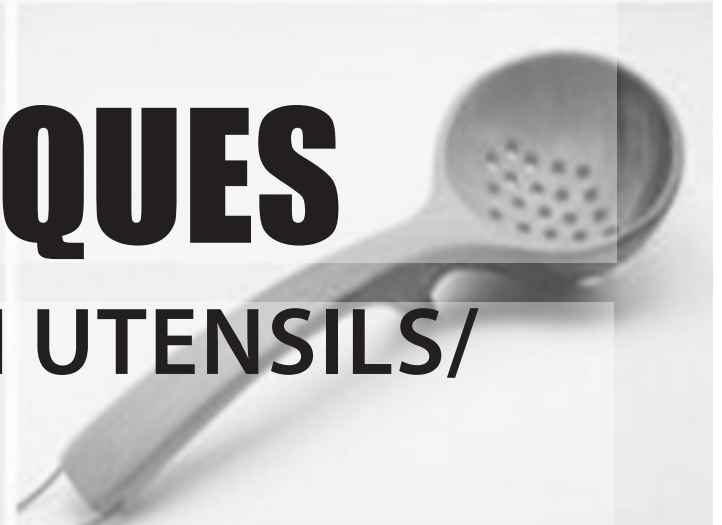
- Total Voltage
- Power
- Total Current
- Total Resistance

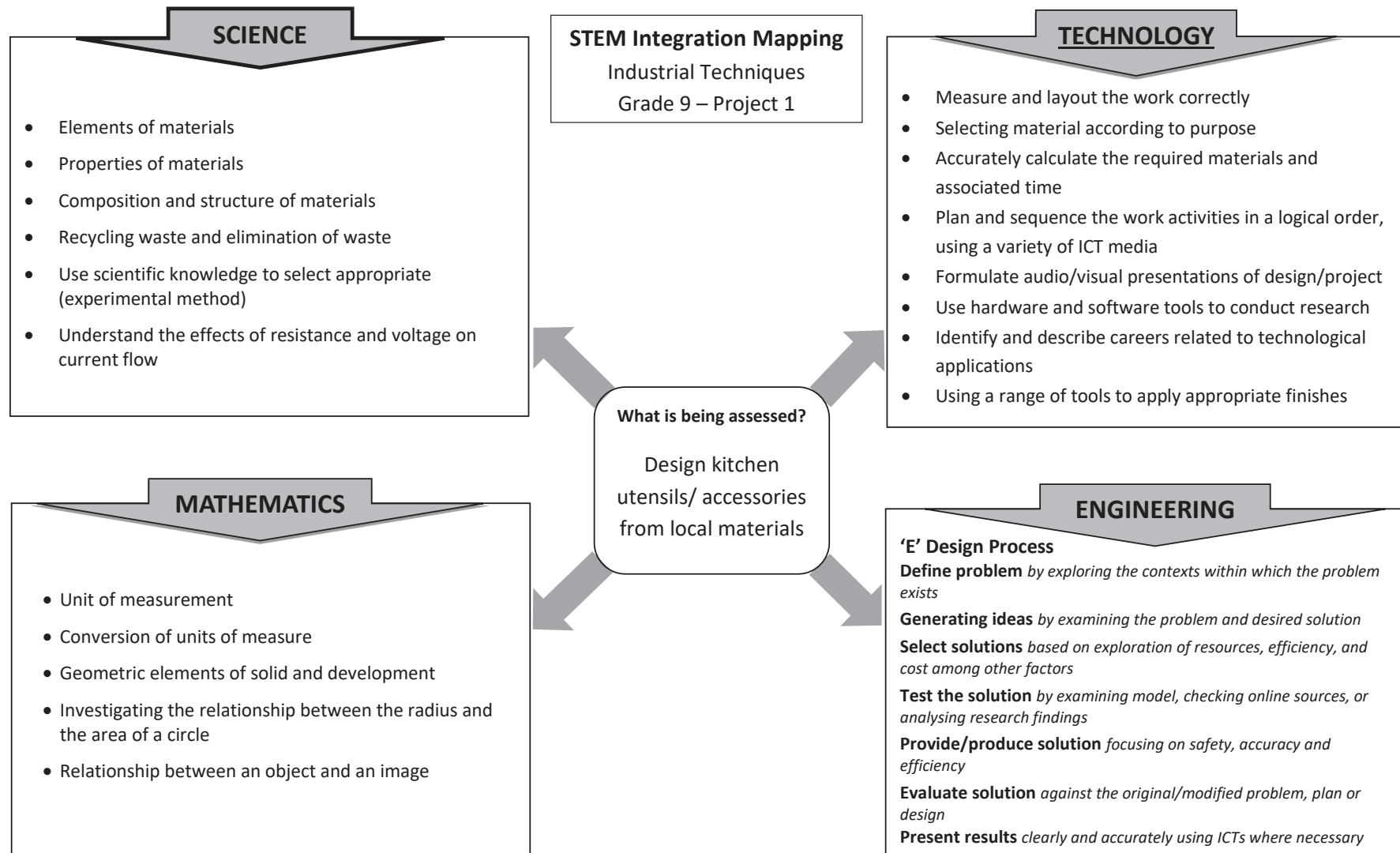


NSC

INDUSTRIAL TECHNIQUES

TERM 1 - PROJECT 9.1 KITCHEN UTENSILS/
ACCESSORIES





Associated Units

Unit 1 - Operating Power Equipment

Unit 2 - Fundamentals of Design and Drafting

Unit 3 - Sketch and Design

Unit 4 - Three-Dimensional Drawings

Unit 5 - Model Making and Construction

Unit 6 - Production and Marketing Techniques

Description of the Project

A local home-goods supplier has embarked on a deal with the schools within its business environs for the supply of personalized novelty and ornamental items that are designed and manufactured through the Mini Enterprise of partner schools. An order was placed for kitchen utensils and accessories from Green Acres High School. The task for the students is to derive simple, innovative and practicable solutions (e.g. spoons, forks, trays, cutting board, spice rack, napkin holder) that will appeal to the customers and utilize eco-friendly material that is safe for use in homes.

This project should involve the use of whatever materials are at the students' disposal, bearing in mind that the solution must be cost effective, functional and environmentally safe. This activity is intended to expose students to the possibilities that exist in the field of designing and production, while developing student's basic skills in entrepreneurial services. The project also aims to develop 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.

About the Project

In this project students will design and create kitchen utensils/accessories (e.g. spoons, forks, trays, cutting board, spice rack, napkin holder). Students are expected to explore a range of locally available and environmentally friendly resources and also to select and use the most appropriate technologies to complete the project. Students will be expected to maximize the use of available technologies at their disposal as well as integrate the principles and elements of design as they construct projects in order to complete the assigned tasks. Problem solving skills should be emphasised and students should be assessed based on their competencies in the selection and utilization of resources and technological applications. Students' abilities in the following processes will be carefully scrutinized:

- i. Conceptualise design ideas
- ii. Use tools and equipment correctly and effectively
- iii. Observe standard safety and environmental practices in the working environment
- iv. Produce solutions to problems in an efficient and cost effective manner

As students will also be required to establish a mini-enterprise project and develop an accepted business model/plan. It is also anticipated that students will develop competency in working collaboratively in groups, as well as in product development and marketing.

During the teaching and learning process, teachers and students should explore associated career fields, entrepreneurial opportunities and the infusion of information and communication technologies. It is recommended that the Business Basics concepts be discretely integrated through the teaching and learning process and activities and that Business Basics teacher be called upon when needed to reinforce any fundamental skills that may be proven to be critical at particular points/juncture of the grade 9 year.

Range of Content

Students will develop knowledge and understanding by learning:

1. The standard health and safety procedures in the work environment.
2. Classification of resources.
3. Classification of technology.
4. The importance of technology in the development of projects or ideas.
5. Classification of tools and equipment.
6. Standard procedures and practices:
 - Care and maintenance of tools and equipment.
 - Use of tools and equipment.
7. Sources of power for tools and equipment.
8. Sketching principles and practice
9. Basic designing and drafting principles.
10. Introduction to CAD applications
11. Simple CAD applications (2D modelling)
12. Basic 3D Modeling Applications (eg. Sketchup)
13. Development of Business Plan.
14. Assembly and fitting procedures and principles.
15. Existing and emerging careers in project development, design and manufacturing, logistics, and Entrepreneurship.
16. Entrepreneurial opportunities associated with the development of the project.

Check that students:

- Have some knowledge and understanding of materials used in the design and construction of Industrial Techniques Projects
- Understand the basic uses of hand tools and industrial processes

PROJECT 9.1: Kitchen Utensils/Accessories

Attainment Target(s)

Strand 1: Creativity & Innovation

- Conceptualize a business idea and formulate a plan.
- Evaluate the plan to ascertain its feasibility based on cost, quality and efficiency in production/assembly

Strand 2: Method & Procedures

- Undertake tasks with increasing competence in the use and care of tools and equipment.
- Identify materials and resources required after giving consideration to quality efficiency and environmental factors.

Objectives

Students will:

- Use brainstorming and/or concept mapping to design a solution based on the problem or concept
- Research product ideas and present findings in project/presentation formats
- Evaluate designs using the design process
- Modify designs if necessary after evaluation exercises
- Demonstrate freehand sketching principles in the drawing of design solutions
- Accurately use Technical Drawing principles to draw angles, quadrilaterals, circles and arcs, polygons and other plane figures
- Create two dimensional sketches or drawings of the proposed project
 - o Using traditional drawing techniques
 - o Using Simple CAD Applications
- Accurately use the principles of Isometrics, oblique and/or perspective drawing to produce three dimensional sketches or drawings of the proposed project
 - o Using traditional drawing techniques
 - o Using Simple CAD Applications
- Identify available resources and materials to carry out the given tasks
- Select appropriate resources best suited to complete assigned tasks by analysing physical and chemical properties

Attainment Target(s)

Strand 3: Apply & Solution

- Create designs to communicate ideas for the solution as well as evaluate and modify designs based on critiques and group discussions.
- Apply a sequenced approach to the development and construction of project.

Strand 4: Career Pathway

- Demonstrate awareness of new and emerging career choices/occupations regarding activities.

Objectives

- Differentiate appropriate resources with consideration to project needs/problem.
- Examine the range of construction processes to be used to accomplish the task
- Demonstrate competence in the care and maintenance of hand tools and powered equipment.
- Select appropriate portable power tools or stationary equipment to be employed in the completion of the task.
- Select the appropriate hand tools to be employed in the completion of tasks.
- Apply appropriate safety practices in the execution of the sequence of work
- Use hand tools and portable power tools safely, accurately and efficiently.
- Calculate accurately the amount of material that is needed to complete the project.
- Apply appropriate dimensions/measurements for the project solution.
- Assemble components in a logical sequence to complete the project.
- Use appropriate information and communication technologies (ITC's) to illustrate design and construction processes.
- Estimate accurately the cost required to complete project.
- Compare finished product with other products with respect to cost, value and quality.
- Justify the choice of materials and resources with due diligence for the environment.
- Connect technological applications in society to the design and construction of the tasks
- Evaluate product against established design criteria
- Identify career pathway associated with completing this project.
- Work individually and or in groups to undertake the project or activity.

ICT ATTAINMENT TARGETS:



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



RESEARCH, CRITICAL THINKING, PROBLEM SOLVING 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.

STEM ATTAINMENT TARGETS:

SCIENCE - Students will use scientific knowledge to select appropriate experimental methods. Understand the formation and importance of minerals, rocks, and soils. Understand the importance of conserving forests and wildlife.

TECHNOLOGY - Students will develop an understanding of the role of society in the development and use of technology. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. Students will develop an understanding of and be able to select and use manufacturing technologies.

MATHEMATICS - Students will use the correct units, tools and attributes to estimate, compare and carry out the processes of measurement to given degree of accuracy. Students will explore paths, geometric shapes and space and make generalization about geometric relationships within the environment.

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 in this case a range of kitchen utensils/accessories by:

- Selecting the most feasible business ideas to determine type/ mode of mini-enterprise.
- Exploring the human, non- human, renewable and non-renewable resources available to them. Using a suitable graphics or drawing software to show their understanding of the various categories of resources.
- Discussing the technologies and selecting the most appropriate and efficient technologies that are available for the construction of the items.
- Using online and offline methods to conduct research in order to outline current and emerging trends in technology for completing similar tasks.
- Conducting interviews and surveys with selected business owners/resource persons to ascertain advantages and disadvantages of operating a business enterprise and producing kitchen utensils/accessories.
- Exploring the range and classifications of hand and power tools needed to produce a range of marketable items in an efficient manner.

- Conceptualize a solution to the need through group discussion and exploration of resources and materials
- Organize work activities sequentially and efficiently around the min enterprise
- Discuss possible alternatives Interpret data and information to arrive at a rationale conclusion
- Explore a range of available tools to complete a task
- Use hand and power tools in a safe and efficient manner

- Group/peer interaction/activities observed to ascertain effectiveness of teamwork and group dynamics among students.
- Questioning techniques used to determine students' ability to plan effectively.
- Rubric used to quantify and qualify students' competence in planning and logistics.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Designing

- Formulate a business plan to demonstrate a systematic approach to the proposed venture to include; feasibility study and market survey.
 - Create design drawings of the proposed kitchen utensils/ accessories using a systematic approach and outlining the proposed solution using:
 - o Orthographic sketches or
 - o Pictorial sketches
 - Insert a table in a word processing application to create a material list of the resources needed to complete the project. Save the document in a properly labelled folder for further retrieval and updating. This folder will be used for adding other portfolio items.
 - Discuss best practices among experts in order to improve the proposed mini-enterprise venture.
 - Discuss careers in drafting, design and woodcraft construction and associate the careers discussed with the design and construction of the project. Students will use the Internet to search for key terms such as 'careers in drafting', 'careers in design', and 'careers in woodcraft'. Student will cite the sources of information found on the internet.
 - Develop a design criteria to cater to the functionality of the proposed project
 - Discuss and critique designs in peer groups and class discussions and justify their designs culminating in a re-modelling or revision where necessary.
 - Measure and layout the parts or components of the design solution and make modifications where necessary as they evaluate their own progress.
- Review plans to justify activities
 - Design and draw visual representation of solution using traditional and/or basic CAD methods
 - Insert word processing tables
 - Save file in folder
 - Evaluate best practices
 - Cite sources appropriately
 - Justify findings
 - Assess design solution for accuracy and efficiency
 - Critique progress based on modifications
- Students observed individually or in groups as they execute designing and drafting exercises as well as critique or justify designs.
 - Rubric used to prove students' designing and drafting skills meet competency standards.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Executing

- Execute practical operations associated with the project using selected range of tools provided. 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 finish the project using the necessary fasteners and adhesives for component parts of the project
- Apply the necessary finishes or finishing to the assembled project where necessary.
- Students will compile a portfolio of the designs/modifications made to indicate increasing competence.
- Students will use images captured to create a document outlining the steps taken. Each image should have a suitable caption and a description of the process or step that was applied at each stage.

- Measure and layout accurately
- Calculate accurately with respect to material, time and associated costs
- Modify processes and practices to increase efficiency of tasks
- Observe safety rules in the execution of tasks
- Use hand and power tools skilfully and safely
- Apply appropriate finishes
- Compile evidence in a logical order
- Insert illustrations

Students observed individually or in groups as they execute tasks:

- Using hand tools and powered equipment appropriately, accurately and safely
- Practicing health, safety and environmental protection habits
- Evaluating and modifying as work progresses
- Finishing given tasks to approved standards

Evaluating

- Test project for accuracy and workability.
- Evaluate project against design criteria
 - o Individual and peer assessment practices
 - o 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.
- Conduct a Mini Enterprise business venture as outlined in a Business Plan.

- Test solution for accuracy, durability and material readiness
- Evaluate solution against original design
- Observe process and align with environmental and safety standards
- Predict possible logical outcomes

Rubric (observation, checklists and/or Rating Scales) used to qualify students' competence in:

- Compilation of the business plan
- Use of tools and materials
- 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 everyday life.
- ✓ Recognise the difference between the types of resources.
- ✓ Differentiate between non-renewable and renewable resources.
- ✓ Choose appropriate technology to suit particular situation, problems or needs.
- ✓ Develop a business plan.
- ✓ Assess the impact of modern technology to the development of modern society.
- ✓ Appreciate the importance of resource conservation in sustaining development.
- ✓ Explain the importance of safety in the use of technology.
- ✓ Appraise the alignment of safety programmes within the working environment to established standards.
- ✓ Follow safety procedure in the use and maintenance of tools and equipment.
- ✓ Differentiate between types of tools :
 - o Hand/power
 - o Classifications
- ✓ Choose appropriate tools to carry out given tasks
- ✓ Manipulate tools to carry out basic practical operations
- ✓ Use inventory control systems to manage the use and storage of material, tool and equipment.
- ✓ Read and interpret symbols and convention of working drawings
- ✓ Layout design of project
- ✓ Evaluate projects against design criteria
- ✓ Use appropriate ICT tools to create documents for portfolio
- ✓ Conduct research safely online relating to careers in drafting, design and woodcraft construction

Points to Note

- Determine the number of students to be engaged in the activities (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

Extended Learning

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

- Educational excursion
- Research projects
- Site visits
- 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, Personal protective clothing, Computers, Drawing tables, Internet access, Fasteners

KEY VOCABULARY

Design, construction, modelling, drafting, conservation, inventory, marketing, product development, technology, safety, accidents, resources, power, career, occupation, environment, maintenance, dimension, assemble, fasteners, adhesives, evaluate.

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. 2 – Designing and Producing

A.T. 3 - Research, Critical Thinking, Problem Solving And Decision Making

A.T. 4 - Digital Citizenship

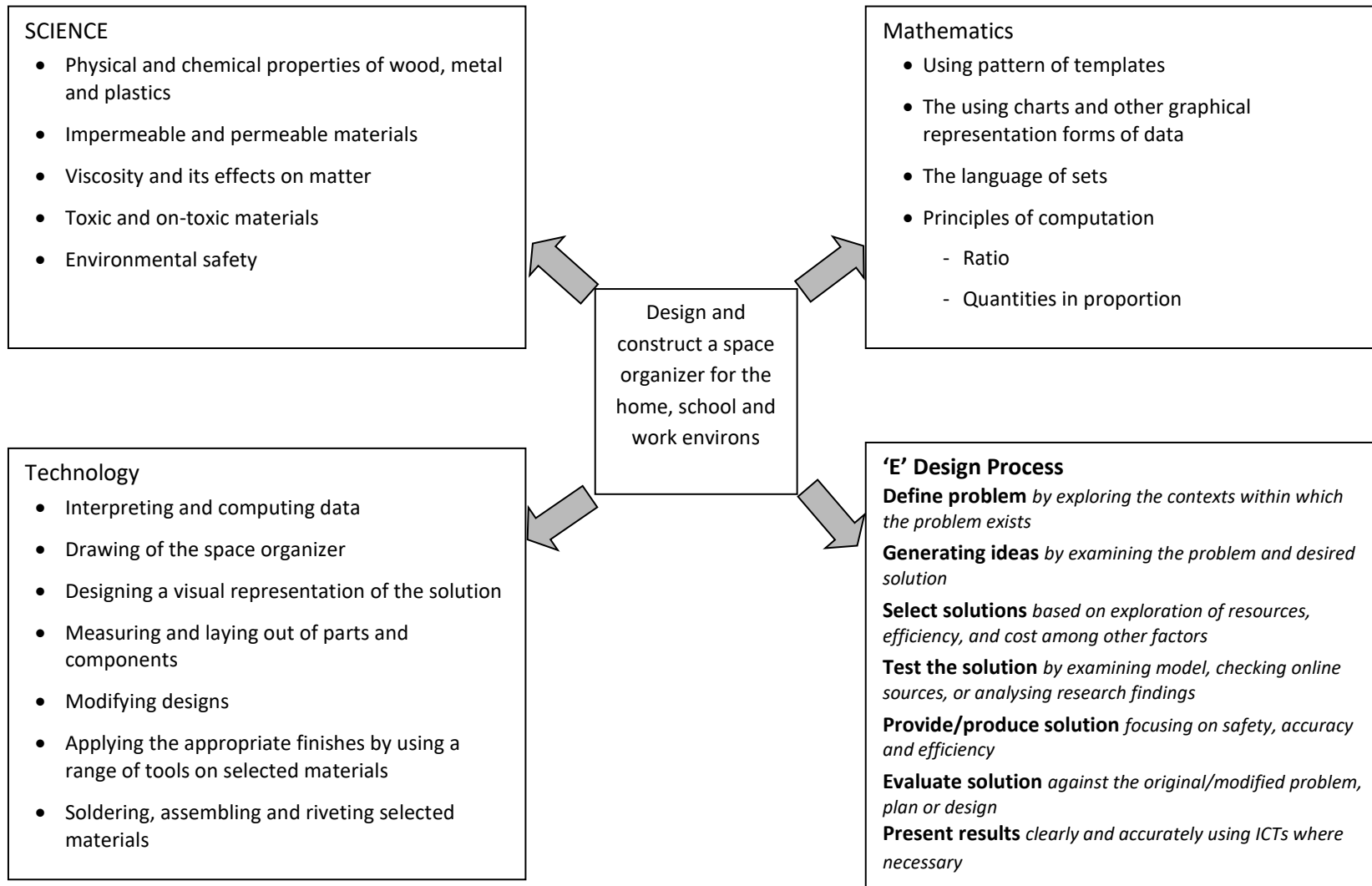


NSC

INDUSTRIAL TECHNIQUES

TERM 2 - PROJECT 9.2: STORAGE DEVICE OR
SPACE ORGANIZER

Industrial Techniques STEM Mapping
Grade 9 – Term 2



Associated Units

Unit 2 - Fundamentals of Design and Drafting

Unit 3 - Sketching

Unit 4 - Three-Dimensional Drawings

Unit 5 - Model Making and Construction

Description of the Project

The private sector organization of Jamaica, in an effort to encourage young people to see TVET as a viable option, is embarking on a major project to equip technical high schools with basic tools and equipment for all TVET areas (Industrial Education, Home Economics, Visual arts and Agriculture). Before any of the approved tools and equipment can be supplied to any school, the schools are required to design and construct suitable storage facilities to house the tools and equipment slated for each school. The principal, in an effort to secure as much tools and equipment as possible, proposed a challenge to students in the Industrial Education Department. The Industrial Education Department will be divided into four groups. Each group will be assigned a TVET department and given a specified timeline to design a storage facility to house basic tools and small equipment for that particular area. The designs produced will be judged by the teacher and students and the necessary adjustments will be made as required. The Industrial Education Department will be further tasked to construct the storage device for each department. The solution should provide a safe, convenient, cost effective and space saving storage unit for basic hand tools, gadgets and other miscellaneous items.

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.

About the Project

In this project, students will design and manufacture storage devices or space organizers for the home, school or work. They are expected to design each item to be constructed from sheet metal. Students will explore a range of sheet metal types along with their associated properties and characteristics and apply design concepts and principles to create an aesthetically pleasing and fully functional product. The product should meet market standards as students are also expected to make and market the product(s) through the mini-enterprise series of activities.

The tasks students perform (both individually and collectively) will be done through the application of proven problem solving techniques, geared towards using a range of locally available and environmentally friendly resources. In completing the tasks, students will be encouraged to select and utilize the most appropriate technological applications accessible to them. As students are monitored and supervised by their teachers and peers, the competencies in conceptualizing designs, using tools and equipment, entrepreneurship and careful observance of standards of safety and environmental procedures in the work environs will be acutely facilitated.

Students' communication and interpretive skills will be further developed and nurtured in a student centred and inquiry based teaching and learning environment. As students discover the various jobs and careers associated with light weight structural design and construction and operating a mini enterprise, it is anticipated that students will make the necessary linkages with what is done in order to complete this project and the tasks performed by professionals in the real world of work. Learners will apply business concepts and behaviour as they progress through the stages of conceptualization through to production and marketing by establishing a mini-enterprise that reflects the operations of a business entity.

Range of Content

Students will develop key concepts and competencies in:

1. Understanding the importance of health and safety when working with resources.
2. Analyzing market needs for goods and services.
3. Business and project planning to execute a mini enterprise
4. The use of the design process.
5. Selecting appropriate resources to provide solutions to problems/needs.
6. The fundamentals of sketching, designing and drafting
7. Working with materials and equipment.
8. Understanding the differences in tools and equipment.
9. Developing competencies in the use of appropriate tools for the execution of relevant tasks.
11. Material and cost calculations (quantity specifications)
12. Performing layout and assembly processes
13. Understanding mass production and efficiency.
14. Applying verbal and nonverbal skills in creating and analysing solutions.
15. Analysing the environmental impact on the use of materials.
16. Exploring waste management and its impact on the environment.
17. Application of finishes (aesthetic appeal).
18. Comparing modern practices to traditional (previous) practices.
19. Understanding career opportunities (emerging and existing) associated with the development of the project.

Check that students:

- Have knowledge and understanding of the structural characteristics of materials
- Possess knowledge of the uses of hand tools and portable power equipment
- Possess knowledge of entrepreneurship, marketing and production

PROJECT 9.1: Kitchen Utensils/Accessories

Attainment Target(s)

Strand 1: Creativity & Innovation

- Create unique designs of the Storage Device or Space Organizer and Explore technological applications in the design and construction of solutions.
- Plan and execute an entrepreneurial enterprise to produce and market the Storage Device or Space Organizer

Strand 2: Method & Procedures

- Identify materials and other resources required to execute the construction of the proposed solution.
- Examine the range of activities in the development and marketing of the Storage Device or Space Organizer.

Objectives

Students will:

- Design a solution based on the problem or concept
- Use tools, materials and machines safely and accurately
- Name the related tools and machines associated with the project to be produced
- Predict the number of projects to be produced from a given quantity of materials
- Draw two/three dimensional drawings of the proposed projects to an appropriate scale
- Produce two/three dimensional designs using available software
- Use basic CAD applications to produce drawings
- Create a series of presentation drawings of the proposed project
- Outline the steps required to complete a specific processes (for e.g. cutting or at a particular degree) or the project
- Construct orthographic views of simple objects
- Produce a budget schedule for an estimated target
- Prepare working drawings from pictorial views
- Identify available and/or smart resources needed to complete assigned tasks.
- Select available and/or smart resources needed to complete assigned tasks.
- Select the most appropriate resources with consideration to project needs/problem and environmental considerations.
- Calculate the total cost of materials used to complete a given task/project
- Demonstrate a range of operation processes to complete tasks (for cutting, layout, assembling, finishing, soldering)
- Differentiate between the terms 'unit production' and 'mass production'
- Apply appropriate finishes to a range of materials and components
- Assemble components in a logical sequence to complete the project.

Attainment Target(s)

Strand 3: Apply & Solution

- Follow a logical/systematic flow in the execution of necessary tasks to complete/construct the personal item holder.
- Apply the necessary practical skills to execute the tasks of production and marketing of the Storage Device or Space Organizer.

Strand 4: Career Pathway

- Explore career opportunities that are associated with the design and construction of the personal item holder.
- Collaborate effectively in teams/groups and simulate real world work environments.

Objectives

- Apply appropriate dimensions/measurements for the project solution
- Justify the choice of materials and other resources with due considerations for the environment
- Demonstrate an awareness of possible careers associated completing the project.
- Work individually and 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 contribution to the learning of others.



RESEARCH, CRITICAL THINKING, PROBLEM SOLVING 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.

STEM ATTAINMENT TARGETS:

SCIENCE - Students will use scientific knowledge to select appropriate experimental methods. Understand the formation and importance of minerals, rocks, and soils. Understand the importance of conserving forests and wildlife.

TECHNOLOGY - Students will develop an understanding of the role of society in the development and use of technology. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. Students will develop an understanding of and be able to select and use manufacturing technologies.

MATHEMATICS - Students will use the correct units, tools and attributes to estimate, compare and carry out the processes of measurement to given degree of accuracy. Students will explore paths, geometric shapes and space and make generalization about geometric relationships within the environment.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Planning

Conduct market research to determine the feasibility of batch producing the solution as an entrepreneurial activity using questionnaires as well as digital and online surveys.

Explore a concept for the project by analysing the results of the market research as well as examining the resources, and possible costs in completing the project's products.

Discuss the possible materials to be used to construct the project guided by their teacher based on: availability, cost, workability, durability, and other properties/characteristics of the materials.

Use internet to conduct research on the types of materials to ascertain the advantages and disadvantages of each before a final selection is made.

Explore or examine various methods of storing or sorting the identified items at different locations in the home, school or work environs with due regard for the type of materials from which they are constructed.

- Explore storage methods for specific materials

Suggest the best way(s) to store or display the items for ease of access and to determine the most suitable type(s) of materials to make a holder/container for the selected items.

Plan strategies to produce and market the item in an efficient and cost effective manner giving consideration to quality, safety and environmental factors

- Conduct research of facts presented
- Design and analyze questionnaires
- Conceptualize solution to needs identified
- Calculating cost based material proportionalities
- Conduct electronic search
- Probe a range of materials, methodology and design
- Plan strategically for quality
- Categorize materials according to suitability
- Explore methodologies for storing

- List of items in the selected environments – feasibility of storage/organizing
- Research shows evidence of interaction with community and peers to determine genuine need and feasibility of producing in large quantities
- Documents indicate development of competencies in ICT.
- Research indicates evidence of knowledge of classification and properties of metals using both online and offline resources
- Evidence of emergence of planning skills and group dynamics as well as leadership and management skills among peers.

Suggested Teaching and Learning Activities

Students will:

Designing

Select a category of items used in the selected environments and suggest the most suitable method and type of material(s) to store or display items in an efficient and safe manner.

Analyse the selected items giving consideration to material, purpose, size, shape and factors relating to characteristics and makeup.

Select an existing Storage Device or Space Organizer and ask student to critique the design, highlighting specific principles and elements of design, students will make notes of their observations.

- Students could be placed in groups and each group select a storage device/space organizer to critique and present their findings.

Investigate and assess what was done by previous and existing designers with emphasis on specific principles and elements important to the creation of those designs. Students should closely scrutinize/analyse the number of components/parts, shape and size, colour and texture, and the type of material(s) infused in the item's design. Use electronic or online sources to conduct research on other designs. Create a typed report of designs found in research, including images as well as detail of the design elements used.

Decide on the type of material(s) they will use to construct the Storage Device/Organizer. To justify their selection students will create a multimedia presentation highlighting the specific benefits of the material(s) selected based on the material's physical and chemical properties.

Determine the shape, size, type and the number of items the Storage device/ Organizer will store or display by developing a design specification table of the project's width, height, length, colour, range/type of materials and capacity (to be done based on project functionality/purpose).

Create design(s) of storage device or space organizer with emphasis on how the items will be stored in a safe manner or organized for ease of access by users.

determined by the students.

Key Skills

- Selection of material
- Critique principle and elements of design
- Assess prior work and output
- Calculate material in respect to quantities
- Formulate a final design based on a number of predetermined objectives
- Create and format multimedia presentation
- assess design solution for accuracy
- Design and draft visual representation of project concept
- Prepare/format working drawings
- Use digital drafting tools

Assessment Criteria

- Designs created adhering to the principles and elements of design

Suggested Teaching and Learning Activities

Students will:

Design and complete all drawings in two and three dimensional formats utilizing both manual and digital methods to formulate or conceptualize design (use of computer aided drafting and designing software and hardware tools).

Represent sketches and drawings of their designs on plain uncoated paper, grid sheet or digital templates with correct annotations to be

Executing

Make presentation to entire group to illustrate the design and design specifications focusing on how the design aids in the functionality and output efficiency of a product (digital/ manual; Audio/visual presentations).

Organize teams (if group work is done) to reflect different stages of the production and marketing process to reflect the business and production environments. Create time sheets and inventory documents as well as set completion targets and deadlines (using digital or manual forms)

Develop a process flow sheet/chart to organize the production plans and to track their future progress of work/tasks to signal coverage of points of completion and outline the steps/stages and processes that are necessary/required to create/construct a fully functional item holder/container.

Construct the project in an agreed time (set deadline) determined by both the teacher and students. Select the best tools (manual and portable) to be used at different stages of constructing the project relating to basic operations for: measuring and layout; cutting and modifying; and application of finishes

Fit the component parts and check for accuracy before installation of fasteners. Quality assurance team check for accuracy and efficiency and reports to team leader and/or manager (using digital and manual forms).

Discuss and probe the various career pathways that are aligned and associated with the design and construction and fabrication of materials industry guided by the teacher and use of electronic databases or other online sources.

Key Skills

- Make an audio-visual presentation of project concept
- Collaborate effectively in teams
- Use target completion tools and documents
- Design progress or production chart
- Construct the proposed project
- Evaluate component's readiness
- Research related/associated careers
- Use electronic databases and other sources
- Apply finishing applications
- Observe safety rules in the execution of tasks

Assessment Criteria

Working drawings developed to specify appropriate width, length, height and any other main dimensions critical for the project's complete construction

Project profile highlights key or main stages to complete the project and includes for example sketches, working drawings and design specification sheet

Storage Device or Space Organizer made within the prescribed time and according to the specifications developed using a range of hand and portable tools in a safe manner

Suggested Teaching and Learning Activities

Evaluating

Critique work by conducting individual reflection and self-evaluation.

Quality assurance team assess work and conduct presentations/team meetings to highlight areas of success/weakness.

Mount or display completed projects in a designated area of the classroom/lab/school and perform peer group critiques based on pre-established criteria with a view for students to suggest at least one design change to improve the function or aesthetic merit of the other individuals'/group project. Capture Image of projects, post to class blog, allow students to post critiques and rate projects based on a given rubric.

Management team analyse work and set prices and marketing plans.

Key Skills

- Critique processes and make recommendations
- Evaluate solution against original design
- Analyse mounted projects
- Post comments
- Conduct surveys
- Collaborate on assessment

Assessment Criteria

Rubric (checklists and/or Rating Scales) used to qualify students' competence in using of hand tool and quality of work based set of pre-set criteria agreed on by teacher and students

Learning Outcomes

Students will be able to:

- ✓ Conduct market research and product development exercises
- ✓ Prepare a business plan to chart proposals for entrepreneurial activities.
- ✓ Prepare estimates for completion of work with respect to cost, time and manpower needs.
- ✓ Understand that properties and characteristics of the sheet metal, fasteners and finishing material are critical to the functional design of a project.
- ✓ Understand that the properties of a material can be manipulated to improve effectiveness and efficiency as well as the quality of the product.
- ✓ Appreciate that design principles and function can improve the functionality of a project.
- ✓ Identify and use basic hand and portable tools safely.
- ✓ Use sheet metalworking tools safely and efficiently.
- ✓ Carry out basic operational processes.
- ✓ Represent designs on paper and digital platforms.
- ✓ Develop basic two and three dimensional drafting skills.
- ✓ Perform basic estimates of quantities of material needed for completion of solution based on design specifications.
- ✓ Recognize the discrete stages in the construction of a project/product.
- ✓ Construct/assemble solution to meet design criteria/specifications.
- ✓ Begin to make informed project assessment/evaluation.
- ✓ Use online and offline resources to investigate existing designs
- ✓ Collaborate online to critique projects
- ✓ Capture and upload images of projects.

Points to Note

- Market research conducted and business plan created to reflect the feasibility of developing a mini enterprise project.
- Mini Enterprise to be created to manufacture and market items.
- Student groups formed to deal with management and production in the Mini Enterprise.
- Determine the number of students to be engaged in the activities (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/honing students' creative ability in design tasks.
- Collaborative/peer group interactions among students.
- Students should be encouraged to practise safe behaviour when using digital media or searching for information on the internet.

Extended Learning

- Investigate what are composite materials and how they are used in the small project construction, building and general construction fields.
- Improve on the existing design of project.
- Developing a care label and/or user manual for the project, based on the type of material used and function of item.

RESOURCES

Material for example: wood, plastic, glass, Hand and portable tools, Internet, Multimedia devices, Paper, CAD software, Computer, Books, Adhesives and fasteners, Finishing materials, Personal protective clothing

KEY VOCABULARY

Characteristics, Drafting, Two dimension/ three dimension, Properties, Physical, Rivet, Solder, Business Plan, Market Research, Supervise Chemical, Software, Adhesive, Modify, Finish, Finishes, Environment, Client, Manage

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

A.T. 3 - Research, Critical Thinking, Problem Solving And Decision Making

A.T. 4 - Digital Citizenship

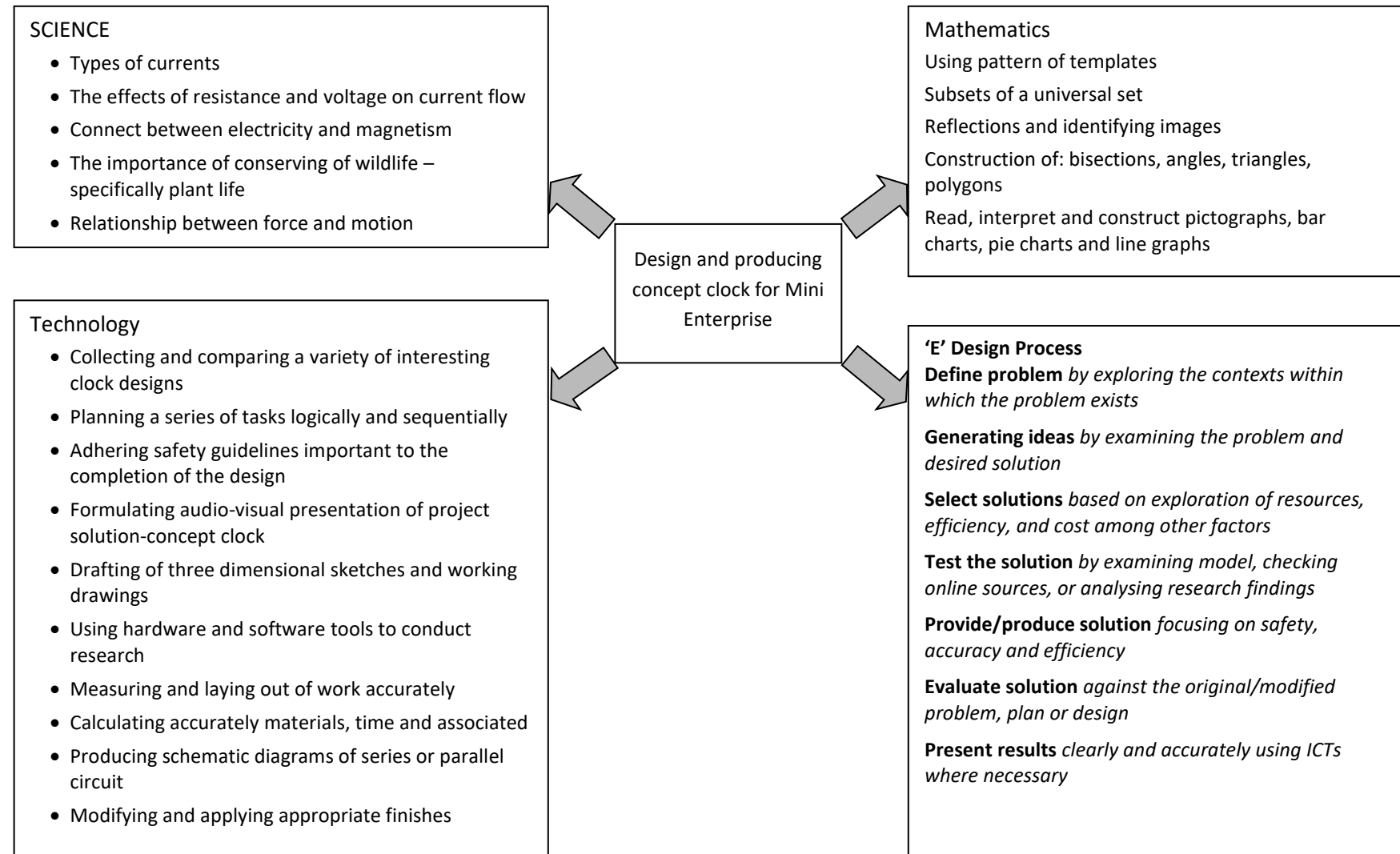


NSC

INDUSTRIAL TECHNIQUES

**TERM 3 - PROJECT 9.3: PERSONALIZED
CONCEPT CLOCKS**

Industrial Techniques STEM Mapping
Personalised Concept Clocks
Grade 9 – Term 3



Associated Units

Unit 1 - Operating Power Equipment

Unit 3 - Sketch and Design

Unit 5 - Waste Management

Unit 6 - Resource Management

Description of the Project

In the execution of this project students are expected to design and construct personalized concept clocks for display and use in any room in the home or an office setting. The shape of the clock will be based upon an agreed theme or mood of your choice and can be made from any available material(s) in the local environs. The clock mechanism will be provided through the mini-enterprise as one of the enterprise's main production inputs. The clock can be designed to be either free standing or fitted with an attachment so that it can be displayed hanging from a wall. The design of the clock should also accommodate a controlled lighting feature with bulbs (LED) connected in a parallel circuit design. Students are expected to design and develop a prototype to be replicated or modified for production in the mini-enterprise project.

About the Project

In the execution of this project students are expected to design and construct personalized concept clocks for display and use in any room in the home or an office setting. The shape of the clock will be based upon an agreed theme or mood of your choice and can be made from any available material(s) in the local environs. The clock mechanism will be provided through the mini-enterprise as one of the enterprise's main production inputs. The clock can be designed to be either free standing or fitted with an attachment so that it can be displayed hanging from a wall. The design of the clock should also accommodate a controlled lighting feature with bulbs (LED) connected in a parallel circuit design. Students are expected to design and develop a prototype to be replicated or modified for production in the mini-enterprise project.

It is also anticipated the students will be actively engaged in a range of diverse process in keeping with operating an efficient mini-enterprise project with the express view/goal to make a determine return on the projects' initial investment. While the main objective is the production clocks for resale in the mini-enterprise project, students are expected to develop and refine their competencies in the following areas: representing visual ideas/concepts; producing two and three dimensional designs whether manually or electronically; using tools and equipment to carry out a task or process more proficiently with a regard for safety; installation and testing of a simple parallel circuit; identifying and managing a production cycle for producing small items such as the one produced for a mini-enterprise; determining the feasibility and marketability of a product and the tenets of a good business plan. It is believed that the exposure that students garner at this juncture will assist them in honing their creative, imaginative and collaborative skills as learners actively contemplate their career aspirations whether as entrepreneurs, industrial professional or production managers through active and real world engagements.

Range of Content

Students will develop key concepts and competencies in:

1. The importance of health and safety when working with resources.
2. Sketching and designing basic visual ideas
3. Modelling, Designing and Constructing a concept design (such as a personalized concept clock)
4. Creating three dimensional models and producing workings drawings
5. Producing Computer Aided Design/Drafting (optional)
6. Selecting resources for Construction and Forming
7. Using a range of hand tools and portable power tools correctly to execute specific operations
8. Introductory operations of power equipment
9. Processing various of Materials
10. The installation of Parallel Circuits
11. Testing simple electrical circuits
12. Operating of a Mini Enterprise
13. Developing a product to reflect a range of production objectives
14. Critically assessing factors necessary for planning and organizing phases of production
15. Entrepreneurial opportunities associated with the development of the project

Check that students:

- Materials and the properties that influence selection for use and processing
- Hand and portable power tools use in different work situation
- Design and construction principles in attaining prescribed objectives/targets
- The tenets of a good business plan

PROJECT 9.3: Design and Production of Personalized Concept Clocks

Attainment Target(s)

Strand 1: Creativity & Innovation

- Produce an original/germane plan to operate an entrepreneurial enterprise based on the industrial techniques competencies previously acquired and being honed
- Increase skills, knowledge and competence in the selection and utilization of materials, tools, techniques and processes

Strand 2: Method & Procedures

- Make informed decisions in order to identify and select materials, processes, tools and equipment best suited to produce the desired outputs for the project
- Discuss the role of technology and individuals in the development and production of personalized concept clock

Strand 3: Apply & Solution

- Communicate/convey their ideas through gathering information, data and images necessary to plan and develop designs for the concept clocks
- Plan, design, construct and evaluate well-crafted personalize concept clocks for a prescribed market

Strand 4: Career Pathway

- Demonstrate awareness of new and emerging career choices/occupations regarding activities.
- Explore career opportunities that are associated with the design and construction of the personalized concept clock.
- Collaborate effectively in teams/groups and simulate real world work environments

Objectives

Students will:

- Explain the principle of current flow
- Use the elements of design to produce/make 3D object
- Use prescribe scales to reduce and enlarge an image or object
- Interpret diagrammatic information on working drawing
- Demonstrate the accurate using of manual and CAD enabled tools to produce various drawings
- Define the term production
- Outline the tenets/features of a business plan
- Define the term marketing
- Identify production techniques used in the manufacturing process
- Model the roles of operatives in a business
- Connect accurately to components of a series to produce a desire outcome
- Apply the standard principles of electricity to compute various electrical values
 - o Calculate accurately the total voltage in a circuit
 - o Calculate accurately the power in a circuit
 - o Calculate accurately the total resistance in a circuit
 - o Calculate accurately the total current in a circuit
- Explain appropriate/accurate terminologies relating to electrical measurements and quantities
- Use electrical tools and measuring instruments safely
- Use drawing tools appropriately and safely
- Justify/assess the operating principles of a simple circuit solution
- Distinguish/differentiate between the components in a simple circuit
- Identify the main characteristics/considerations used to determine the most suitable finishing material
- Explain how energy/motion can be transferred/manipulate using different types of mechanical mechanisms

ICT ATTAINMENT TARGETS:



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



RESEARCH, CRITICAL THINKING, PROBLEM SOLVING 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.

STEM ATTAINMENT TARGETS:

SCIENCE - Students will use scientific knowledge to select appropriate experimental methods. Understand the formation and importance of minerals, rocks, and soils. Understand the importance of conserving forests and wildlife.

TECHNOLOGY - Students will develop an understanding of the role of society in the development and use of technology. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. Students will develop an understanding of and be able to select and use manufacturing technologies.

MATHEMATICS - Students will use the correct units, tools and attributes to estimate, compare and carry out the processes of measurement to given degree of accuracy. Students will explore paths, geometric shapes and space and make generalization about geometric relationships within the environment.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Planning

- Outline the major activities to be performed in the mini-enterprise activities
- Organize the activities to be performed in the business under the related departments
- Outline duties to be performed by each team member
- Prepare job description for each department
- Select team leaders/managers for each departments
- Construct an organizational chart to represent the business structure, relationship and process flow. Use available software tools to develop organisational chart.
- Select method of production
- Outline market and sales strategies
- Propose liquidation and closing down plan *to be introduced and implemented as Mini-Enterprise experience evolves*
- Brainstorm for designs of the clocks by developing a cognitive charts (spider diagram) or attribute analysis by seeking answers to the following questions:
 - o Where will the product be used?
 - o Who will use the product or system?
 - o What materials will the product be made of?
 - o How much money will it cost to make each product?
 - o Where will the resources come from to complete the product?
- Create a brainstorming chart to highlight areas of importance to be included when designing the personalized concept clock the product. Use a word processing or spread sheet software to create chart.

Material	Where will it be used	Size	Colour	Access	Budget

- Create an image board of the target market by using old magazines, promotion flyers and web page images

- Insert illustrations

- Probe a range of materials and design solutions

- Critically assess design needs

- Insert illustrations

- Manipulate a word processor

- Create idea charts and boards

- Organize work activities sequentially and effectively

- Compare and contrast design solution

Design and formulate charts and tables that adhere to and shows evidence of understanding of brainstorming and creative process principles

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

- Collect and compare a variety of interesting clock designs, between 3 -5 then critique the designs of the clocks based on the following factors: cost, user, aesthetics, size, environment and materials
- Create a design needs table of specification, the table created should be based on the six factors identified in the previous activity and comment on what 'must' and what 'may' be included when designing and constructing the clocks
- Develop a step by step outline (procedural map) of all the steps required to complete the clock and replicated (copied), so that all members of the production team will have knowledge and access to this for reference when constructing each clock. Use available software to outline steps and print a copy for the production team.

- Represent ideas visually
- Plan a series of tasks logically and sequentially

Steps and guidelines developed shows evidence of understanding of concepts and production/ process flow

Designing

- 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.
- Analyse and decide on the final clock designs, by assessing the types of materials most available and suited for making the base frame and supports for the clocks which will house the clock mechanism. Students should also be aware that the clock's overall design should include the necessary allowance or design flexibility to include the configuration of a parallel circuit lighting feature, which can be powered on/off as needed
- Produce 3D sketches and working drawings of final designs of the clock, using traditional and digitalize formats:
 - o Isometric Drawings
 - o Oblique Drawings
 - o Basics of Orthographic Projection Drawings on either plain uncoated paper or on a digital platform

- Produce safety guidelines
- Analyse and discuss critical features of a final design
- Produce three dimensional sketches and working drawings
- Use digital drawing tools
- Use hardware and software Tools

Designs and working drawing created adhere to the principles and elements of a quality good technical drawing and drafting competencies

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

- Investigate/research the following methods/processes:
 - o Vacuum Foaming
 - o Strip Heating
 - o CAD CAMeach of which can be used to create base frames/templates for the specific products, in this particular case (the base frames/templates for the clocks. Student will be asked to produce a 12 slide presentation using a multimedia presentation format of their choice (use of offline/online resources is encouraged) to represent their findings

- Investigate new processes
- Create multimedia presentation
- Present audio-visual information effectively
- Use offline and online source for gathering information

Observation of students individually or in groups as they critique and justify the concept for their design and complete drafting exercises

Executing

- Create templates or use a specific method to develop the required base frame for the concept clocks, this should be able to make several frames from the single template or mould
 - o Measuring and layout processes
 - o Cutting and modifying processes
 - o Joining and fitting processes
- Decide and justify evidence for selecting the most suitable method for producing the base shape/frame for the clocks to be used in the 'Mini-Enterprise, based on the following factors:
 - o Type(s) of materials available for use
 - o Time needed to make each shape
 - o The ease of processes
 - o Ability to replicate processes with maximum accuracy and efficiency
- Agree on an established procedure/method for decorating the face of the clocks' base shape/frame by: shaping, superimposing an image, or painting an image or design to the clock. The method used should create an aesthetically pleasing image

- Measure and layout work accurately
- Calculate accurately materials, time and associated costs
- Collaborate effectively in teams
- Select appropriate tools and equipment

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

Students will:

- Make the following design and production decisions after peer and group feedback and inputs:
 - o Design a suitable method for mounting or providing support so that the clock will be able to stand securely when displayed
 - o Ensure that the batteries for the clock can be accessed from the back of the clock
 - o The switch for powering on/off the light feature should be fitted for ease of access
 - o Make a hole or incision in the frame of the clock to accommodate the hands and clock mechanism which should be securely attached/fixed to the back of the clock
 - Design and produce a schematic diagram for the lighting feature of the clock; the diagram must be correctly annotated with details where necessary.
 - Install the lighting feature of the clock using a parallel circuit design layout, this should be done in an efficient way to minimize waste and should be discretely hidden so that wires are not easily observed or accessible. Bulbs should be arranged in a manner that highlights and add to the design features of the concept clock
 - Preassemble all components and parts of the clock and test functionality of related units:
 - o Main Shape/frame of the clock
 - o Hands of the clock
 - o Clock mechanism
 - o Lighting feature wiring
 - o Lighting feature bulb arrangement and alignment
 - o Battery holder positioning
 - o Attachment or stand for mounting or displaying the clock
 - Apply an appropriate finishing applications to the various components /parts where necessary using a recommended application method for example whether through brushing or spraying
 - Assemble all components/parts with appropriate, fasteners, adhesives and ironmongery fittings and fixtures for example hinges and locks
 - Prepare a plan to market all the items/products made for the 'Mini-Enterprise' in terms one and two with a view to recoup the initial investment of capital used to start the company (Mini-Enterprise)
- Use tools and equipment
 - Execute accurately all processes
 - Use schematic diagrams
 - Install components to specification
 - Observe safety rules in the execution of tasks
 - Modify processes and practices
 - Apply appropriate finishes

Design of schematic created adhere to the principles and understanding of an electrical circuit operation

Outcome of research undertaken demonstrates understanding of careers in connection with project

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

- Conduct research in groups to investigate the different career paths associated with the different skill sets explored or task performed during the mini-enterprise activities to determine how these entrepreneurial type jobs impact people's lively hoods and sustainable economy returns in Jamaica and globally
- Conduct online research

Evaluating

- Display the prototype of the concept clock using an appropriate evaluating instrument design to record the target market response to the finished product
 - Analyse the information and comments and make the minor adjustments where necessary before the batch phase production for the mini-enterprise begins
 - Design an instrument to record and report on the mini-enterprise's performance based on a number of pre-established attainment targets
 - Document findings and recommendations for posterity in an appropriate manner (whether on paper or digitize format) to be used as a resource material for future Mini-Enterpriser. For example photos, specification tables and work sheets and drawings
 - Evaluate solution against original or modified design
 - Analyse work done and modify as is necessary
 - Chronologically document findings and recommendations
 - Critique processes and make recommendations
- Records give evidences and proof of successful implementation of project

Learning Outcomes

Students will be able to:

- ✓ Select and use materials based on the functionality and versatility of the material
- ✓ Manipulate materials to improve effectiveness and efficiency as well as the quality of the product.
- ✓ Use design principles and function to improve the functionality of a project.
- ✓ Identify and use basic hand and portable tools safely.
- ✓ Carry out basic operational processes.
- ✓ Represent designs on paper and digital platforms.
- ✓ Develop two and three dimensional drafting tasks.
- ✓ Perform basic estimates of quantities of material needed for completion of solution based on design specifications.
- ✓ Identify and develop steps for designing and constructing of a project/product.
- ✓ Construct/assemble solution to meet design criteria/specifications/market needs.
- ✓ Make informed project assessment/evaluation decisions.
- ✓ Determine a project and business viability based on cooperative assessment
- ✓ Report with confidence findings and recommendations based on empirical evidence
- ✓ Use software tools to aid presentation and express ideas
- ✓ Conduct online and offline research

Points to Note

- Main tenants of the Business Plan and the objectives of the Mini-Enterprise
- Number of students to be engaged in the activities (determine whether major tasks will be done individually or in groups)
- Identify limitations in respect to size and overall capacity of the project
- Safety of students working with materials, tools and among peers
- Accurately recording and representing financial information
- 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 attitudes can be further augmented by the following:

- Investigate the requirements of a patent and develop a patent for any unique designs created during this activity that could be refined for future opportunities
- Investigate the advantages and disadvantages of operating a small to medium size business
- Field trip to the Jamaica Stock Exchange to get an understanding of that entity's role in assisting companies improve their viability

RESOURCES

Materials for example: wood, plastic, glass, Blank paper, Related hand/portable tools, Computers, Drawing tables, Work table, Internet, LED bulbs, Wire, 30 watt Soldering Iron, 60/40 Soldering wire, Multimeter, Protective wares and gears, Fasteners and adhesives, Computer Aided design Software, And other materials, tools and equipment that maybe deeded necessary in executing specialized tasks and operations

KEY VOCABULARY

Portable, Stationary, Production, Marketing, Advertise, Management, Coordinate, Mini-Enterprise, Isometric, Oblique, Perspective, Modelling Feasibility, Modification, Innovative, Entrepreneur, Liquidation, Mechanism, Vacuum, Cognitive, Attribute, Replicate, Access, Reference, Efficient, Aesthetic, Schematic, Emitting, Diode, Soldering, foam

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. 2 – Designing and Producing

A.T. 3 - Research, Critical Thinking, Problem Solving And Decision Making

A.T. 4 - Digital Citizenship

Business Basics: A.T's -

Related to entrepreneurship and business plan development and implementation



NSC

RESOURCE AND TECHNOLOGY

GRADE 9 PROJECTS: BUSINESS BASICS



NSC

BUSINESS BASICS

GRADE 9: TERM 1

PROJECT 9.1: TYPES OF BUSINESS OWNERSHIPS

TERM 1

UNIT 1 -

Types of Business Ownerships

- Reasons for establishing a business
- Types of business ownerships – sole proprietorship, partnership and private limited company
- Features, formation and termination of business units
- Advantages and disadvantages of the types of business units (sole proprietorship, partnership and private limited company)
- Skills and qualification for careers in business operation

TERM 2

UNIT 1

Marketing Activities

- Definition of terms: marketing, sales promotion, advertising, distribution
- Types and importance of sales promotion strategies used by business to promote sales
- Types and importance of advertising media used by businesses
- Factors determining the medium used by businesses to advertise goods and services
- Channels for distributing goods and services
- Safety considerations associated with marketing goods and services
- Careers associated with the marketing, health science, and weather are applicable to future careers

UNIT 2

Planning and Organizing for Production

- Major departments in a business: production, sales, finance, administrative services
- Duties performed in the various departments in a business
- Financial records maintained by a business; order form, invoice, receipts, cash book
- Job descriptions, company charter
- Organizational charts for business to be operated

TERM 3

UNIT 1

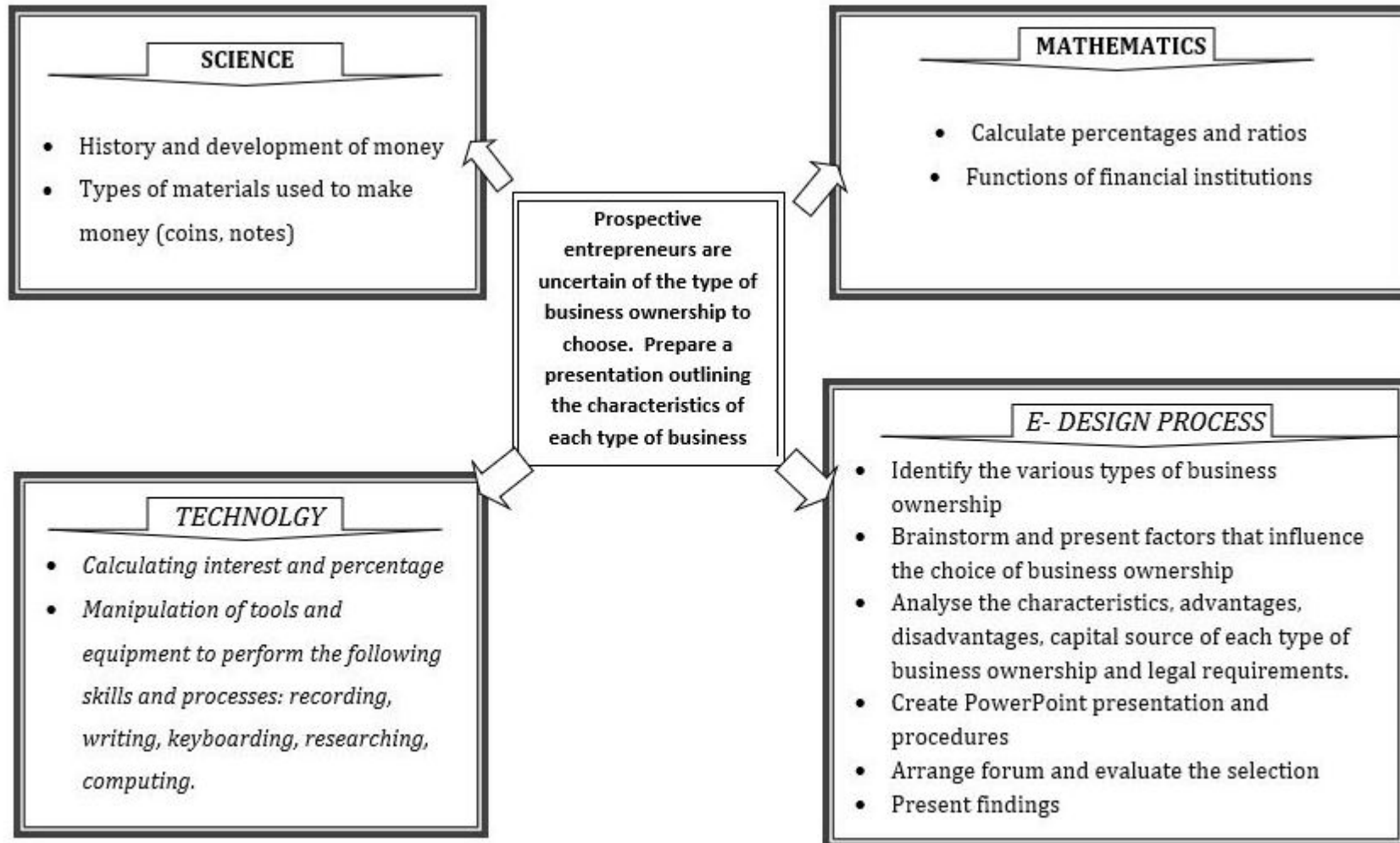
Operating the Business

- Sourcing raw materials
- Complete appropriate financial documents to purchase raw materials and supplies
- Establishing production procedures
- Developing strategies for organizational production
- Producing/manufacturing/retail goods or services
- Monitoring product quality
- Promoting goods and services
- Selling goods and services
- Preparing financial documents to record credit sales (journal)
- Preparing periodic departmental reports

UNIT 2

Evaluating and Liquidating Business

- Definition of Terms: Evaluating and liquidating
- Responsibilities of department for evaluating and liquidating
- Financial records and other documents used for evaluating and liquidating
- Preparation of final departmental reports
- Preparation of annual reports
- Calculating of dividends
- Disbursing dividends



About the Project**In this project students will learn about**

- three of the four types of business ownerships; namely sole proprietorship/sole trader, partnership and private limited company or corporation.
- features of each type of business ownership.
- advantages and disadvantages of each type of business ownership.
- the legal requirements for registering businesses
- documents prepared for registering a business
- Sources of financing for businesses
- key terms associated with establishing a business intellectual property such as registering trademarks, patents or copyrights.
- On completion of the project they should be able to select the appropriate type of business unit/ownership best suited for the business to be operated in terms one or two.
- To select and implement management practices for a given situation
- To select and use correct resources to achieve positive business outcomes

Range of Content**Key concepts, skills and knowledge students will learn in this Project:**

- Reasons for establishing a business
- Types of business ownership - sole proprietorship, partnership and private limited company
- Features, formation and termination of business units
- Advantages and disadvantages of the types of business units (sole proprietorship, partnership and private limited company)
- Skills and qualification for careers in business operation

Guidance for the Teacher

Students should be exposed to three of the four types of business ownership. A scenario should be developed to introduce the content for example an individual has decided to establish a business but needs advice on the type of business that could be established or examples of business ownership in the immediate community can be presented for discussion e.g. the owner of a grocery shop in the community, the dentist, commercial banks, a team of professionals e.g. lawyers, doctors, architect, a large manufacturing company

Lessons should be developed to introduce each type of business organization with emphasis on the features or characteristics, formation, sources of raising capital, documentation associated with each type of business and the advantages and disadvantages of each.

Where an interview is to be conducted an interview protocol should be developed to guide students in asking the appropriate questions of the interviewee. The protocol should be developed with the assistance of the teacher. The three types of businesses being studied should be represented.

Guidelines for completing Project

For presentation of the project, students should be organized in three groups, each selecting one type of business and prepare a powerpoint presentation outlining the legal requirements of establishing the type of business selected, sources from which capital can be identified, benefits, advantages and disadvantages of the type of business selected. Students may select existing businesses in their immediate or wider community as practical examples and discuss other legal or ethical requirements for operating the particular business e.g. local licences Completed samples of documents relevant to the specific business should be included e.g. food handlers' permit, spirit licence.

Check that students can:

- main department in a business
- various types of business organizations operating in their communities

PROJECT 9.1: Types of Business Ownerships

Attainment Target(s)

Strand 1: Creativity & Innovation

- Brainstorm to determine the types of businesses that can be established to provide goods or services to satisfy consumer needs or wants

Strand 2: Method & Procedures

- Gather information on the requirements for establishing a business
- Identify the resources that are required to register businesses in Jamaica

Strand 3: Apply & Solution

- Evaluate the options available to operate business

Strand 4: Career Pathway

- Identify skills and qualifications associated with operating a business

Objectives

Students will:

- Define the terms business, capital, liability, limited liability, unlimited liability, collateral, loan
- Discuss the reasons for starting a business
- Identify three types of business ownerships
- Describe the features of each type of business ownership
- Discuss the various sources of raising capital for each types of business ownership.
- Calculate capital contribution of each partner from given scenario.
- Discuss the role of financial institutions as a source of capital
- Identify materials used to make money (coins and notes)
- Discuss the advantages and disadvantages of each type of business ownership
- Outline the legal requirement for establishing each type of business ownership
- Prepare the appropriate documents that are required in forming a business
- Outline the procedures for the formation of each type of business
- Suggest the factors which influence the choice of business
- Identify the basic skills and qualification required to operate a business.
- Calculate the interest on a various sources of capital to determine the 'best' bargain.

ICT ATTAINMENT TARGETS:



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



RESEARCH, CRITICAL THINKING, PROBLEM SOLVING 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.

STEM ATTAINMENT TARGETS:

SCIENCE - AT3 Energy and Matter – Grade 3 - Sort materials into groups in a variety of ways and explain why some materials are suited to specific purposes.

TECHNOLOGY - T&S STANDARDS 13 - Students will develop the abilities to assess the impact of products and systems

MATHEMATICS - AT1 Number Operation and Application – Grade 8 Solve simple problems involving ratio and proportion

AT1 Number Operation and Application – Grade 5 Demonstrate an understanding of financial institutions and their functions

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Discuss case studies or scenario depicting forms of business ownerships Critique business names to determine the type of ownership e.g. Grace Kennedy Ltd., J & J Garage, Juici Patties

Conduct research online or read textbook to formulate definition of types of business organizations

Listen to video or guest presentation or conduct interviews with individuals who operate any type of business outlining the reasons for operating business, , type of business operated , legal requirements for establishing the type of business, advantages and disadvantages of operating the types of business.

In groups make an oral and written presentation outlining the key characteristics of each type of business ownership

Use video/audio recording device to record oral presentation for class playback

Discuss key terms associated with each type of business and formulate definitions e.g. liability, limited and unlimited liability, collateral, capital, loan,

Collect brochures or visit website, conduct field trip (Companies of Jamaica) and research the procedure for registering a business in Jamaica.

Download or collect samples of appropriate forms required to register business.

In groups complete appropriate forms for registering a hypothetical business. Create forms using appropriate application software

- Read and interpret information Explain meanings of terms

- Conduct interview and compile information

- Summarize information

- Record using audio /video recording device
- Research and define terms

Browse and search and deduce appropriate for information

- Complete forms with relevant information

Types of business ownerships correctly defined

Reasons for operating business, features of each type of business, sources of raising capital for each type of business, advantages and disadvantages

Correct definition for terms associated with types of businesses

Logical procedure for registering a business

Relevant forms with appropriate information

Suitability/relevance of information on forms

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Discuss with a representative from financial institutions, read brochures, or access information from websites on the requirements for accessing finance for business purposes as well as interest rates.

Use the interest rates quoted/obtained to calculate the interest payable on various capital amounts.

Given a capital amount calculate the proportion to be contributed by each person given the ratio.

Research from textbooks, conduct interviews, browse on the internet and identify other sources of raising capital.

Using quiz/debate or class discussion review the history and development of money.

Conduct research on materials used to make money (notes and coins)

Organize a forum and make a power point presentation to a simulated group of prospective business owners giving advice on the form of business organization to select.

Create a brochure that outlines the skill and qualifications that would be required to operate businesses

• Browse and search for information Document finding

Researching for information

Plan and organize
Present information in a logical manner

Create and format document

Sources of raising capital

Correction calculation of interest and capital contribution.

Requirements for accessing loans listed.

Development of money

Materials used to make coins and notes correctly identified

Appropriate type of business that can be operated for a specific product or service, documents required for registering the named business, advantages and disadvantages

Learning Outcomes

Students will be able to:

- ✓ Know three types of business ownership
- ✓ Understand the procedure for setting up business
- ✓ Know the documents used to register businesses
- ✓ Appreciate the contribution businesses make to a community
- ✓ State possible sources of capital for businesses
- ✓ Discuss the characteristics of each type of business ownership

Points to Note

Three types of business organizations/units:

- Sole trader/sole proprietorship, partnership, private limited company/corporations
- Lessons should be developed to focus on the following areas for each type of business to be studied:
 - Features/characteristics
 - Sources of raising capital
 - Legal requirements for establishment
 - Documentation for registration
 - Advantages and disadvantages
 - Sources of capital
 - Personal savings/assets, loans from financial institutions, family members/friends, partners' contributions, sale of shares/stocks
 - Collateral – anything of value that is accepted by a financial institution as surety/security against a loan.
 - Shareholder – persons who contribution to capital in a company by purchasing shares
 - Partners – persons who contribute to the capital or time and effort to the running of a business
 - Stock/share – start-up capital that is divided among persons who wish to become part-owners of a business
- Teacher should ensure that students practice online safety and cite sources accurately

Extended Learning

Participate in co-curricular and community based activities to further refine skills

RESOURCES

Case studies, panel discussions, resource persons, sample documents e.g. partnership deed, memorandum of association, textbooks, internet, audio-visual (PowerPoint) access to internet, presentation,

KEY VOCABULARY

Business unit/organization, sole proprietorship/sole trader, partnership, company/corporation,, partnership deed, liability, limited liability, unlimited liability, memorandum of association, articles of association, share/stock, shareholder, partners, capital, loan, collateral

LINKS TO OTHER SUBJECTS

Language Arts: Grade 7; AT2 Reading: Strand 2 Reading for meaning and enjoyment

Grade 6: Early Entrepreneurs: Creativity and Innovation, Brainstorm to determine the types of business that can be operated

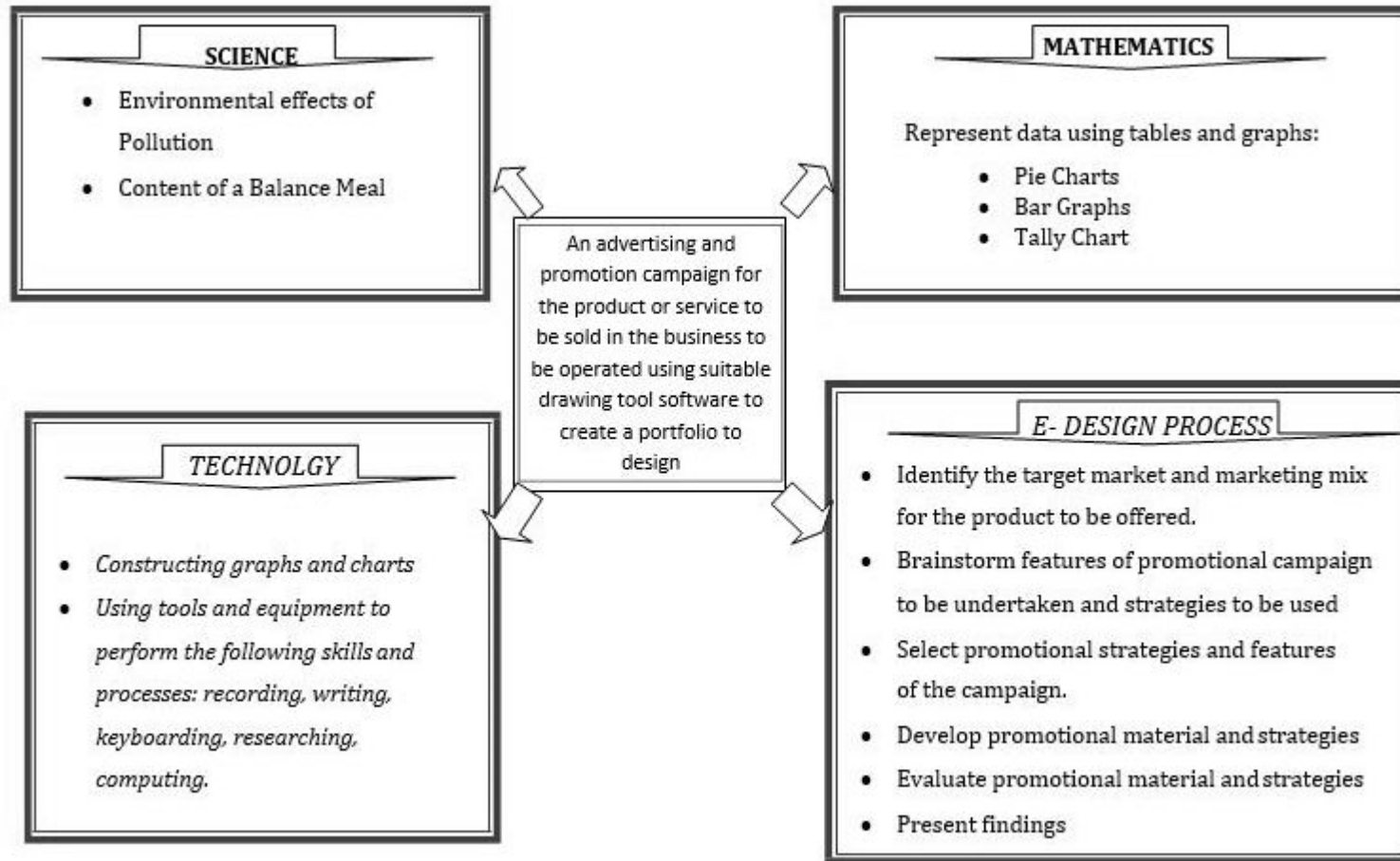


NSC

BUSINESS BASICS

GRADE 9: TERM 2

PROJECT 9.2: MARKETING ACTIVITIES



About the Project

In this project students will explore the world of marketing by examining how companies promote themselves and their products through logos, product advertisements, sales promotion and distribution. Students working in teams will have the experience of creating a company marketing plan for a product that they have chosen and developed.

Range of Content

Key concepts, skills and knowledge students will learn in this Project

- Definition of terms marketing, sales promotion, advertising, distribution
- Types and importance of sales promotion strategies used by businesses to promote sales
- Types and importance of the popular forms of advertising media used by businesses
- Factors determining the medium used by businesses to advertise good or service
- Channels for distributing goods and services
- Safety considerations associated with marketing goods and services
- Careers associated with the marketing, health science, and weather applicable to future careers.

Guidance for the Teacher

The project requires students to develop a portfolio which should be based on the business to be operated in term 3. The business name and logo created in term 1 in the project conducting market research should be incorporated in this unit. The design process should be used in completing the portfolio.

The sample pack should contain various types of product such as foods, household product, school supplies etc.

Check that students can:

- Identify some advertising and promotional strategies used by businesses

PROJECT 9.2: Types of Business Ownerships

Attainment Target(s)

Students will:

Strand 1: Creativity & Innovation

- Brainstorm possible ways used by businesses to promote goods and services
- Discuss creative strategies that businesses use to make consumers buy their products and services

Strand 2: Method & Procedures

- Discuss the role of technology in promoting goods and services
- Use simple tools and equipment to create promotional strategies

Strand 3: Apply & Solution

- Explain the steps necessary to create promotional strategies
- Evaluate the effectiveness of the promotional strategies

Strand 4: Career Pathway

- Identify careers in the field of marketing
- Observe rules and procedures of working within a group
- Utilize technological applications

Objectives

Students will:

- Define terms marketing , sales promotion, advertising, distribution,
- Describe major marketing activities carried out by businesses (Advertising, Sales promotion)
- Identify strategies used by businesses to promote sales
- Explain the four P's of Marketing (product, pricing, promotion, and place) and how they are used in business and in society.
- Design a promotional strategies
- Identify types of advertisements
- Discuss the main features of an advertisement
- Describe the various media used by businesses to advertise goods and services.
- Differentiate between sales promotion and advertising
- Design an advertising campaign for a product or service to be sold
- Identify two channels of distribution (Direct & Indirect)
- Discuss safety considerations in marketing of goods and services.
- Conduct market research to assess their last meal based on freshness, nutritional value, and how the food was packaged.
- Discuss the environmental impact of improper disposal of packages and wrappers.
- Identify some careers available in the field of marketing.

ICT ATTAINMENT TARGETS:



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



RESEARCH, CRITICAL THINKING, PROBLEM SOLVING 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.

STEM ATTAINMENT TARGETS:

SCIENCE - AT3 Exploring science and the environment – Earth’s Resources - Grade 3 - Recognize how some activities can harm the environment

TECHNOLOGY - T&S Standard 1 & 5- Student will develop an understanding of the effects of technology on the environment.

Student will develop an understanding of the characteristics and scope of technology.

MATHEMATICS - AT5 Data Handling and Probability – Grade 5 - Discuss the uses of tables and graphs; draw simple graphs and interpret data represented in these graphs.

Discuss the uses of tables and graphs and solve related problems using data.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Project Implementation

Students will:

Collect clippings from magazines, catalogues, newspapers or listen to the radio, television or internet of various types of strategies that are used by businesses to promote or advertise the goods or services

Explain whether strategies selected are used to: persuade or convince consumer to buy the goods or services, provide information on the goods or services; and state the differences between both

In groups discuss the strategies and evaluate their effectiveness in promoting and advertising strategies

Conduct a research online or from textbooks to determine the various ways businesses promote or advertise their products or services

Conduct research on the internet or from textbooks and correctly define each term associated with marketing (advertising, sales promotion, marketing, target market)

Use suitable/appropriate software tools or pen and paper to design the following: an appropriate promotional strategy to boost the sale of an existing product or service or an advertisement for a new product or service

Students select a product they buy frequently; students will identify the target market and the marketing mix. Students will then create their own products, identify the target audience and develop the components of a successful marketing mix.

Listen to recordings of jingles or slogans used by businesses to promote and advertise, discuss each and state how effective each is in promoting or advertising the product or service; How do they affect the consumer's thoughts and the choices they make?

Classify the recording into various form of advertising (informative, persuasive, and competitive).

In group develop a jingle/slogan for an existing or selected product or service.

- Identify solutions Research for information
- Explain special features
- Discuss differences

- Conduct research on the internet or from textbooks and correctly define marketing terms

- Create design using selected tools

- Identifying 4P's of marketing

- Evaluate effectiveness
- Create or design jingle/slogan

Classification of activities

Research and presentation of findings

Development of advertising campaign

Conduct research on the internet or from textbooks to develop a glossary of marketing terms

Advertisement with relevant information e.g. name, ingredients, availability, price, function
Promotional strategy that will persuade or convince the consumer

Developing a marketing mix

Jingle/slogan that has a tag line and grabs attention of the consumer.

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Show students the sample product pack e.g. cereal packet, drinks carton, confectionery, Instruct students to write down the most significant features about the product. What value did the packaging add? Is that packaging recyclable? What do you think will happen to the packaging that was thrown away? Invite the students to share what they have written. Discuss:

- Did members of the class eat more processed food or food made from fresh ingredients?
- How healthy do students think the meal was?
- Why did students choose to eat the food that they did?
- How do our systems for obtaining food affect our choices about what we eat?
- What types of food had the most packaging?-
- What happened to the packaging when the meal was over?
- How is the environment impacted by the package?

Students will construct a tally chart of the responses. Then use the tally chart to construct pie chart and bar graph to represent the information.

View video of company conducting market research. Using the examples in the video students should design a way of inviting people to a new restaurant (place) or to buy a commodity (product). They can use coupons, displays, contests, samples, etc. They should describe how they would use the idea to promote new items.

- Create or design tally chart, pie chart and bar graph

Graphs and chart constructed

- Thinking & Reasoning Communication
- Designing promotional activities

Using market research to design strategies to boost sale

Promotional activities designed

Suggested Teaching and Learning Activities

Students will:

Use a suitable software drawing tool to design an advertising and promotion campaign for the product or service to be sold in the business to be operated. Create a portfolio which should include the: product or service target market, relevant information about product or service strategy to promote or advertise (brochure, flyer, jingle/ slogan, competition media to be used to promote and advertise.

Create sales promotion materials, including slogans, brochures, catalogue, (One-page colourful flyer or brochure with graphics) Incorporate business name and logo through the use of various forms of technology.

Use computer drawing tools or another art program to design a company logo.

Key Skills

- Identify solution to problem
- Identify resources,
- Plan and organize strategies,
- Design solution
- Evaluate the effectiveness of the solution
- Create design using selected tool

Assessment Criteria

Portfolio containing appropriately designed business name and logo, promotional strategies and advertising campaign designed to promote the good or service appropriate for selected media

Learning Outcomes

Students will be able to:

- ✓ Know the methods used by businesses to promote goods and services
- ✓ Demonstrate skills in designing promotional strategies
- ✓ Know the difference between an advertisement and promotion
- ✓ Create designs using selected tools

Points to Note

Marketing is the process of informing the consumer of the value of a product or service

Advertising is a message which promotes ideas, goods or services communicated through one or more media by a sponsor which can take a form of television, radio, magazines, newspaper, and internet placements. Its goal is not only to increase in sales in a short to mid-term but also to strengthen the brand image of the company and its products and services to develop long term sales and consumer loyalty.

Promotion is a short term strategy to encourage purchase of goods or services. The main objective of doing promotion is to build the sales in the short term.

Promotional strategies include giving free samples, special events or offers, providing discounts or coupons, BOGOF, Price promotion, games and competition, public relations, free samples, coupons, customer loyalty scheme, exhibitions and trade fairs)

Features of advertising: introduce new products on the market, to increase demand for a good or service, inform and remind customers about the product, persuade and build customer loyalty.

Media used to advertise goods and services (Flyers, brochures, catalogue) electronic media (TV, Radio, Websites, telemarketing), Print media (newspaper, magazines), billboard advertising

Careers in marketing e.g.

Sales Representatives to face to face/telemarketing sales. Takes order for goods and services. Conduct research to identify the types of advertising

Ask parents and family members if they have ever participated in sales promotion activities used by businesses. Find out if they have ever won a contest.

Marketing Manager(develop the marketing campaign for the business.

Sales Clerk responsible for selling the product to the customer. Merchandisers (persons who display the business products in supermarkets

Extended Learning

Participate in co-curricular and community based activities to further develop and refine skills.

RESOURCES

multimedia projector, laptop, samples pack (various consumer products), video presentation, pictures, magazines, newspaper, internet access, website, catalogue, case study, drawing software

KEY VOCABULARY

marketing, sales promotion, advertising, recording device, electronic media, print media, brochures, flyers, jingle, slogan, consumers, Sales Representative, Sales Clerk, Marketing Manager, Merchandiser, career

LINKS TO OTHER SUBJECTS

Link with ICT Grade 8 Attainment target 2 Designing & Producing Technology Operations and Concepts Creativity and Innovation Link to Visual Arts Grade 6 Attainment Target 2 Plan and Design

Link to Civics Grade 9 attainment Target3 Demonstrate an awareness of individual and collective rights and attendant responsibilities

Link to Language Arts Grade 9 Attainment Target 3 Strand 1 Communication

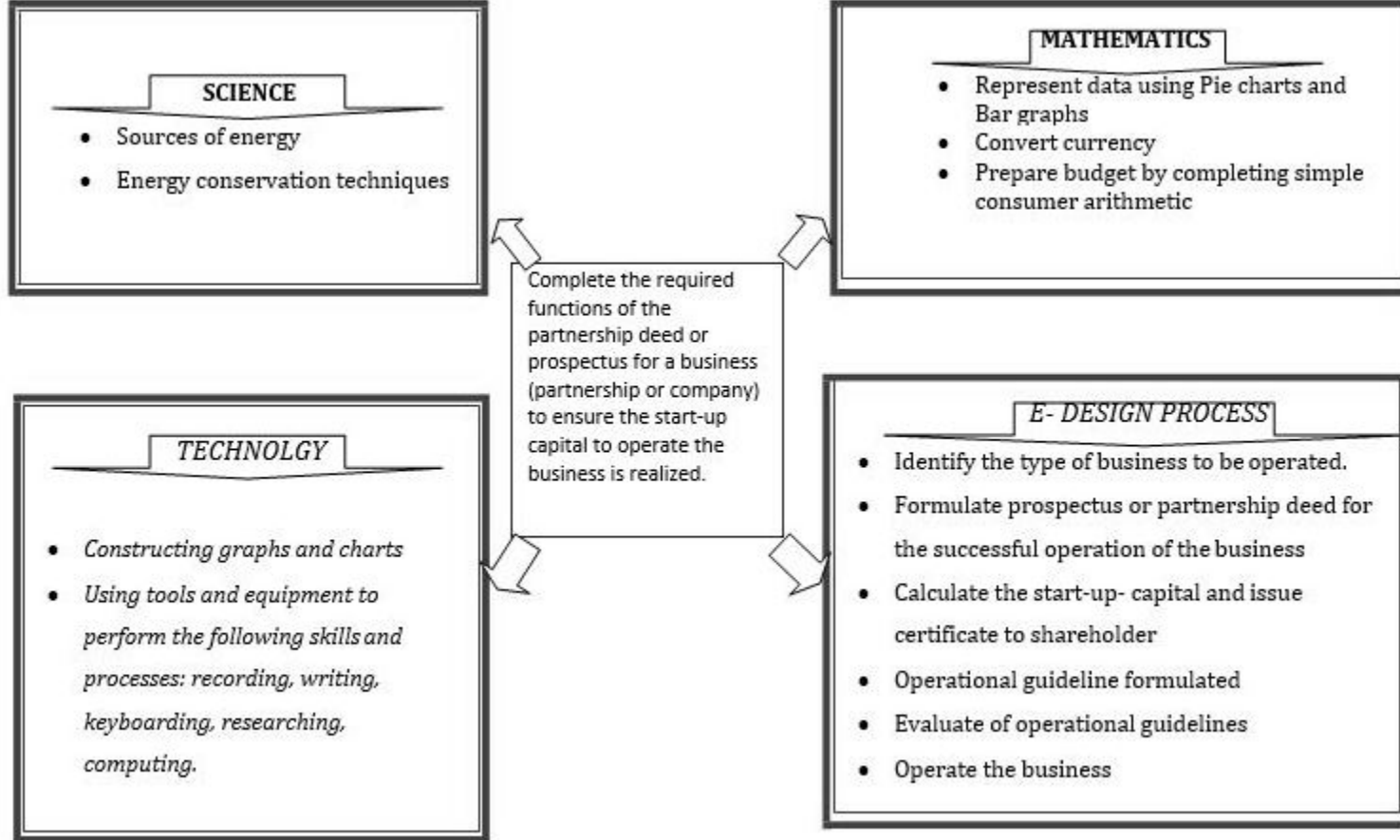


NSC

BUSINESS BASICS

GRADE 9: TERM 2

PROJECT 9.3: PLANNING AND ORGANIZING
FOR PRODUCTION



About the Project

In this unit students will be engaged in planning and organizing a business that will meet customers' preferences. They will plan and organize activities to implement the business idea/s conceptualized.. They will develop an understanding of how business activities are organized in specific departments and outline those responsibilities that will be performed in the business to be operated. Students will also understand that departments in an organization must interact to achieve the goals of the business. The specific duties to be performed by the employees in the selected business will be outlined in job descriptions that will be prepared by the students. Students will construct an organizational chart to represent the business structure.

The unit is also designed to help students assess their personal skills, interests and values and explore career opportunities

Range of Content

Key concepts, skills and knowledge students will learn in this Project

- Major departments in a business; production, sales, finance, administrative services
- Duties performed in the various departments in a business
- Financial records maintained by a business; order form, invoice, receipts cash book
- Job descriptions, company charter
- Organizational chart for business to be operated

Guidance for the Teacher

If your school operates a Junior Achievement Club, you may consult the literature or collaborate with the coordinator of the Junior Achievement Club in your school to obtain valuable information that can assist in planning and organizing the business to be operated.

The most appropriate type of business to operate would be a company as it would be easy to raise the capital needed to start the business and also encourages participation of a large class. However, if the class size is twenty (20) and under, a partnership can be established. A partnership deed would have to be developed to guide the roles and responsibilities of the partners and the sharing of profit and loss.

Where a company are to be operated students should be asked to sell shares and the following information should be provided to potential investors: Explain that they are selling shares in a company which will be run and liquidated by students in the school.

Cost or value of each share

Explain that profit is not guaranteed, but investors will recoup their investment and dividends Each member (student) must be encouraged to purchase stock/ share in the business

A Job Application should be designed and distributed to each student. Allow students to complete applications and indicate the department they would like to work in. Each student should be assigned to work in a department. Team leaders/managers should be elected to represent and lead each department. An election should be held to identify the leaders for the business for example executive director, heads of the various department.

Check that students can:

- Some of the major departments in a business
- Job titles associated with tasks to be performed in the specific business.

PROJECT 9.3: Planning and Organizing the Business

Attainment Target(s)

Strand 1: Creativity & Innovation

- Explore the different approaches to setting up a business

Strand 2: Method & Procedures

- Create simple design to represent the structure of the business to be operated
- Gather information to plan and organize business operations

Strand 3: Apply & Solution

- Explain the steps necessary to develop documents to be used in the formation of a business
- Create a visual representation of a business by constructing an organizational chart

Strand 4: Career Pathway

- Discuss jobs/careers that are related to the business to be operated
- Compile a list of personal attributes necessary for the job related tasks

Objectives

Students will:

- Outline the major activities to be performed in the business activities
- Organize the activities to be performed in the business under the related departments
- Select the appropriate records to be maintained during the period of operation of a business
- identify functional areas of a business: finance, accounting, production, sales, marketing, administrative
- Outline the departments of each functional areas in business
- Define terms associated with business operations: organization chart, job description, task sheet, finance, accounting, production, sales, marketing, administrative
- Prepare job descriptions for post within the operational departments in a business
- Vote to select team leaders/managers for each departments
- Develop documents required for the formation of a company Memorandum of Association and Articles of Association
- Construct an organizational chart to represent the business structure, relationship and ranks
- Prepare a budget for the business to be operated
- Sell stocks to raise initial (start-up) capital
- Convert Currency from one denomination to another
- Prepare and distribute share certificates
- Discuss the sources from which energy will be generated to operate the business.

ICT ATTAINMENT TARGETS:



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



RESEARCH, CRITICAL THINKING, PROBLEM SOLVING 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.

STEM ATTAINMENT TARGETS:

SCIENCE - Energy and Forces - Grade 5 - Be aware of energy forms, their sources, and how heat is transferred

TECHNOLOGY - T&S Standard 1 & 5 - Student will develop an understanding of the effects of technology on the environment.

MATHEMATICS - AT1 Number Operations and Application – Grade 7 Identify 'best buys' and bargains by creating budgets

Convert Jamaican dollars to other currencies and vice versa

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Discuss a scenario of a prospective business owner who is unaware of how to organize the operations of a business and conduct research online or use textbooks to determine the activities required to set up business operations

Discuss the operations performed within the school, or listen to a recorded presentation from a business owner to identify the main departments of his/her business,

Make a list of the main departments and sub-departments into which the business should be divided

Conduct a research online or offline or interview business owners to determine the major activities conducted by a business.

From research make a list all the activities that would be performed in the business to be operated

Re-organize related activities and identify the appropriate departments that would perform the activities

Conduct a research online or offline or interview business owners to determine sources of energy used in business. Students will complete a log of energy use in business and make a list of ways to conserve energy

Identify the job functions that employees would perform in each department

Prepare job description for employees/operatives within the business to be operated

Select departments they would like to work in based on their interest, competencies and knowledge of the various job functions to be performed

Analyze competencies of their peers and select team leaders supervisors/managers in a transparent and democratic manner

- Discuss problem and recommend solution
- Identify and organize job functions

- Plan and organize activities appropriately

- Researching, listing and organising information

- Discuss tasks and develop related documents
- Assess personal skills, interest, abilities, attitudes
- Peer assessment sheet created

List the functional areas in business

Identify business activities correctly aligned to the relevant departments

Log of energy use and energy conservation mechanism identified

job descriptions for relevant departments

Complete peer assessment sheet

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Select the appropriate records that will be maintained by each department

Create or download sample copies of records that will be utilized by business to record transactions e.g. receipts, order form

Compile a task sheet template, listing the tasks to be performed, employees who will complete tasks and deadlines for the completion of tasks

View and discuss a sample of school's organizational chart to gain first-hand knowledge and an understanding of the structure of a business.

Use and appropriate application software or computer drawing tools to construct an organizational chart to represent the business structure, working relationships and ranks based on the business to be established

Critique samples of a Company Charter or Articles of Incorporation from internet sources or from textbooks, or a company then develop one for the business to be operated using an appropriate software for this activity

Use suitable software to create/prepare a budget to record expenses and projected income to be incurred during the operation of the business,

Calculate the start-up capital to operate the business

Contribute to start-up capital by purchasing shares (company) or contribute to capital (partnership)

Download from internet sources or design sample of share certificates
Issue share certificate to verify amount of shares sold and bought

Convert the sum received to start the business from Jamaican Currency to U.S currency

Optional: Draw-up guidelines to govern the sharing of profit (if a partnership) business is formed

- Analyze information on documents,

- Plan, organize, classify,

- Discuss and interpret structure (chart)
- Create/design structure

- Critique document
- Create and format document

- Calculate expenses and income
- Create and format document

- Calculate amounts Create/design document
- Conversion of currency

Appropriate records

Task sheet completed with activities to be performed correctly sequenced

Organizational chart correctly outlining departments, relationships and ranks of the business to be operated

Components relevant to an articles of incorporation of company charter

Listings of expenses and projected income

Calculation to determine start-up capital in a private company

- Cost of each share
- Selling price for one unit/share

Share certificate appropriately designed to indicate: No. of shares bought, date, name of shareholder
Convert currencies from one denomination to another

Partnership Deed outlining how profit and loss will be dealt with

Learning Outcomes

Students will be able to:

- ✓ Understand the operations of business
- ✓ Select the appropriate documentation to govern the operations of a business Understand the basic responsibilities of the management of a business Identify the appropriate sources to raise start-up capital
- ✓ Demonstrate competencies required to operate a business Understand the importance of an organizational chart Know how to invest their money
- ✓ Be aware of the procedure to create documents using suitable software

Points to Note

Major departments of a business are:

Production department – manufactures the product to be sold,

Finance – prepare financial records, calculates profit and loss, prepares payroll

Sales/marketing – promotes, advertises and sells the goods or services produced by a business

Administrative services – manages the communication process between clients/customers and the business, distribute stock certificates

Job description – an official written description of the responsibilities and requirements of a specific job to be performed by an employee

Organizational Chart – diagrammatical representation of a business outlining the job functions, relationships and ranks

Task sheet highlights all the activities to be performed during business operation and the timeline; to ensure that the business meets its goals

Capital can be acquired from the following sources: selling of stocks/ shares and loans

Calculating Cost of each Stock/Share

Start-up capital is divided by the number of members in the business to arrive at the cost of each stock or share

Shareholder - a person who contributes to the start-up capital by purchasing stocks or shares in a business

Teacher should ensure that students practice online safety

Extended Learning

Students can be asked to:

- find out from family members and friends about the job functions that they perform in the various departments to which they are employed in a business and the job title for persons who are employed in the respective departments
- read up on the role the Jamaica Stock Exchange

RESOURCES

Resource personnel, case study/scenario, Computer to design /prepare organizational chart, sample job description, task sheet template, strips of paper to be used as ballots

KEY VOCABULARY

departments, finance, accounting, production, sales, marketing, organizational chart, job description, administrative, careers, expenditure/expenses revenue/income, start-up capital, shares

LINKS TO OTHER SUBJECTS

Mathematics: AT 2, Grades 1-3 Number Operation and Application

Language Arts: AT 2: Reading for information; AT3: Writing; Strand 1; Communication-Grades 7-9 Use deduction and inference to interpret information and to predict outcomes

Visual Arts: AT1 Grade 3 Create and Develop

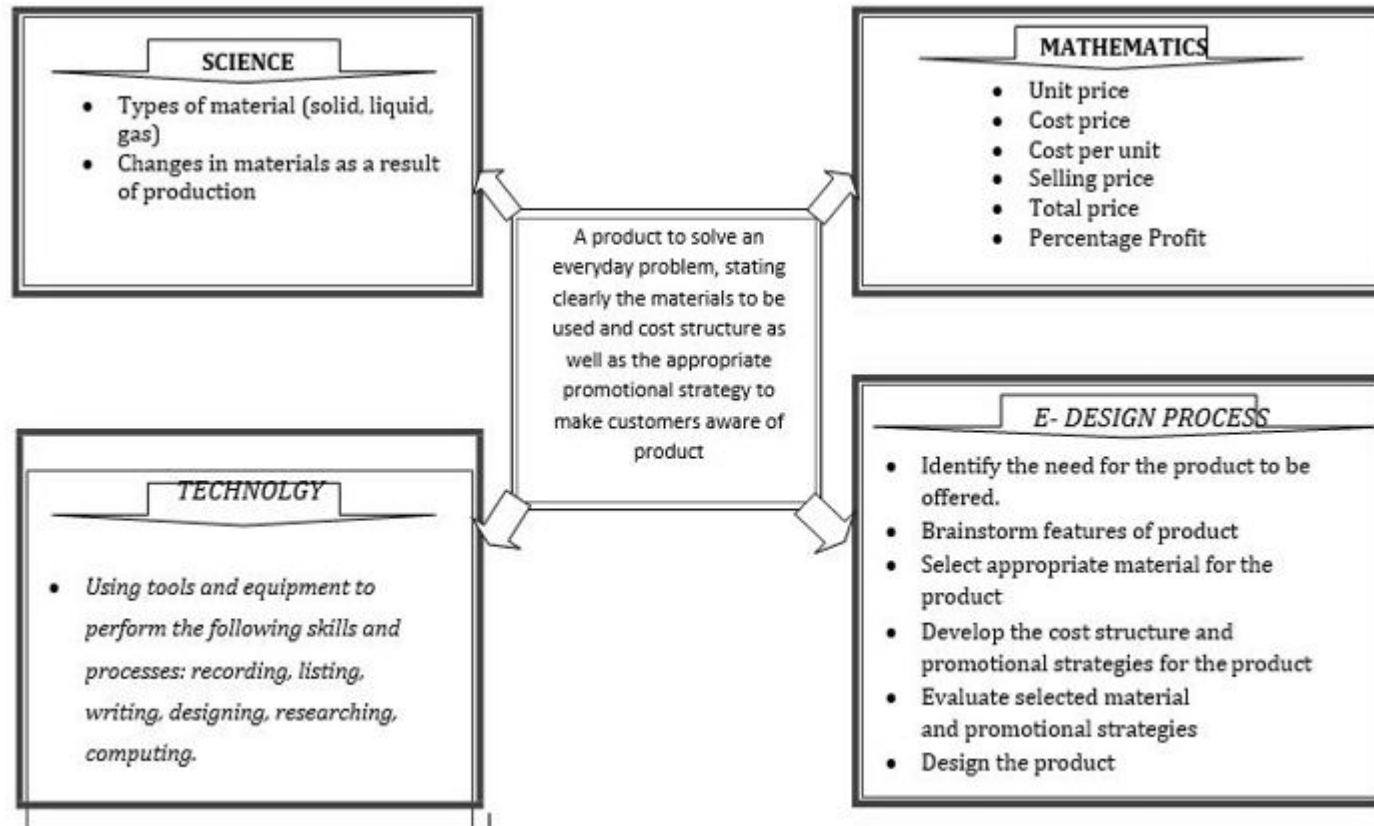


NSC

BUSINESS BASICS

GRADE 9: TERM 3

PROJECT 9.4: OPERATING THE BUSINESS



About the Project

This unit is designed to give students hands on experience of operating a business. They will implement the company's business plan and will perform the following activities:

- Initiate purchasing materials for production
- Produce and sell the product or service
- Complete records needed for company operations
- Utilize technological applications in 'real world' situations
- Identify sales order forms and product sales process
- Promote the product or service
- Utilize their interest, abilities and strengths to operate the business
- Explore rules they would like to pursue as adults

Range of Content

- Sourcing raw materials for production
- Completing appropriate financial documents to purchase raw materials and supplies
- Establishing production procedures
- Developing strategies for organizational production
- Producing/manufacturing/retail goods or services
- Monitoring product quality
- Promoting goods and services
- Selling goods and services
- Preparing financial documents to record credit sales (journal)
- Preparing periodic departmental reports

Guidance for the Teacher

If the business will be engaged in the resale of goods, production will not be necessary. The production department should work closely with the finance department to initiate purchases of the necessary materials. The appropriate documents should be completed to indicate the quantity to be purchased and orders should be placed in a timely manner. Where a product is to be manufactured for sale preparatory work should be done prior to production. Activities could include the following:

- Planning and designing the product
- Designing and preparing area for production e.g. plot
- Creating a prototype of the product or service and at an affordable cost. The purpose of a prototype is to flesh out the concept and create a tangible version of the product or service to be produced. This should be done if the focus of the operation is on areas such as food, fashion, and furniture. However, it may not be possible to do prototypes for certain types of services, technology, creative arts, and entertainment,
- Drafting pattern
- Identifying raw materials to produce
- Planning menu

The Production Department should ensure that the guidelines for specific areas of the production process are adhered to.

Safety Guidelines

An effective safety programme should be implemented to ensure high productivity, quality and safety of workers/students. Ensure the following:

- Personal Protective Equipment or safety gear is worn during production
- Tools and equipment are safe for use and in good working conditions
- Proper storage for harmful chemicals and tools
- First Aid kit is available
- Students/workers are aware of safety procedures
- Procedure for recording incidents is known by all

Production Standards

The production process should be guided by the production goals, quality control procedures, safety plans and schedules that were developed in the Business Plan. The production record should be maintained and the progress monitored.

Quality Control

Control checks should take place regularly to ensure that products are of high quality

Labelling

Goods produced should be attractively packaged and labelled. The following should be identified on the packaging; name of product, manufacturer's details, ingredients listed in descending order and expiry date where necessary.

Sales Activities

All students/workers should be involved in the sale of products or services. An agreed commission can be awarded to each student at the end of business operation

A simulation exercise should be conducted to ensure that students acquire the appropriate customer service skills prior to the sale of products of services

Check that students are aware of:

- Functions performed in the various departments in a business
- Skills required to manufacture product/service
- Strategies used by businesses to promote goods/services

PROJECT 9.4: Operating the Business

Attainment Target(s)

Strand 1: Creativity & Innovation

- Describe the process involved in creating product or service to satisfy wants or needs
- Evaluate product or service for functionality, proportion, appearance, strength, purpose

Strand 2: Method & Procedures

- Identify appropriate resources to produce goods or services
- Use simple tools and equipment to execute specified tasks
- Demonstrate awareness of the safe and hygienic use of tools and equipment

Strand 3: Apply & Solution

- Follow instructions to manufacture product according to specification
- Evaluate product outcome against the given design
- Prepare relevant financial records used in business transactions

Strand 4: Career Pathway

- Observe rules and procedures of working in a group
- Utilize technological applications during production

Objectives

Students will:

- write up the relevant documents to purchase raw materials
- Convert the unit price and quantity of raw materials
- Calculate total cost and total quantity of raw materials
- procure raw materials and supplies for production
- organize production procedures
- Identify materials to be used in the manufacturing of a product
- Discuss that materials are suitable for making a particular object because of their properties.
- manufacture product or design service to be offered
- practise safety in the use of tools and equipment
- promote /service product or prototype
- label and package product/service
- display and sell product/service
- prepare the relevant financial records used for sales transactions
- prepare periodic performance reports

STEM ATTAINMENT TARGETS:

SCIENCE - Attainment Target 3: Energy and Matter – Nature of Materials Grade 5: Know that materials can exist as solid, liquid or gas, and explore how materials change when they are heated and cooled (cooking, freezing ice etc.)

TECHNOLOGY - T&S Standard 1 & 5 - Student will develop an understanding of the effects of technology on the environment.

MATHEMATICS - AT1 Number Operations and Application – Grade 7: Identify ‘best buys’ and bargains by creating budgets, Compute the total price given quantity and unit price Compute unit price given the quantity and total price Compute quantity given the total price and the unit price

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Prepare the relevant financial records to procure raw materials for production of good or service e.g. order form

Purchase raw materials and supplies

Complete purchase order to show unit cost, quantity and total cost of raw material.

Conduct research using online or off sources to explain the properties of solids and liquids. Determine the key facts, such as solids keep their shape whereas liquids flow to fill containers.

Conform to the specifications for creating product and manufacture accordingly

Adhere to safe and hygienic use of tools and equipment during production of goods and services

Or

Ask students to design a product to keep off the rain, students will identify the materials they could use, or not use and why.

Package and label product appropriately

Utilize the appropriate promotional strategy to make customers aware of product

Role play role of customer and salesperson to demonstrate understanding of the sales process

Sell product or service in agreed designated location or choose the appropriate channel to sell product or service

Prepare sales chart to encourage competitiveness

Maintain appropriate financial documents to record receipt of money collected (receipt) or for credit sales (journal)

- Write up documents
- Interpret information on documents
- Perform purchasing function

- Calculating and recording information
- Researching and recording

- Design and manufacture product

- Design and label package

- Utilize promotional strategy

- Sell product/service demonstrate good customer service

- Calculate amounts
- Record information accurately

Students knowledge of how to write up order form

Role-play the purchase of raw materials and supplies

Purchase order completed showing unit cost, quantity and total cost

Demonstration of required skills to manufacture product

Students awareness of safe and hygienic use of tools and equipment

Students understanding of how to package product (labelling, ingredients in descending order of quantity, contact no. address)

Appropriate promotional strategies selected and utilised

Professional appearance, greeting and tone

Appropriate financial documents correctly completed

Suggested Teaching and Learning Activities

Students will:

Use a checklist to review the activities of departments to which they are assigned

Collaborate with the team leader, head of each department prepare periodic performance report. Use an appropriate application software

Key Skills

- Evaluate performance
- Summarize activities
- Produce report

Assessment Criteria

Report outlining performance of departments

Learning Outcomes

Students will be able to:

- ✓ Know how to relate to colleagues and superiors/supervisors
- ✓ Develop standard work ethics
- ✓ Appreciate the value of work
- ✓ Understand the value of each as it relates to the entire organization
- ✓ Understand the value of time
- ✓ Identify some careers in business
- ✓ Practise good customer service skills

Points to Note

An order form must be completed to indicate the name of the supplier, purchaser, date, amount and description of goods to be purchased

Money received for payment of goods must be documented on a receipt

Sales journal should record goods/products credited

RESOURCES

As required to manufacture of specific products, Internet sources to retrieve sample financial records, appropriate packaging materials, computer, pens, pencils to prepare labels for products

LINKS TO OTHER SUBJECTS

Visual Arts: AT2: Plan and Design

Civics: AT3: Develop the capacity to interact respectfully and positively

Mathematics: AT3 Writing: Strand 1 Communication; Grade 7: Write a wide range of texts on paper and on screen for different purposes

Drama: AT2: Expressing and Enacting; use the process of drama to generate ideas and perception

Extended Learning

Students could be encouraged to:

- Conduct a research online or visit an industry to observe the production process e.g. factory, farm
- visit retail outlets to observe effective techniques used by sales clerk
- consult relatives or friends who work in various departments of a business engaged in the production of goods or services and discuss the activities that must be performed to meet production deadlines

KEY VOCABULARY

procure, raw materials, supplies, production, manufacture, retail, sales, label, package, receipt,

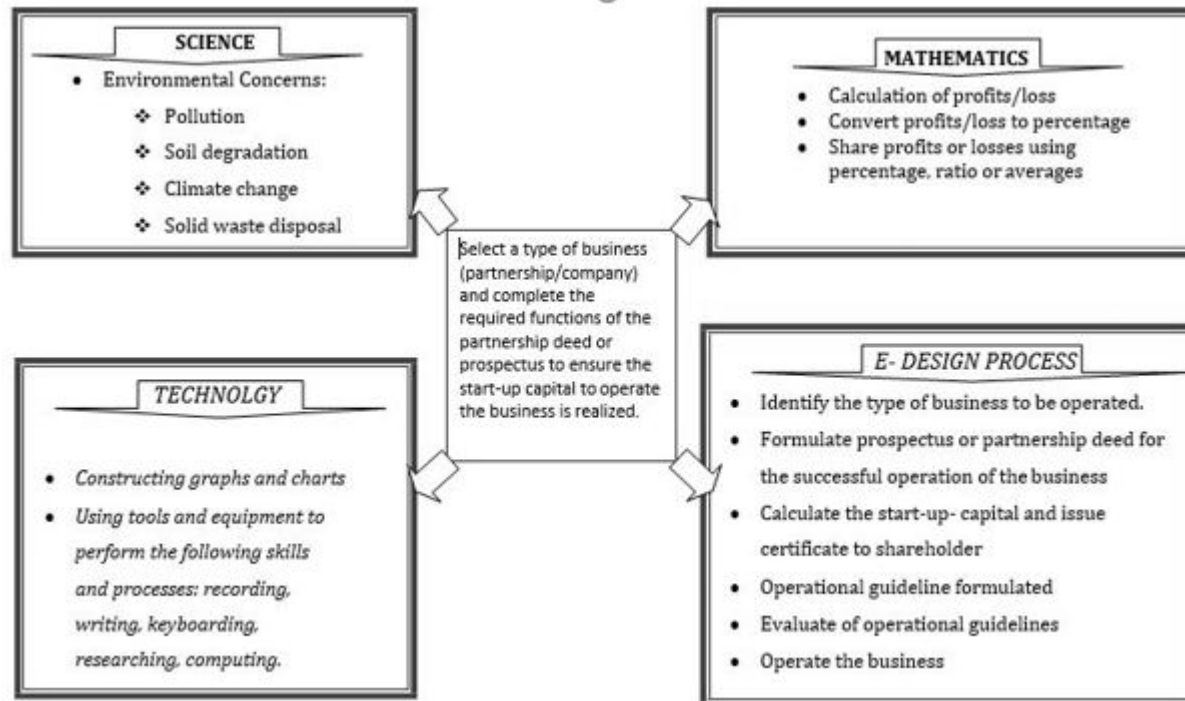


NSC

BUSINESS BASICS

GRADE 9: TERM 3

PROJECT 9.5: EVALUATING AND LIQUIDATING
BUSINESS



About the Project

In this unit students will finalize production, assess excess inventory and prepare for evaluation and liquidation of company. They will identify and evaluate production and prepare liquidation forms and records for the final report

Range of Content

Key concepts, skills and knowledge students will learn in this Project

- Definition of terms evaluating and liquidating
- Responsibilities of departments for evaluation and liquidation
- Financial Records and other documents used for evaluating and liquidating
- Preparation of final departmental reports
- Preparation of annual reports
- Calculating of dividends
- Disbursing dividends

Guidance for the Teacher

Each student should play a vital role in the business liquidation process. The exercise is a simulation and the business must liquidate to exist the market. Each department is responsible for completing specified liquidation forms and completing the annual report. If production is still taking place, the activity should cease. Products/services available should be sold at a reduced price close to the liquidation period to encourage additional sales. Unsold items should be regarded as a loss. Attendance records should be presented so that employees can be paid for the period of operation.

Check that students can:

- Identify goals of the business
- Components of a business plan

PROJECT 9.5: Liquidating and Evaluating Business

Attainment Target(s)

Students will:

Strand 1: Creativity & Innovation

- Use expressive language to explain the performance of the business operated

Strand 2: Method & Procedures

- Critique product or service to determine its effectiveness in meeting consumer preference
- Identify resources required to prepare business documents

Strand 3: Apply & Solution

- Evaluate the outcome of good or service to meet consumers' needs
- Select appropriate materials, tools and equipment to calculate earnings

Strand 4: Career Pathway

- Develop appropriate work habits and routines
- Identify skills that are required by different careers

Objectives

Students will:

- prepare departmental reports to evaluate the performance of the business for the period of operation
- prepare a financial analysis to compare budgeted amount with actual expenditure
- discuss the challenges experienced during operation of business
- complete an evaluation checklist to assess performance of business
- make recommendations to improve the performance of business
- prepare a cash book to calculate profit earned by the business
- make repayments for loans/capital
- share profit/dividend among partners or shareholders

ICT ATTAINMENT TARGETS:



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



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.

STEM ATTAINMENT TARGETS:

SCIENCE - Exploring Science & the Environment - Earth's Resources - Grade 6: Be aware of some key environmental problems and how to mitigate them (climate change, solid waste disposal, soil degradation).

TECHNOLOGY - T&S Standard 1 & 5 - Student will develop an understanding of the effects of technology on the environment.

MATHEMATICS - AT1 Number Operations and Application – Grade 7: Calculate profit and loss in monetary and percentage terms

Suggested Teaching and Learning Activities

Key Skills

Assessment Criteria

Students will:

Compile a report outlining the overall performance of the business for the various departments of the business for the period of operation. Reports should indicate whether goals set were achieved

Use appropriate word processing software to compile report

Use appropriate financial records to prepare a financial analysis of performance of the business to compare budgeted expenses and revenue with actual earning and spending.

Use appropriate spread sheet software to compile financial report.

In each group representing departments complete a performance evaluation checklist of the business for the period of operation

Analyse performance checklist , identifying the challenges

Make recommendations to improve performance of the business

Prepare a Cash Book to record the income, expenditure and identify profit for the period in which the business was operated

Calculate dividends or profit to be distributed among the shareholders or partners in the business.

Dissolve business by distributing dividend or profit and reimburse capital invested by each student

- Evaluate performance and prepare report
- create and format document

- interpret information calculate
- create and format document

- Conduct assessment
- Make recommendations

- Do calculation
- Write up record accurately

- Calculate and distribute dividends

- Share dividends

Performance of business e.g. challenges experienced, amount of money earned and spent

Cash Book, Income and Expenditure A/C showing income earned and expenses incurred

Components of performance evaluation checklist e.g. production department – no of products produced, no. rejected.

Two column cash book recording income, expense, date

Accurate calculation of Shareholder dividend

Learning Outcomes

Students will be able to:

- ✓ Know how to implement a business plan
- ✓ Assess the performance of a business
- ✓ Know the procedure for calculating profit or loss
- ✓ Know the procedure for liquidating a business

Points to Note

Financial Analysis should include the appropriate columns: item, amount budgeted, actual amount spent and variance

Business Performance checklist should include the following questions:

- Was the product or service beneficial to the consumer?
- Was the good correctly priced?
- Was the channel for selling goods accessible to customers Were the goals of the departments met?
- Was the business profitable
- What are some of the challenges experienced?

Procedure for disbursing Profit: Profit or dividend to be paid should be determined by the type of business which was operated

If a partnership was operated, the Partnership Deed should outline the procedure for sharing profit or loss

If a company was operated, students should be reimbursed the start-up capital first. Profit made on the start-up capital should be divided by the number of students who invested in the business to determine each dividend

NB Wages/salaries agreed on should be paid

Extended Learning

Students could be asked to:

Visit public limited companies and read their annual reports which are displayed to observe the presentation

OR

Develop a personal action plan to strategize their own entrepreneurial venture.

They could respond to the following questions:

- What do I really like to do? What am I really good at doing?
- What market do I see?

Students can also identify the most promising market/product winner; the one that they are most excited about and answer the following questions

- What actions will I take to identify the necessary financial resources
- What actions will I take to identify and market to potential customers

RESOURCES

Sample performance checklist, Junior Achievement Manual, source documents e.g. receipts, computer, Internet

KEY VOCABULARY

Financial analysis, dividend, profit, loss, income, expenditure, reimburse

LINKS TO OTHER SUBJECTS

Language Arts: AT3: Writing: Communication: Grade 7-9: Write a wide range of texts on paper and screen for different purposes

Mathematics: AT2 Number Operation and Application: Strand: Number: Grades 7-9: use basic operations, number relationships, patterns, numbers, facts calculators and software to compute and estimate in order to solve real world problems

Social Studies: AT2: Diversity, Sustainability and Interdependence; Grade 2: Recognize the needs and the relationship between earning a living and satisfying these needs



NSC

RESOURCE AND TECHNOLOGY

GRADES 9: APPENDICES

SUBJECT GLOSSARY

TERMS	DEFINITIONS/MEANINGS
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
Advertising	The action of calling something (product, service, etc.,) to the attention of the public in order to induce people to buy or use it.
Assets	Assets are the economic resource (tangible or intangible) owned by the business

TERMS	DEFINITIONS/MEANINGS
Business	An organization or economic system where goods and services are exchanged for one another or for money.
Capital	Money used to start a business
Cash Book	A book in which receipts and payments of money are recorded.
Company	A legal entity formed and organized to carry on a business. Types of companies include sole proprietorship, partnership, limited liability, corporation, and public limited company.
Customer	A person who buys goods or services from a business.
Department	Specialized functional area within an organization or a division, such as accounting, marketing, planning.
Distribution	Is the process of making a product or service available for the consumer.
Dividend	Is a payment made by a company to its shareholders, usually as a distribution of profits.
Entrepreneur	A person who organizes, operates, and assumes the risk for a business venture.
Financing	Is the act of providing funds for business activities.
Invoice	A document prepared by the Accounts Departments that lists items sold or services provided, and says how much money you owe for them.
Leadership	The action of leading a group of people or an organization
Liabilities	Is typically an amount owed by a business to a supplier.
Liquidation	Is the act of turning assets into cash.
Loan	An amount of money that is borrowed and has to be paid back.

TERMS	DEFINITIONS/MEANINGS
Logo	A recognizable graphic design element, often including a name, symbol or trademark, representing an organization or product
Marketing	The process of researching, promoting, selling and distributing a product or service.
Partnership	A legal form of business operation between two or more individuals who share management and profits and losses.
Payment	The act of giving money for something.
Personnel	People working in a business.
Profit	The surplus (money) remaining after total costs are deducted from total revenue
Receipt	A written acknowledgment that a person has received money in payment following a sale or other transfer of goods or provision of a service
Risk	The possibility of loss, injury, or other adverse or unwelcome circumstance.
Sales	The exchange of a product or service for money.
Shares	Are units of ownership or interest in a company.
Slogan	Is a short phrase that serves as a very brief representation of a product or company
Sole-Proprietorship	Is a type of business that is owned and operated by a single individual.
Teamwork	This is the combined efforts, or the actions of a group, to achieve a common purpose or goal.

ALTERNATIVE PATHWAYS TO SECONDARY EDUCATION (APSE)

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 multiple lenses 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 partnership 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.

REFERENCES

- Jolly, A. (2014). *STEM vs. STEAM: Do the Arts belong?* Retrieved from:
<http://www.edweek.org/tm/articles/2014/11/18/ctq-jolly-stem-vs-steam.html>
- Morrison, J., Raymond, V. & Barlett, B. (2009). *STEM as a curriculum: An experiential approach*. Retrieved from: <http://www.edweek.org/ew/articles/2009/03/04/23bartlett.h28.html>
- Sousa, D., Pilecki, T. (2013). *STEM to STEAM: Using brain compatible strategies to integrate the Arts*. London: SAGE Publications Ltd.
- Trochim, Williams, M.K., (2006). *Positivism & post-positivism*. Web Centre for Social Research Methods. Retrieved from: <http://www.socialresearchmethos.net/kb/positivism.php>

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.

5E Instructional Model

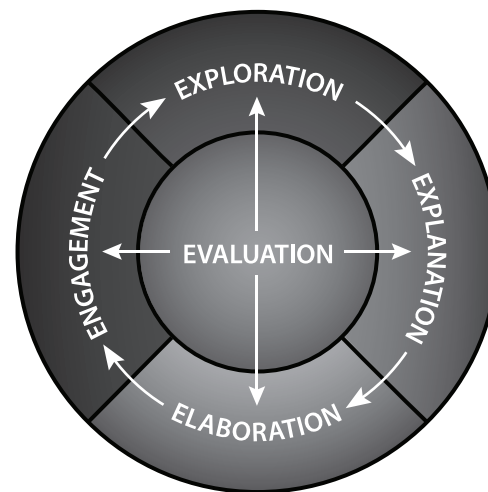


Figure 1. Illustrating one version of the 5E model that conveys the role of valuation as an interconnecting process that is at the core of the learning experience.



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.

REFERENCES

- Meegan, G. (2017). *The Intellectual Standards*. Retrieved from <https://theelementsofthought.org/the-intellectual-standards/>
- The 5 E Model (n.d.). Retrieved from <http://tiny.cc/7ogijy>
- The 5 E Model (n.d.). Retrieved from <http://tiny.cc/oogijy>

LESSON PLANS

GRADE:	9
LESSON DURATION:	50 Minutes
BIG IDEA:	Entrepreneurs can create solutions for unemployment

PURPOSE OF THE LESSON

Learning Objectives: Students will:

1. Identify terms associated with people who operate business
2. Differentiate between an inventor and an entrepreneur
3. Identify inventors who utilise scientific methods to develop products and business ventures

RESOURCE & TECHNOLOGY ATTAINMENT TARGETS

Strand 1: Creativity and Innovation

Attainment Target: Students will understand that people become entrepreneurs to create solutions to satisfy a particular need

Strand 2: Explore Methods and Procedures

Attainment Target: Students will identify the similarities and differences between inventor and entrepreneur

Strand 3: Apply Solution

Attainment Target: Students will gather information to determine reasons persons become entrepreneurs

Strand 4: Career Pathways

Attainment Target: Students will:

1. Demonstrate good interpersonal relationship
2. Practise good team spirit

Science Standards: Science Application and Design Practice - Grade 7

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

Mathematics Standards: Number – Grade 5

AT1 Number Operations and Application: Use mathematical tool to carry out one step and two step calculations involving all four operations and interpret the display correctly in the context of money.

Technology Standards:

T&S Standard 1 & 5: Student will develop an understanding of the effects of technology on the environment.

Resource Materials:

Case studies, internet sources, video presentations, role play, field trips, resource personnel

Tools/materials/equipment

Materials

Classroom Safety e.g. Students will

Activity Highlights

Engagement

- Play a song entitled “She works hard for her money”.
- Critique the song
- Students will be engaged in a discussion about persons who are self- employed.
- Students will make a list of the names used to describe a person who operates a business

Exploration

Identify a product or service used everyday, and conduct a research online or use a textbook to identify who invented it, when and where the person who invented the product or service originated

Explanation

Students will make a presentation on the findings of the research.

Extension

- Students will invent a dance move
- Students will create a product or redesign a product.

Evaluation

Teacher will use a checklist and a rubric to assess the originality and adaptability.

Enrichment

Students will do a research how to copyright or patent their product.

ASSESSMENT AND RECORD KEEPING

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 or 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.

SAMPLE
 RECORD OF ASSESSMENT OF LEARNING OUTCOMES
 PROJECT: ORANMENTAL GARDEN – GRADE 4

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	supply appropriate nutrients to ornamental plants	perform maintenance activities in ornamental garden
John Allen						
Rupert Bonnett						
Navla 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)	Mastery (4)
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 problem	Student understands problem but can only identify some necessary data or create a slightly inaccurate plan to solve problem	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 collection	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

Descriptors	No progress (0)	Introductory (1)	Emergent (2)	Proficient (3)	Mastery (4)
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 demonstrates no understanding or progress towards 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 carries 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)		
<p>NAME: _____</p> <p>GRADE: _____ DATE: _____</p>		

STRATEGIES FOR THE DELIVERY OF RESOURCE & TECHNOLOGY**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 brainstorm 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:

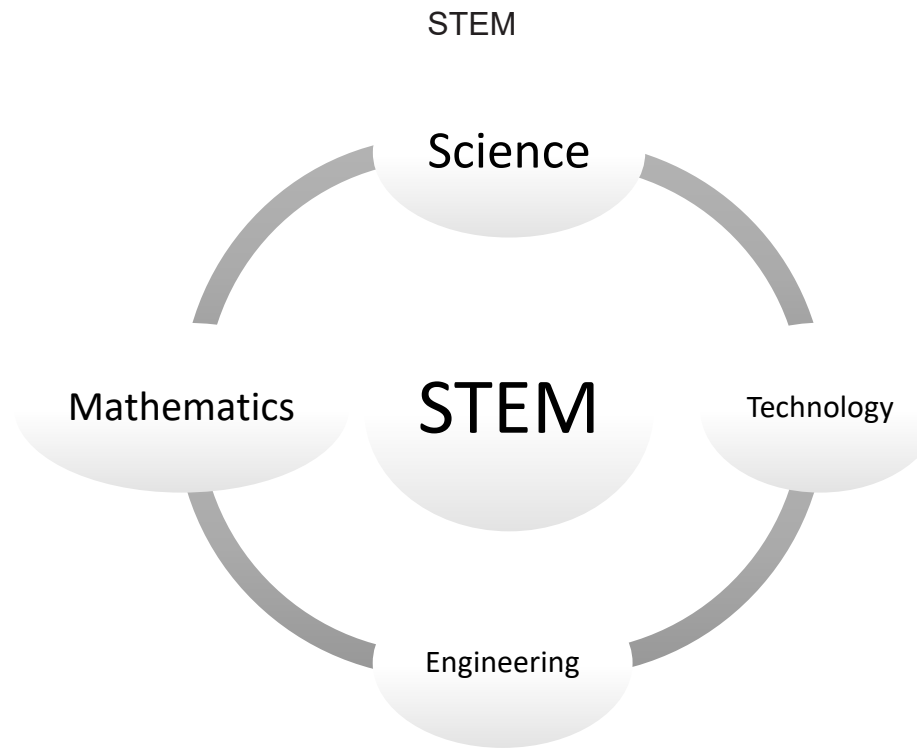
- problem-based – students develop imaginative solutions to presented or observed problems
- reality-based – students work in real-life/world learning environments
- decision-making – students have choices about what they learn, make choices within their learning environment and set personal goals
- 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

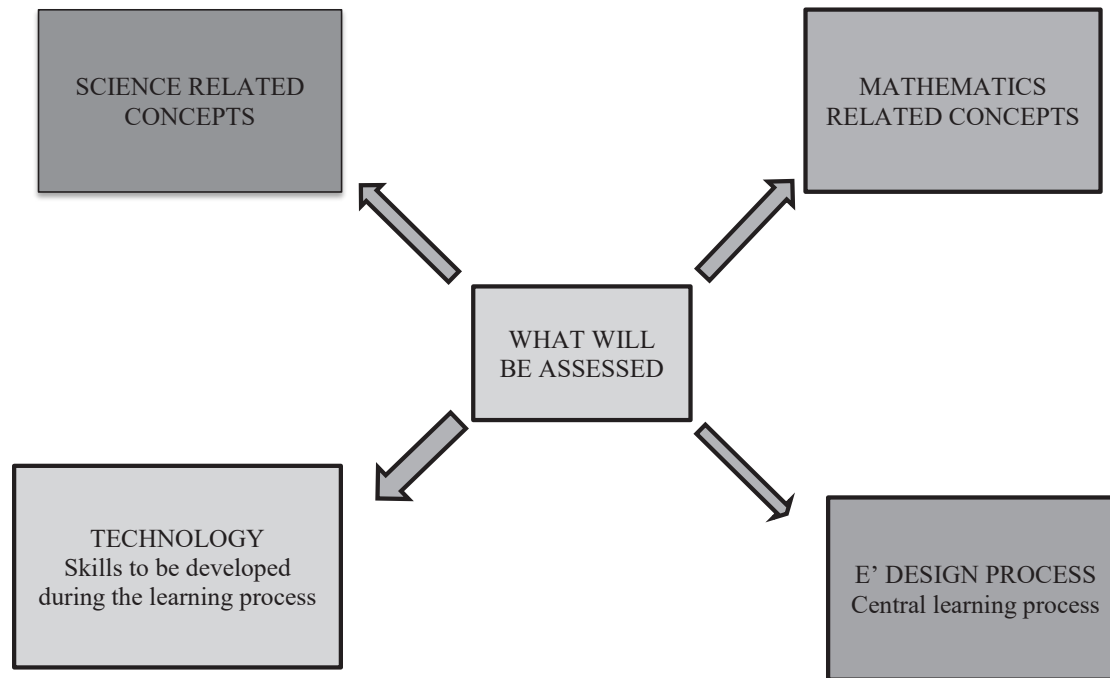


Diagram illustrating STEM/STEAM components integrated in a lesson

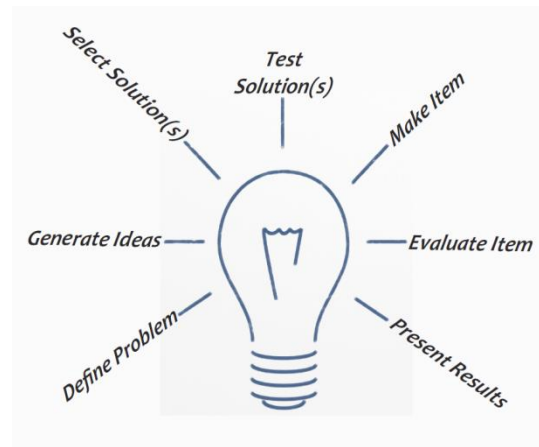
To ensure that the integration of STEM principles in a unit of work or project, the teacher is encouraged to design a 'STEM Map' as illustrated above. This is further illustrated and explained in the Teachers' Guide for all the projects or units of works. This model has been developed to ensure that 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 ensure 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:

