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MINISTRY OF EDUCATION

Secondary School Teacher's Guide

Technology Education

Curriculum Development Division

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Part 1

Introduction

Introduction

A Technology Education (Tech Ed) teacher facilitates the development of the knowledge, skills and attitudes of a specialized skill subject area using the Tech Ed methodology. In more ways than one, the Tech Ed teacher is in a unique position. The formal curriculum document that is presented to the Tech Ed teacher is neither prescriptive nor definitive but only bounded by time and the process by which students acquire these attributes. As such, teaching in Tech Ed is continuously evolving and each teacher will have to find their own distinctive way of interacting, interpreting, questioning and re-visioning the formal curriculum document.

The 2014 curriculum writing group for Tech Ed grounded its thinking in the perspective of the teacher who seeks to provide students with opportunities to think creatively and critically, solve problems in their community and to engage in co-operative learning. Tech Ed is poised to provide your students with these opportunities.

Although Tech Ed has been available to students of the lower secondary classes since 2001, it continues to be the most innovative attempt to make secondary education in Trinidad and Tobago, exciting, appealing and effective. Success in the twenty-first (21^{st}) century's dynamic global village demands particular skills and attitudes towards technology that must be encouraged, supported and facilitated.

Tech Ed can help to produce learners who are creative, technologically literate, effective communicators and problem solvers. Students will be empowered to live, learn and work successfully in an increasingly complex society. Tech Ed helps to develop a critical thoughtful approach to everyday issues, enhances personal employability, increases the potential for entrepreneurial activity and encourages the pursuit of higher levels of education and training.

The draft curriculum which you are asked to use as a guide is an inclusive one that caters for students of varying abilities, aptitudes and interests. An exciting combination of learning activities provides all students regardless of innate differences the opportunity to make decisions

in an environment that encourages creative risk-taking. Its greatest strength lies in its practical, hands on approach to problem solving.

About this guide

The Teacher's Guide seeks to support the successful implementation of the Technology Education (Tech Ed) curriculum by its teachers. The Tech Ed curriculum engages teacher and student in a problem-solving situation. The teacher's role is both as judge of the requirements of the teaching and learning situation and as a guide on the side in the generation of ideas and proposals for solutions. As a consequence, the goals of the guide are to:

1) provide information on the overall approach to the teaching of Tech Ed
2) provide assistance in interpreting the contents of the curriculum guide
3) explore the expected learning outcomes and the suggested teaching and assessment strategies
4) suggest resources that are needed to support curriculum delivery

In that regard, the guide is divided into five (5) parts, namely:

SECTION	**TOPIC**	**HIGHLIGHTS**
Part One	Introduction	Guiding philosophy, historical perspective, key terms and definitions used by developers, relevance to education in the 21st Century, teaching and learning theories.
	Subject Framework	Shows links among the content of components with teaching strategies and resources.
Part Two	Teaching and Learning Strategies	To promote and develop critical thinking and research skills with an emphasis on group work.
	Teacher support material	Activity and Technique Descriptors
Part Three	Assessment Support Material	Authentic assessment, use of portfolio, product, process and presentation as key assessment tools
Part Four	References and Appendices	Text based materials, online resources.

Subject Rationale

Whereas the first two versions of the Tech Ed curriculum were responses to learning outcomes seen as essential for graduates of our secondary schools, the 2014 version is underpinned by the detailed and significant Value Outcomes set out in the Strategic Plan 2011-2015 of the Ministry of Education of Trinidad and Tobago. In particular, the interdisciplinary nature of the 2014 Tech Ed Curriculum Guide aims to support children in achieving their full potential by providing opportunities that are a mix of academic principles and tech-voc skills, embedded in challenging activities that are economically, socially and culturally oriented. Tech Ed emphasizes access and use of technology in research and in the production of prototypes, products and service events as solutions to authentic, real world problems.

The Guide's content relates to contemporary problems and issues in society such as urban living, environmental concerns, health and wellness. Other challenges focus on personal development needs such as construction skills, entrepreneurial knowledge, and safety principles. Tech Ed's instructional and assessment approaches continue to facilitate the student's acquisition of 21st century skills as it requires that students collaborate, cooperate, and operate with high levels of interpersonal skills, as well as the capacity to act in ethically and morally responsible ways. Finally, Tech Ed is inclusive of students with varying abilities, aptitudes, and interests, by providing avenues for all students to learn by making decisions in safe environments that promote and encourage creative risk-taking.

Applicable Learning Theories and Principles

The 2014 version of the Technology Education curriculum continues to support students' acquisition of 21st century skills. Technology Education seeks to provide a platform for students to demonstrate creativity, critical thinking, problem-solving, and decision-making skills. In addition Technology Education requires and rewards communication and collaboration. Every activity in Technology Education employs the tools of information and communications technology (ICT) and information literacy. Finally, Technology Education promotes a sense of personal and social responsibility. In particular this version adds a focus on design skills and a layer of business literacy. These new areas reflect the dynamic nature of educational goals as we strive to achieve the clearly defined Value Outcomes outlined in the Ministry of Education's Strategic plan.

The Technology Education curriculum continues to work with a clear belief in the benefits of problem-based learning (PBL) where students are motivated to make maximum effort to come up with creative solutions to real-life problems, acquire and retain new learning almost incidentally, including learning to collaborate in teams, make connections with concepts and skills learnt in other subjects and subject their work to review and evaluation by others. At its best, PBL interweaves curriculum, instruction and assessment almost seamlessly as it takes advantage of research in constructivist and brain-based learning theories including that of the existence of multiple intelligences in any one group.

In Technology Education, the content to be learnt is negotiated out of the context of the students and the unthreatening challenges presented. Both students and teachers are urged to create their own challenges out of their own settings and understandings. In Technology Education, the instructional strategies take a constructivist perspective where students begin by identifying their prior knowledge, use technology to add to their source of knowledge and/or make requests for the teacher's intervention to add new knowledge. Finally, Technology Education ensures that assessment mirrors the tenets of multiple intelligences allowing for a range of response types with clear and pre-set criteria for assessment used most productively in the provision of feedback.

As the 2014 Technology Education curriculum guideline continues to apply the same tenets of the three main learning theories it would be useful to outline some implications for learning and teaching in a similar manner to those set out in the previous curriculum guidelines. Teachers are urged to carry out their own research of these seminal learning theories.

Constructivist theory

The constructivist perspective states that learners construct knowledge for themselves, taking into account their own experiences. It follows that students are interested in real-life problems that are contextualized in their own experiences. The solutions to these problems will make use of students' prior knowledge as well as their innate social drive to contribute to their acquisition of new knowledge.

Implications for teaching and learning strategies

- The Technology Education teacher sees his role as facilitator of the learner in acquiring the skills outlined above as well as the concepts the learner has identified as valuable.
- Students should be allowed to work in self-directed groups and at their own pace;
- Learning activities should be contextualized and problematized as a key to motivating the learner.

Brain-based learning theory

The structure and functioning of the brain are the focus areas in this theory that treats the brain as a tool with processing capability that cannot help but learn. However, it works most efficiently when highly motivated, freed from negative emotions and supported physiologically.

Implications for teaching and learning strategies in Technology Education

The instructional techniques associated with brain-based learning are orchestrated immersion, relaxed alertness, and active processing.

- *Orchestrated immersion* refers to the creation of learning environments that fully immerse students in an educational experience.
- *Relaxed alertness* requires the elimination of fear in learners, while maintaining a highly challenging environment.
- *Active processing* allows the learner to consolidate and internalize information and is most efficient when the body and brain has had adequate sleep, has exercised and maintained good nutritional practices.

Multiple intelligences (MI) theory

Howard Gardner (1983) advocates that individuals possess between 7-10 intelligences (verbal-linguistic, mathematical-logical, musical intelligence, visual-spatial, bodily-kinesthetic, interpersonal, intrapersonal, naturalist, existential) to various degrees of strength. Any one Technology Education group consists of a variety of intelligence groupings with abilities which can be nurtured and strengthened, or ignored and weakened.

Implications for teaching and learning strategies in Technology Education

- When asked for content, the Technology Education teacher should use a range of forms (demonstration, notes, performances etc.) to share the requested information
- Teachers should encourage and reward students who demonstrate multiple ways of understanding and value their uniqueness.
- Students learn from their peers perhaps even more than from their teacher. Teachers should give students opportunities to know and appreciate what each brings to the curricular context.

As we continue to apply the above learning theories, our expectations of this version of Technology Education remain the same, that is, both students and teachers find the curriculum meaningful and authentic, learner-centred and interactive. Technology Education has great potential to eliminate a number of problems that prevent our students from learning and even wanting to learn.

Content Framework

for

Technology Education

Table 1: Framework for Biological Technologies

CONTENTS		TEACHING AND LEARNING STRATEGIES	RESOURCES
Biological Technologies - provide opportunities to use biological systems to solve problems related to agriculture, food, health, and the environment in a sustainable and environmentally friendly manner. - create new products to improve the quality of life - modify existing ones to improve the quality of life	**Agricultural Technology** - use of technology to improve the efficiency of crop and animal production. - use of living organisms or parts of organisms to make or modify organisms, biological systems, and products for practical purposes. - comparing methods of food preservation - growing of crops using a soil-less medium - rearing ornamental fishes **Environmental Management Technology** - use of technology to assess and manage the effects of man's action on the environment - decorate an area using plants and other materials - produce water purification system - promote soil conservation	- Teacher guidance - Student self-directed research/investigation activity - Group-based activity - Presentations using ICTs - Peer group discussions - Field trips - Handouts - Demonstrations - Guided discussions - Demonstration of safety tools and equipment - Brainstorming - Self–evaluations - Monitoring the construction process	- Safety Gear - Local fruits and vegetables - Basic kitchen utensils and equipment - Food preservatives - Local materials - Garden tool and equipment - Fertilizers - Pesticides - Seedlings/seeds - Construction materials - Construction tools - Materials for making soil-less media - reusable materials - Fish tanks and accessories - Water –testing kits - Measuring tape - Fish food, - Salt blocks

Table 1

Framework for Biological Technologies (continued)

CONTENTS		TEACHING AND LEARNING STRATEGIES	RESOURCES
Biological Technologies (continued)	**Health and Wellness Technology** Use of technology to manage one's health and achieve a state of wellness -Application of methods to assess health status -Promote healthy lifestyles -Discover intervention strategies to manage health issues	- Evaluation of solutions to choose an appropriate design - Production of a system design/model/product - Evaluation of presentation - Review of Portfolio	- Fish medication - Ornamental plants - Recyclable materials - Garden ornaments - Garden tools

Table 2: Framework for Engineering Technologies

CONTENTS		TEACHING AND LEARNING STRATEGIES	RESOURCES
Engineering Technologies - the conversion or modification of raw and processed materials - concepts such as planning, - designing, preparation processing, supply constructing, finishing, manufacturing, maintenance - storage - current technology used in engineering instruction of and safe use of tools and equipment	**Automation Technology** - Operation technical and computer- based control systems in Robotics - Applications development - Animation with an emphasis on game development - Computer Numerical Control (CNC) Machines - 3D Design and Printing **Building Technology** - Use of traditional and new building /construction materials - Utilization of measurement and manipulative skills to construct models of buildings and parts thereof, internal storage items and simple furniture pieces **Design Technology** - Understanding and appreciation of design skills - Designing and drawing/sketching as communication - Manipulation of measurement, basic geometric shapes and construction ideas to create models, graphical items and simple layouts for construction or furniture pieces.	- Activity-based Group Discussion - Games - Field trips - Oral Presentations - Collaboration - Portfolio Development - Brainstorming - Problem solving - Concept Mapping	- Software - Printer - Camera - Camcorder - Computers - Robotics kits - recyclable materials from items such as computers, toys and appliances, printers, old clothes - recyclable materials such as chipboard, - Wood/ply board - Metal (sheet) - Paper, construction board, kite paper - Plastic sheeting - Pencils - Coloured pencils

Table 2

Framework for Engineering Technologies (continued)

CONTENTS		TEACHING AND LEARNING STRATEGIES	RESOURCES
Engineering Technologies (continued)	**Electrical and Electronic Technology** - Design, creation, installation and testing of simple electrical and electronic circuits. - Building of models of devices and systems to generate electrical energy from renewable energy sources - Appreciation of the impact of traditional energy sources on the environment. **Mechanical Technology** - Plan, design, and use materials in the manufacture of quality products - Describe different types of ferrous and non-ferrous metals - Use tools and equipment in a safe manner to fabricate, construct, and perform basic machining operations - Interact and troubleshoot with small machines and engines.	- Teacher guided discussions - Student self-directed research/investigation activity - Group-based activity - Presentations using ICTs - Peer group discussions - Field trips - Handouts/Instructional handouts - Demonstrations - Guided discussions - Demonstration of safety tools and equipment - Skills/concepts practice - Brainstorming - Self-evaluations - Monitoring the construction process - Supervised practical activities - Testing & troubleshooting techniques - Electronic lab kits activities	- Glue, hot glue sticks, glue gun, wood glue - Screw fasteners - Rivets - Solder flux - Set squares, scales - Electrical (connecting) wires - Electrical/ Electronic devices - Batteries/Power sources - Paint (oil, water, poster), varnish - Cloth - Software - Circuit boards - Testing Instruments - Sensors - Magnets & Electromagnets - Electronic learning kits - Electronic components

Table 3: Framework for Entrepreneurship

CONTENTS		TEACHING AND LEARNING STRATEGIES	RESOURCES
Entrepreneurship - identify opportunities for profit-making, - recognize the business potential of activities in the other components of the Technology Education curriculum - preparing product-focused business plans - engage in business operations - prepare relevant business documents and records	**Business planning** - discovery of selected business terms, forms, functions and skills, - development of simple business plans - appreciate entrepreneurial environments - building of perspectives and attitudes of successful business people. **Document preparation:** - Preparation of key business documents used in various personal, and office environments - Management of key business documents used in various personal and office environments.	- Teacher guided discussions - Student self-directed research/investigation activity - Group-based activity - Presentations using ICTs - Peer group discussions - Field trips - Handouts/Instructional handouts - Demonstrations - Guided discussions - Skills/concepts practice - Brainstorming - Self -evaluations - Interviews - Skits - Resource Personnel	- SWOT Questionnaire - Internet - Bristol board - Textbooks - Business Plan - Marketing Plan - Operations Plan - Marketing Plan - Financial Plan - Pictures - Newspapers - Magazines - Software - Questionnaires - Computer - Printer - Institutions like National Entrepreneurship Development Company Ltd (NEDCO), Credit Unions, Central Bank, Commercial Banks,

Table 3

Framework for Entrepreneurship (Continued)

Content		Teaching and Learning Strategies	Resources
Entrepreneurship (continued)	**Record-keeping** Preparation of simple accounting records Preparation of Minutes of Meetings Proposal Writing	- Information resource banks like textbooks, websites, handouts, brochures	- Youth Business Trinidad and Tobago (YBTT), Venture Capitalists, - Business Development Unit, Agricultural Development Bank - Websites - http://www.doingbusiness.org/data/exploreeconomies/trinidad-and-tobago/starting-a-business, www.nedco.gov.tt - Minute templates - Statutory Forms like NIS, Identification cards, driver's permit, BIR, passport, job application

Table 4: Framework for Human Ecology

CONTENTS		TEACHING AND LEARNING STRATEGIES	RESOURCES
Human Ecology - personal development - human relationships with family - knowledge and skills necessary to adapt to demographic and socio economic changes in society	**Clothing and Textiles Technology** - Application of Textile Science to the production of garments and accessories for personal or household uses. - Develop basic skills in needle work and garment construction - Application of the behaviour of various textiles to their uses. **Consumer Technology** - Application of life skills to the management of personal, family and societal resources - Manipulative skills in professional image, manicuring, conduct and personal hygiene - Utilization of resources to maximize individual and familial development within the home - Efficiently and effectively manage a household	- Guided research - Demonstrations - Experimental procedures - Field Trips - Discussions - Role playing - Brainstorming - Information resources e.g. textbooks, internet, journals, newsletters etc.	- Fabric - tee shirts - fabric dyes - fabric paint - accessories - glue - rubber bands - twine - internet - textbooks - journals - handouts - boxes - gift paper - wall plugs - plug socket cover - play mat - plastic containers - glue - wood - paper - wire

Table 4

Framework for Human Ecology (continued)

CONTENTS		TEACHING AND LEARNING STRATEGIES	RESOURCES
Human Ecology (continued)	**Food Technology** - Application of Food Science to the processing, preservation, packaging and distribution of raw material - Description of nutritional and physical properties of food components - Application of safety concerns in the handling of foods and equipment	- Self-evaluation - Peer evaluations - Group activities - Presentation skills	- oats - cream of wheat - eggs - milk - fruit - fish - boxes - plastic - meats - vegetables - honey - sugar - salt - oven - dehydrator - all other materials as approved by the teacher.

Part 2

Teaching and Learning Strategies

The Tech Ed curriculum requires that we remain authentic in our approach to teacher implementation and assessment. In doing so, we focus on key areas:

1. Planning for Instruction
2. Classroom management
3. Use of ICTs in Learning
4. Rubric development
5.

Planning For Instruction

In other subject areas implementation begins from a clear understanding of what should be taught, where, when and even how. From this, the teacher will draw up schemes of work, unit plans, lesson plans and notes of lessons. Some of these are required still in Tech Ed but there is less clarity or rigidity since students decide what they need to know. However, the Tech Ed teacher usually chooses the challenge to be presented to particular student groups (e.g. Form 1) and begins by this to circumscribe somewhat, what the students will likely to want. In that regard, the teacher should be clear about what he needs to Know, Do and Learn. The section below provides some support for teachers in terms of indicating the content, scope, sequence and resources applicable to the named activity. A careful reading of the specific learning outcomes will also provide teachers with direction if needed. The third column contains suggested teaching and learning strategies (TALS) as well as continuous assessment strategies (AS). The fourth column suggests possible resources needed by teacher and students.

It is recommended that students engage in activities for either 6 or 12 weeks during the term.

Classroom Management in Technology Education

Classroom management is a term used by teachers to describe the process of ensuring that teaching and learning is conducted smoothly while minimizing disruptive behaviour by students. On the other hand, from the student's perspective, effective classroom management involves clear communication of behavioural and academic expectations in a cooperative learning environment.

The Tech Ed classroom is a vibrant, interactive space in which non-traditional teaching methodologies and strategies are deployed to enable students to accomplish the objectives of the activity. The main strategy employed by teachers is the presentation of a challenge to groups of students and thereby placing them in a problem-solving mode. To determine a solution to the given problem requires student groups to follow a problem solving methodology and perhaps more importantly, to do so as a team. As a result, many activities take place simultaneously, energetically and perhaps noisily, within the Tech Ed classroom. However, the classroom is also characterised by problem-based and co-operative learning, high student engagement, and the use of technology.

In managing the Tech Ed classroom, the teacher is expected to create an environment which inculcates the attributes of motivation, discipline and mutual respect in students. In motivating students, your thoughtful selection and approaches to implementation will inspire confidence in students. In formulating guidelines to maintain discipline, the teacher should arrive at a list of clear and practical rules and their consequences. These class rules should be guided by policies of the Ministry of Education and the school but should also be the results of agreement between teacher and students. In those circumstances, the teacher should:

- Establish ground rules for his/her class.
- Involve students in establishing group rules and parameters.
- Establish rewards and consequences for positive and negative behaviours, respectively. Students can assist in deciding on these criteria as well as carrying out the consequences.

- Be consistent and fair in all students/group interactions.
- Arrange the classroom in ways that provide support for problem-based, performance-based and co-operative learning, high student engagement, and the use of technology.

  For example, have students produce wall posters on such topics as safety, the IDEATE process, group organization etc.
- Assist students in achieving success –for example, choose challenges or parts of challenges which are attainable and appropriate for the level, cohort abilities and interests and available resources.
- Outline, where necessary, the IDEATE steps in accomplishing the tasks.
- Make an effort to know each student e.g. call each student by his/her name.
- Use effective ways of creating groups and allow time for the team-building process.
- Keep a record of group membership and make changes as necessary.
- Encourage students to develop trust and respect for each other.
- Manage group conflict carefully.
- Be prepared to flex as student groups change their focus partway through the problem-solving process.
- Provide resources as requested once approved by you.
- Give small tangible rewards for positive reinforcement.
- Give immediate and positive feedback to student groups with suggestions for improvement.
- Use positive tones and state positive expectations of students.
- Inject humour into exchanges allowing students to see another side of the teacher.
- Demonstrate empathy and patience.
- Share of oneself and be honest with students. (They will teach you if you admit you don't know.)

Use of ICTs in Learning

Learning is not a transfer of knowledge but rather an active construction. Research has shown that the infusion of Information and Communication Technology (ICT) can lead to improved teaching methods and enhanced student learning. ICT is a generic term, which is used for collecting, storing, editing and passing on information in various forms. ICTs have the potential to transform the nature and process of the learning environment into one of interactivity, flexibility and convenience. The infusion of ICTs into the IDEATE process provides students with opportunities to use information and communication technology tools to arrive at solutions and present finished products.

Technology has given us the capacity to access and interact with information globally, so as to achieve instructional objectives. The growth of these technologies, their ease of use, the power and diversity of information transfer allow teachers and students to have access to a world beyond the classroom. ICT is also used as an assisting tool and is independent from subject content. ICT tools can be used to achieve various purposes, such as collecting data and documentation, communicating, conducting research, in presentations and in completing a given project. Students need to be able to recognize situations where ICTs will be helpful, choosing the most appropriate tools for a particular task, and using these tools in combination to solve real problems.

The digital revolution of the 21st century encompasses ICT tools such as word processing, publishing, CAD, 3D printing, database, statistical analysis and modelling, multimedia, simulation, animation, coding, wearable technologies and robotics. Students can utilize these tools to enhance the learning experience in the Tech Ed classroom.

Teachers must be cognizant of health and safety issues associated with the use of ICTs for learning. It is important that the teacher develops a strategy for sharing health and safety information with students. Students must be aware of, for example, the physical discomforts that are associated with abuse of ICTs, internet addiction, netiquetting and the dangers of sharing personal information online.

Rubric Development

Rubrics are an integral component of assessments when implementing any curriculum area. Rubrics are usually developed to match particular end-of-topic assessments. In Tech Ed, rubrics are applied in tandem with the standard tasks that must be carried out for all activities. Pre-existing rubrics are used to inform students about teacher expectations for the results of their activities. Teachers can apply the rubrics in preliminary assessments to provide feedback throughout the period. This can help to ensure that final grades are truly representative of students' ability.

When developing rubrics, teachers must identify key skills that they wish students to demonstrate. Key skills can be identified from the expected learning outcomes. Only measureable criteria should be evaluated. Keep in mind that the rubric should be short and simple. Each rubric item should focus on a particular skill. Some rubrics remain the same for certain components in the mark scheme e.g. teamwork skills, while other rubrics will need to be tweaked to reflect the nature of the challenge e.g. product evaluation. Rubrics are further developed to identify separate performance levels. This would then lead to the development of a scoring scale. For example, a rubric may identify 40% -50% as the minimum or lowest performance found acceptable, 51-70% may be called a middle-range performance, and above 70% may be the highest levels of performance. Teachers must determine how many score levels are needed based on the learning outcomes that were set. Differences between score levels should be clearly defined.

Choosing the correct type of rubric is also important. The two main types of rubrics are holistic rubrics and analytical rubrics. Analytical rubrics identify and assess components of a finished product. Holistic rubrics assess the student work as a whole. The latter is more subjective but can be quite useful at the beginning of the activity. It is very important that rubrics be communicated to students when assignments are given so that students are aware of what is expected of them. You may wish to develop, for your class or for each group, a rubric sheet which indicates student performance for each criterion, to enable marking. Share criterion-based results with students so they are aware of performance levels achieved.

Once rubrics are properly developed both the teacher and student will be clear as to what is expected and assignment of marks will be more transparent.

TEACHER SUPPORT MATERIALS

- BIOLOGICAL TECHNOLOGIES
- ENGINEERING TECHNOLOGIES
- ENTREPRENEURSHIP
- HUMAN ECOLOGY

DESCRIPTORS FOR ACTIVITIES IN

- AGRICULTURE TECHNOLOGY

-ENVIRONMENTAL MANAGEMENT TECHNOLOGY

- HEALTH AND WELLNESS TECHNOLOGY

Agricultural Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***Treat Me Nice***	1. identify local produce with potential for post-harvest management 2. identify suitable post-harvest techniques 3. select a suitable post-harvest technique for the identified local produce 4. identify materials needed for the post-harvest technique for the identified produce 5. develop a food product using an appropriate post-harvest technique 6. evaluate the chosen post-harvest technique for effectiveness	• Advise on safety: use of Internet, use of tools and equipment • Advise on food handling practices by resource personnel e.g. Food and Nutrition teacher, Public Health personnel • Guide discussions on post- harvest techniques • Define terms • Demonstrate (e.g. online videos) • Use feedback from students • Review portfolio	• safety gear • local produce • basic kitchen utensils and equipment, food dehydrator, vacuum sealer, vacuum sealer bags, glass jars, freezer bags • digital resources: http://www.slideshare.net/monivijay/post-harvest-handling-of-fruits http://www.fao.org/3/a-y5431e.pdf http://2003.64.245.61/fulltext_EB/2001-2010/eb0146.pdf http://www.extension.iastate.edu/NR/rdonlyres/B0D64A49-9FA9-410E-849A-31865EFECE91/146402/GAPSpostharvest.pdf

Agricultural Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Look! No Soil***	1. identify different types of soil-less media 2. identify short term crops that can be grown on soil-less media; 3. select a short term crop that can be grown on a soil-less media 4. prepare a soil-less medium from local materials 5. design a system for growing a short term crop using the soil-less medium 6. construct the system for growing the short term crop 7. grow and maintain the selected short term crop from transplanting to harvesting 8. harvest the crop at correct stage of development	• Organize a field trip to a hydroponics/peat farmer or to the Ministry of Agriculture demonstration station • Advise on safety: use of Internet, correct use of tools and equipment • Guide discussions on soil-less media and on systems using soil-less media by resource personnel (e.g. Agricultural Science teacher, Agricultural Extension Officer) • Define terms, • Demonstrate (e.g. online videos) • Use feedback from students • Review portfolio	• local materials for making soil-less media • garden tools and equipment • fertilizers and pesticides • seedlings/seeds • construction materials & tools • reusable materials • safety gear • digital resources: http://www.gardeningknowhow.com/garden-how-to/soil-fertilizers/soilless- http://www.instructables.com/id/...a-super-easy-hydroponics-system http://www.hydroponics101.com/sw63175.php http://www.finegardening.com/choosing-right-soilless-mix http://edis.ifas.ufl.edu/hs1186

Agricultural Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Pretty Fishy***	1. identify suitable species of ornamental fishes for marketing locally 2. design a system for rearing ornamental fishes 3. determine materials needed to set up the system 4. construct the system for rearing the selected ornamental fishes 5. monitor and manage water quality during production 6. rear ornamental fishes for commercial production 7. identify marketable stage for selected fish species 8. identify business opportunities in ornamental fish rearing	• Organize a field trip to a pet shop or ornamental fish farmer • Advise of safety: Internet use, correct use of tools and equipment • Guide discussions on rearing ornamental fishes • Define terms • Advise on construction of the system, on monitoring and managing water quality during production from resource personnel (e.g. Agricultural Science teacher, Agricultural Extension Officer) • Demonstrate (e.g. online videos) • Use feedback from students • Review portfolio	• fish tanks, bowls and accessories • water –testing kits • measuring tape • fish food • salt blocks • fish medication • safety gear • Digital resources: http://www.ornamental-fishes.com/2009/07/meaning-of-ornamental... http://animals.howstuffworks.com/pets/choosing-aquarium-fish.htm http://www.aquariumfish.net/pages/new_pictures_8.htm http://www.lib.ncsu.edu/documents/vetmed/research/slides/fishpresentation4.ppt

Environmental Management Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***How Beautiful!***	1. identify an area in the school for beautification 2. design and sketch a plan to beautify the selected area 3. identify appropriate plants for the area 4. identify materials needed for implementation of the plan 5. decorate the area according to plan	• Organize a field trip to an ornamental plant shop e.g. La Vega, Undercover. • Advise on safety: Internet use, correct use of tools and equipment • Advise on the use of software for planning an area using plants • Guide discussions on landscaping and on decorating an area using plants • Define terms • Use resource personnel for advice on appropriate plants e.g. local plant shop owner, Agricultural Science teacher • Use of resource personnel for advice on layout e.g. Technical Drawing teacher • Demonstrate (e.g. online videos) • Use feedback from students • Review portfolio	• suitable plants • decorative materials • pots and containers • soil • stone/gravel • agricultural tools/equipment • wire, wood, PVC • Digital resources: http://www.pininterest.com/maggiepi508/garden-raised-beds-layout/ http://www.download.cnet.com/Garden-Planner/3000-18499_4-10285889.html http://www.tomsguide.com/us/download/Planner-Garden,0313-4444.html

Environmental Management Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Crystal Clear***	1. define the term purified/potable water 2. explain the importance of purified/potable water 3. state the characteristics of purified/potable water 4. design and sketch a water purification system 5. make a water purification system 6. produce water that is safe to drink	• Organize a field trip to water reservoir e.g. Navet or Arena Water Reserves • Advise on safety: Internet use, correct use of tools and equipment • Guide discussions on water purification systems • Definition of terms • Resource personnel from water reservoir, Biology Teacher • Demonstrate (e.g. online videos) • Use feedback from students • Review portfolio	• soda bottles • cutting tools and equipment • sponge /cotton • pebbles, gravel, sand • duct tape • charcoal • container • Digital resources: http://www.instructables.com/id/The-Simple-water-purification-System/ http://www.natureskills.com/survival/water-purification-process/ http://www.safewaterscience.org/Downloads/Lesson2.pdf

Environmental Management Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Protect Our Lands***	1. identify different types of soil conservation methods 2. match soil conservation methods to different types of soil erosion 3. identify different types of communication media 4. design a presentation to demonstrate soil conservation methods 5. produce an educational presentation 6. make a model to demonstrate soil conservation	• Organize field trip to observe and interface with soil conservation methods • Advise on safety: Internet use, tools and equipment • Guide discussions on soil conservation • Definition of terms • Seek advice from Resource personnel on soil conservation methods (e.g. Agricultural Science teacher, Agricultural Extension Officer, farmer) • Demonstration (e.g. online videos) • Use feedback from students • Review portfolio	• soil, modelling clay • wood, nails • cutting tools and equipment • measuring tools and equipment • Bristol board, markers • Microsoft Office (Word, Power Point) • Digital resources: www.gardenguides.com/114407-types-soil-erosions.html www.ehow.com/facts_5615012_types-soil-conservation.html http://www.preservearticles.com/20120404298 81/what-are-the-methods-of-soil-conservation-18-methods.html

Health and Wellness Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***A Fun Day at School***	1. explain the concept of health and wellness 2. create a health and wellness theme 3. research five (5) physical activities that would allow for increased calorie expenditure 4. develop menus for healthy meals or snacks 5. measure calorific value of menus or the no. of calories burned 6. design a layout plan of activities 7. communicate plan to an identified audience	• Conduct research on calorific value or the number of calories burned, health and wellness, physical activities • Demonstrate how to calculate calorific value • Supervise students in practice and use of equipment • Allow time and space for group meetings and presentations • Use ICT Tools for designing layout • Organize students in groups • Assess students' activities – refer to mark scheme • Problem solving approach	Internet websites • video on health and wellness safety practices • multi-media projector & laptop computer • handouts and discussions • procedure sheets • calculation of calorific value • practical demonstrations • student's activity sheets • materials, tools and equipment • Rubric/rating scale

Health and Wellness Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Health Check-up***	1. identify basic criteria for assessing health 2. explain at least three (3) non-communicable diseases 3. use appropriate equipment competently 4. record health parameters using appropriate systems 5. use health information to assess health	***NOTE:*** ***It is NOT recommended that body fluids (e.g. blood, saliva, urine) be handled by students and teachers.*** • Research a number of criteria for assessing the health status of individuals e.g. age, sex, weight, height, waist circumference, personal and family medical history • Direct student research on: - criteria for assessing the health status of individuals - systems for recording heath parameters; communicable and non-communicable diseases, invasive and non-invasive health measurements • Provide students with information on safety procedures and practices and/or ensure students demonstrate understanding during taking health measurements • Demonstrate basic skills in recording health parameters • Supervise students in practice and use of equipment • Supplies required materials, tools and equipment • Assess the process and product	• Internet websites and video clips on non-invasive health measurements e.g. http://www.noo.org.uk/uploads/doc789_40_noo_BMI.pdf https://www.youtube.com/watch?v=JrOI-ko68PE • video on hygiene and safety practices in the workplace • multi-media projector & laptop computer • handouts and discussions • procedure sheets • practical demonstrations • student's activity sheets • materials, tools and equipment • timelines/progress chart • Rubric/rating scale

Health and Wellness Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Eat what, when?***	1. identify the non-communicable diseases associated with being overweight 2. use a system for recording foods consumed over a given period 3. perform calculations for estimating the calorific value of meals 4. read and interpret food labels 5. develop meal plans for addressing issues of overweight/obesity 6. adhere to the principles of proper meal planning	***<u>NOTE</u>: Talking with students about weight/obesity issues must be handled with extreme sensitivity. Focus on the fact that weight is an important factor in one's health. Keep the discussion general, (never about any individual and focus attention away from appearance to avoid hurting the self-esteem of any students. Being healthy is about working toward a healthier lifestyle such as making healthier food choices.*** • Research a number of non-communicable diseases associated with being overweight e.g. type II diabetes, high blood pressure, heart disease, cancer, sleep apnea • Direct students' research on: - defining relevant terms - identifying the diseases associated with being overweight - developing meal plans for persons who are overweight or obese or morbidly obese • Demonstrate the safe use of tools and equipment • Supervise students in practice and use of equipment • Demonstrate basic skills in calculating calorific value of meals • Supply required materials, tools and equipment • Allow time and space for group meetings and presentations • Assess the process and product	• Internet websites and video clips on non-invasive health measurements e.g. <u>http://www.noo.org.uk/uploads/doc789_40_noo_BMI.pdf</u> <u>https://www.youtube.com/watch?v=JrOI-ko68PE</u> • video on hygiene and safety practices in the workplace • multi-media projector & laptop computer • handouts and discussions • procedure sheets • practical demonstrations • student's activity sheets • materials, tools and equipment • Timelines/progress chart • Rubric

DESCRIPTORS FOR ACTIVITIES IN

- AUTOMATION TECHNOLOGY
- BUILDING TECHNOLOGY
- DESIGN TECHNOLOGY
- ELECTRICAL AND ELECTRONIC TECHNOLOGY
- MECHANICAL TECHNOLOGY

Automation Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***The Robot and the Maze***	1. design and sketch a maze 2. construct a maze 3. construct a maze that can be disassembled, assembled, easily stored and transported 4. choose the appropriate sensors for the task 5. construct a robot using a robotic kit 6. demonstrate the navigation of a robot through the maze	• Outline to students what is required of them during this activity and how the activity will be assessed • Develop a management strategy for the robotics kits as well as for the class • Identify group selection method for grouping students • Organize students in groups and assign roles to group members • Discuss with students at the beginning of every class the importance of good safety practices • Prepare web search list to guide students • Encourage students to document their activities by taking pictures and videos • Arrange for students to have brain storming sessions • Give students the opportunity to construct the robot using instructions after which students can design their robot using at least one type of sensor • Demonstrate how to programme the robot or give students the opportunity to learn how to programme the robot on their own • Arrange for students to design and construct a maze • Encourage students to test and make modification to robot and maze • Develop or identify instructional materials on safety in the workshop/ classroom, what is a robot and the benefits of studying robotics • Assess student during all activities • Identify ICT tools students will use for example collaborative, presentation and design ICT tools • Demonstrate to students the use of ICT tools • Arrange for students to do presentations or participate in a competition	• robotic kits with sensors, it is recommended that 7 robotic kits can be used for a class of 35 to 40 students • PVC pipes • cardboard • masking tape • styrofoam • computer **Robotics software**: VEX, Lego Mindstorm or any other robotic kit software recommended by the teacher.

Automation Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Simple Robotic Arm***	1. design a robotic arm 2. construct a robotic arm 3. identify types of simple machines 4. demonstrate the use of least one simple machine 5. demonstrate the use of a simple Robotic arm 6. utilize principles of simple machines	• Outline to students what is required of them during this activity and how the activity will be assessed • Develop a classroom management strategy for the successful implementation of the activity • Make resources available to students • Identify group selection method for grouping students • Organize students in groups and assign roles to group members • Discuss with students at the beginning of every class the importance of good safety practices • Prepare web search list for students. This will guide students to websites that can provide information on project • Encourage students to document their activities by taking pictures, videos and making notes • Make arrangements for students to have access to internet or library • Arrange for students to have brain storming sessions • Give students the opportunity to construct the robotic arm • Encourage students to test and make modification to robot arm • Observe students during all activities • Develop or identify instructional materials on safety in the workshop/ classroom, what is a robot, the benefits of studying robotics and the features of a robotic arm • Assess student • Identify ICT tools students will use • Demonstrate to students the use of ICT tools • Arrange for students to do presentations or participate in a competition	• cardboard • paper clips • string • close pins • masking tape

Automation Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Create My APP***	1. design and sketch a mobile application (app) for an Android device 2. create a mobile app for an Android device using an app ICT tool 3. apply the software/system (engineering) design process 4. identify an issue affecting students at your school 5. identify a solution to an issue affecting students at your school.	• Outline to students what is required of them during this activity and how the activity will be assessed • Identify group selection method for grouping students • Organize students in groups and assign roles to group members. • Discuss with students at the beginning of every class the importance of good safety practices • Encourage students to document their activities by taking pictures, videos and making notes • Make arrangements for students to have access to internet or library • Arrange for students to have brain storming sessions • Give students the opportunity to construct the robotic arm. • Encourage students to test and make modification to robotic arm • Observe students during all activities • Develop or identify instructional materials on safety in the workshop/ classroom, what is a robot, the benefits of studying robotics and the features of a robotic arm • Assess students • Identify ICT tools students will use for example collaborative, presentation and design ICT tools : MIT App Inventor or Touchdevelop • Demonstrate to students the use of ICT tools • Arrange for students to do presentations	• Computer • Mobile App Development software (MIT App Inventor, Touchdevelop) • Bristol board

Automation Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#4 ***CNC Machine Simulator***	1. design and sketch an Object that can be used to display jewellery 2. create a programme for the object using a CNC Machine simulator ICT tool 3. create an image of the object using CNC Machine simulator ICT tool	• Outline to students what is required of them during this activity and how the activity will be assessed • Develop a classroom management strategy for the successful implementation of the activity • Make resources available to students • Identify group selection method for grouping students • Organize students in groups and assign roles to group members • Discuss with students at the beginning of every class the importance of good safety practices • Prepare web search list for students. This will guide students to websites that can provide information on project • Encourage students to document their activities by taking pictures, videos and making notes • Make arrangements for students to have access to internet or library • Arrange for students to have brain storming sessions • Give students the opportunity to construct the robotic arm • Encourage students to test and make modification to object • Observe students during all activities • Develop or identify instructional materials on safety in the workshop/ classroom, what are Machines and how CNC machines work • Assess students • Identify ICT tools students will use for example collaborative, presentation and design ICT tools • Demonstrate to students the use of ICT tools • Arrange for students to do presentations	• Computer • CNC simulator software • Bristol board • Paper

Automation Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#5 ***Prototype Simulation***	1. design and sketch a device that can be used to fasten two pieces of material together 2. select the appropriate ICT Tool 3. programme the virtual 3D printer	• Outline to students what is required of them during this activity and how the activity will be assessed • Develop a classroom management strategy for the successful implementation of the activity • Make resources available to students • Identify group selection method for grouping students • Organize students in groups and assign roles to group members • Discuss with students at the beginning of every class the importance of good safety practices • Prepare web search list for students. This will guide students to websites that can provide information on project • Encourage students to document their activities by taking pictures, videos and making notes • Make arrangements for students to have access to internet or library • Arrange for students to have brain storming sessions • Give students the opportunity to construct the robotic arm • Encourage students to test and make modification to object • Observe students during all activities • Develop or identify instructional materials on safety in the workshop/ classroom • Assess students • Identify ICT tools students will use for example collaborative, presentation and design ICT tools • Demonstrate to students the use of ICT tools • Arrange for students to do presentations	• Computer • 3D printer simulator software • Bristol board • Paper

Building Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
# 1 ***The Lifting Device***	1. research simple lifting devices 2. select and sketch one of these lifting devices 3. select suitable materials and tools to construct the device 4. choose appropriate construction techniques to be used when building the device 5. construct the device using appropriate building skills while safely using basic hand tools and equipment 6. test and evaluate the functionality of the item	• Guide students through the research process for a number of possible lifting devices • Advise students on criteria for selecting appropriate lifting device • Demonstrate, basic sketching, measurement, marking/layout, Hand Tools Operations and layout operations • Demonstrate construction of joints using appropriate fasteners when joining different materials • Set up work and use of hand tools - drill holes etc. • Assess the product on: - accuracy of dimensions - apropriate use of materials - completed assembly - adjustments made to finished item according to design sketches • Evaluate the product	• internet websites on design activities. and books • operation sheets • video on safety practices in the workshop • handouts • operation sheets • Rubric/rating scale

Building Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
# 2 ***The Commemorative Item***	1. research simple commemorative items 2. select and produce a sketch one of the commemorative items 3. select suitable materials and tools to construct the device. 4. choose appropriate techniques to be used when constructing the commemorative item. 5. construct the commemorative item using appropriate building skills while safely using basic hand tools and equipment. 6. test and evaluate the functionality of the device	• Research a number of simple commemorative items • Advise students on criteria for selecting appropriate commemorative items e.g. level of difficulty to suit students development level, cost, and level of interest. • Facilitate access to produce sketches • Teach sketching skills to support design concepts • Direct students research on the advantages and disadvantages of different types of wood. • Introduce students to the following: - layout operations and processes - constructing appropriate joints - making adjustments in keeping with design sketches • Conduct demonstrations • Evaluate the product	• Digital resources: https://www.google.com/search?q=wooden+souvenirs+items&tbm • pencils, paper erasers and set squares • teak, cedar, pitch pine and others etc. • combination square • Measuring tape • Wood working hand tools and equipment. • Rubric/rating scale

Building Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
# 3 ***Furniture Construction***	1. discuss purpose of furniture 2. demonstrate designing techniques through sketches 3. identify, select and prepare suitable materials 4. discuss production operations and appropriate processes 5. testing & evaluation	• Teach the design process involving the following paradigms: - Concept: Generation of an idea. - Building: basic sketching, marking/layout and Hand Tools Operations. - Identifying different types of timber (White Pine; Cedar; Pitch Pine; etc.) • Guide students on selecting at least three common joints used in furniture construction • Ensure students demonstrate safe work practices when they - assemble the designed furniture item with appropriate finish - make adjustments according to design sketches - apply selected finish to completed product • Evaluate the product	• Internet websites on designing activities. http://www.minwax.com/wood-projects/ • Teacher's notes simplifying the information from the website • directed reading of Building Technology design textbook • handouts and discussions • video clips including video on safety practices in the workshop • activity sheets • design sketch • assessment rubric

Design Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***Sketching designs***	1. sketch ideas for design 2. communicate ideas through sketching	• Guide research and discussion on information on: - importance of sketching to the design process - types of sketching - proportion in sketching - designs of storage items and suitability of designs for the activity • Demonstrate sketching techniques using: - 2D & 3D figures and shapes and - Software • Use online tutorials for reinforcement of sketching techniques • Guide the construction of the item	Internet websites for research on sketching: www.visual-arts-cork.com/sketching.htm http://design.tutsplus.com/tutorials/the-role-of-sketching-in-the-design-process--psd-153 http://www.dnnsoftware.com/blog/cid/425654/why-sketching-is-an-important-part-of-the-design-process Online tutorials on sketching: http://www.dueysdrawings.com/drawing_tutorials.html http://www.drawinghowtodraw.com/drawing-lessons/things/drawing-cubes-boxes.html **There is no need for students to acquire a Technical Drawing textbook**

Design Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Kite design & Flying***	1. recognize and construct geometrical shapes 2. sketch ideas 3. manipulate measuring tools 4. construct kite 5. observe safety rules for kite flying 6. assess the advantages and disadvantages of kite flying on the environment	• Guide research and discussion on: - basic geometric shapes (triangles, quadrilaterals & polygons) and characteristics - types of kite designs - advantages/disadvantages of kite flying to the environment • Demonstrate: - use a ruler/metric scale - constructions of geometric shapes/figures • Use online tutorials for reinforcement of concepts/construction of geometric shapes • Introduce students to simple full size constructions of basic geometric shapes (triangles, quadrilaterals & polygons	Internet websites on: geometric shapes & characteristics e.g. http://www.math-salamanders.com/list-of-geometric-shapes.html online tutorials on constructions: http://www.mathopenref.com/consttriangleasa.html or http://www.mathopenref.com/constsquare.html Instructional handouts on guided instructions for constructions of geometric shapes **There is no need for students to acquire a Technical Drawing textbook.**

Design Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Garden design & Model***	1. identify four types of geometric shapes 2. manipulate measuring tools 3. sketch ideas for design 4. communicate ideas through sketching 5. make the model of the garden	• Demonstrate: - use a ruler/metric scale - constructions of geometric shapes/figures • Use online tutorials for reinforcement of concepts/construction of geometric shapes • Guide research and discussions on: - information on basic geometric shapes and characteristics - garden designs - model making • Guide sketching of garden designs • Guide construction of models	Internet websites on: geometric shapes & characteristics e.g. http://www.math-salamanders.com/list-of-geometric-shapes.html online tutorials on sketching: http://www.drawingandpaintinglessons.com/Drawing-Lessons/Basic-Geometric-Shapes.cfm or http://www.wikihow.com/Draw-Geometric-Shapes-With-Open-Office-Draw Teachers' demonstration of sketching Teachers' directed research on: Garden designs http://www.pinterest.com/microgardener/small-garden-design-ideas/ Model making – Choice of materials

Electrical and Electronic Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***One off, One on***	1. apply the three (3) relevant codes for lighting circuits (Trinidad and Tobago Bureau of Standards-TTBS) 2. sketch the appropriate lighting circuits 3. connect electrical receptacles 4. test for functionality	• Arrange lectures on standards/codes for domestic lighting circuits • Facilitate research on types of switches used in domestic lighting circuits • Demonstrate: - termination, testing and troubleshooting of a.c lighting circuits - safe use of test instruments - testing for continuity • Explain the purpose of the domestic Service Panel • Provide students with necessary tools, materials and equipment • Supervise students during the practical activity and reinforce - safety practices for use of tools and equipment - safety practices when working on an a.c supply - colour code for wires/cables - sound receptacle terminations - testing and troubleshooting procedures • Provide feedback • Assess the process and product	• TTBS 171-1 Electrical Wiring code-low voltage • electric cable • lamps • lamp holders • two-way switches • male plugs • electrical tape • connectors • test instruments • a.c supply • Digital resources: https://www.youtube.com/watch?v=fOqfjliNtT8 https://www.youtube.com/watch?v=6_TpKdYeQaU

Electrical and Electronic Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***It's a Breeze!***	1. sketch an appropriate design of a cooling device 2. salvage electronic components 3. connect components 4. test electronic circuits	• Lecture or Team teaching on types of renewable energy sources with emphasis on producing electrical power. Both Tech Ed and Science Teachers can be utilized. Solar and hydro energy is suggested • Guide students on research on renewable and non-renewable energy with specific reference to: - differences between renewable and non-renewable energy sources - identification of different forms of renewable energy • Demonstrate building a simple circuit using a battery source and other circuit components as an introduction to electrical circuit construction and operation • Supervise students' practical activities on solar power, using electronic training kits. The teacher should observe the following - Safety practices and use of tools and equipment - Termination of connecting wires and connection of components - Soldering techniques and procedures - Supply required materials, tools and equipment • allow time and space for group meetings and presentations • assess the process and the product • give feedback to students on portfolios and product	• teacher instructional handouts • electronic training kits • solar cell, rechargeable battery, electronic components, cooling device, hook-up wire, connectors, tools. • tools and equipment • activity sheet • Digital resources: http://www.youtube.com/watch?v=4UVIysfZo_M

Electrical and Electronic Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Star Light, Star Bright***	1. apply the three (3) relevant codes for lighting circuits (Trinidad and Tobago Bureau of Standards-TTBS) 2. sketch the appropriate lighting circuits 3. connect electrical receptacles. 4. compare wiring configurations	• Arrange lectures on standards/codes for domestic lighting circuits - cable colour and size, breaker size and maximum number of lights on one (1) lighting sub circuit • Facilitate research on types of circuits - series, parallel and series-parallel lighting circuits - sketching lighting circuits • Demonstrate termination, testing and troubleshooting of simple series and parallel d.c and a.c lighting circuits • Explain the use of the domestic Service Panel • Provide students with necessary tools, materials and equipment • Identify recyclable and reusable materials • Supervise students during the wiring activity and reinforces - safety practices when working on an a.c supply and when testing the circuit - colour code for wires/cables - polarity connections - sound receptacle terminations - testing and troubleshooting procedures	• - TTBS 171-1 Electrical Wiring code-low voltage • recycled materials • electric cable • lamps • lamp holders • male plugs • electrical tape • connectors • test instruments • a.c supply • Digital resources: https://www.youtube.com/watch?v=VnnpLaKsqGU https://www.youtube.com/watch?v=x2EuYqj_0Uk https://www.youtube.com/watch?v=RQ3djos_LY8

Electrical and Electronic Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#4 ***Sound the Alarm***	1. conduct research on different types of sensors and audio devices 2. select an appropriate sensor and audio device 3. sketch an appropriate circuit design 4. build alarm circuit 5. test alarm circuit	• Lecture and Demonstrations on the electromagnetic effect and the motor rule showing applications, such as the electric bell, relays and the speaker operations. • Guide research on sensing devices and electromagnetic devices (Internet, text-book). Examples of sensing devices are motion detectors, light dependent resistors, thermistors, etc. **Note: Relays can also be used as a sensing device.** • Supervise students' practical activities on building of the audio alarm circuit using electronic training kits. The teacher should observe the following - Safety practices and use of tools and equipment - Termination of connecting wires and connection of components - Soldering techniques and procedures • supply required materials, tools and equipment • allow time and space for group meetings and presentations • assess the process and the product • feedback to students on portfolios and product	• instructional handouts • electronic training kits • tools and equipment • activity sheet • assessment rubrics • speakers, relays, electromagnets, bells, motion detector, photocell • Digital resources: http://www.eleccircuit.com/pir-motion-sensor-alarm-circuit/

Mechanical Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***Chewing Gum Scraper/Tool***	1. Sketch a design of a tool to remove chewing gum from the floor 2. Select suitable materials to construct the product 3. Choose appropriate production processes to be used in the construction of the product 4. Demonstrate skills in the safe use of basic hand tools and equipment 5. Test and evaluate the functionality of the product	***<u>NOTE</u>: The school rules regarding eating and chewing of gum MUST be reinforced.*** • Research designing techniques • Direct research on ferrous and non-ferrous metals - ferrous metals e.g. mild steel; sheet metal - non-ferrous metals e.g. aluminium; copper • Provide students with information on safety procedures and practices - wearing of safety glasses when operating machines - fastening of drilling machine vice - use of sharp pointed hand tools • Demonstrate basic machine operations - setting up work and machine - measure and mark out dimensions - fastening - finishing techniques • Supply required materials, tools and equipment - marking out instruments - files, chisels, hammers, centre punch, - rivet machine and rivets, etc. • Assess the process and the product - appropriate materials are used - joints are well constructed - assembly is completed - quality finish is provided	• directed reading of engineering design textbook • video on safety practices in the workshop • handouts • procedure sheets • video clips of practical demonstrations • finishing materials – emery paper, spray paint, etc. • rubric/rating scale • Digital resources: http://www.sayresd.org/Tech/TechManuals/AutoCAD/Design%20Basics.pdf

Mechanical Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***The Organizer***	1. sketch a design of a product to organize and store small items 2. select suitable materials to construct the product 3. choose appropriate production processes to be used in the construction of the product 4. demonstrate skills in the safe use of basic hand tools and equipment 5. test and evaluate the functionality of the product	• Research a number of possible designing techniques • Advise students on criteria for selecting appropriate techniques • Supply required materials and tools • Provide students with information on safety procedures and practices and/or ensure students demonstrate understanding during basic machine operations - wearing of safety glasses when operating machines - fastening of drilling machine vice - use of sharp pointed hand tools - remove sharp edges from prepared metal • Demonstrate basic machine operations and processes - setting up work and machine - measure and mark out dimensions - marking out procedures - finishing techniques • Assess the process and the product - effective time management - joints are well constructed - assembly is completed - quality finish is provided	• teachers' notes simplifying the information from the website • directed reading of engineering design textbook • video on safety practices in the workshop • handouts • procedure sheets • short video clips • practical demonstrations • rubric/rating scale • Digital resources: http://www.sayresd.org/Tech/TechManuals/AutoCAD/Design%20Basics.pdf

Mechanical Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Garbage Storage Device***	1. Sketch and design a device to store household waste/garbage 2. Select suitable materials to construct the product 3. Choose appropriate production processes to be used in the construction of the product 4. Demonstrate skills in the safe use of basic hand tools and equipment 5. Test and evaluate the functionality of the product	• Research a number of possible designing techniques • Advise students on criteria for selecting appropriate techniques e.g. level of difficulty • Supply required materials and tools - steel bars, aluminium, steel sheet, etc. • Provide students with information on safety procedures and practices and/or ensure students demonstrate understanding during basic machine operations - wearing of safety glasses when operating machines - fastening of drilling machine vice - safety equipment to be worn during welding • Demonstrate basic machine operations and processes - setting up work and machine - basic arc welding • Assess the process and the product - effective time management - specific dimensions are maintained - appropriate materials are used - joints are well constructed - assembly is completed	• teachers' notes simplifying the information from the website • directed reading of engineering design textbook • video on safety practices in the workshop • short video clips of practical demonstrations • materials, tools and equipment • finishing materials – emery paper, spray paint, etc. • Digital resources: http://www.sayresd.org/Tech/TechManuals/AutoCAD/Design%20Basics.pdf

Mechanical Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#4 ***Evolution of Engines***	1. identify different types of engines 2. explain how selected engines work 3. conduct research on the evolution of engines within a selected period 4. conduct research on how engines have contributed to human development 5. organize a mini exhibition	• Research the history of automobiles and the evolution of various engines • Lecture on: - engines, how they work - external combustion – steam engine e.g. locomotive - internal combustion – gasoline engine e.g. piston engine and rotary engine - compression ignition – diesel engine • Direct student research on engine development during specific periods • Provide students with information on how engines have contributed to human development • Explain research methodology • Assist with the planning and execute of the mini exhibition • Allow time and space for group meetings and presentations • Ensure that time is managed effectively • Provide feedback – portfolios, research, exhibition and other elements • Assess the process: mini exhibition, research paper, teamwork, presentation and portfolio building and completion	• teachers' notes simplifying website information • Textbook: Motivate Series-Motor Vehicle Technology for Mechanics by Read & Reid. • videos on engines • text-based materials • students' planning sheets • timelines/progress chart • Rubric/rating scale • Digital resources www.youtube.com www.howautoworks.com www.education-portal.com www.ethyl.com

Mechanical Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#5 ***Careers in Engineering Technologies***	1. identify the careers available in their specific occupational area (MET, Auto, Welding Building etc.) 2. develop an awareness of careers in their occupational area 3. prepare and execute a virtual presentation	• Research the differences between jobs, occupation and careers • Review the Dictionary of Occupations in Trinidad and Tobago • Lecture on career paths in various technical and vocation areas • Provide students with information regarding career possibilities in their areas of interest • Explain how to conduct a virtual presentation • Assist with the planning and execute of the virtual presentation • Allow time and space for group meetings and presentations • Ensure that time is managed effectively. • Provide feedback – portfolios, research, virtual presentation, team work and other elements • Assess the process, virtual presentation, research, teamwork and portfolio building and completion	• directed reading from Career Guidance and Counselling textbooks • videos on careers • multimedia projector • students' planning sheets • timelines/progress chart • rubric/rating scale • Digital resources: www.youtube.com www.targetjobs.com www.mic.co.tt www.nta.org/apprenticeship/ www.careersinwelding.com www.educationportal.com www.moe.gov.tt/Docs/Students/DOTT.pdf www.nesctt.org

DESCRIPTORS FOR ACTIVITIES IN

- BUSINESS PLANNING

- DOCUMENT PREPARATION

- RECORD KEEPING

Business Planning

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***Knowing your Entrepreneurial Mindset***	1. conduct a personal SWOT analysis 2. describe their personal SWOT profile 3. use visual means to communicate a personal SWOT profile	• Explain the term entrepreneurship and what is meant by entrepreneurial mindset • Explain what is a SWOT and how it is used in entrepreneurship • Use large groups to get representations of common traits • Encourage self-questioning and development of interpersonal skills among students • Support use of individual journal entries • Advise on the design and production of visual aids for presentation	• internet • textbooks on entrepreneurship • digital resources • other visual resources • SWOT Profile Appendix 2

Business Planning

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Moving from Idea to Business Plan***	1. recognize solutions that have potential for business development 2. select the most viable solution 3. list the components and prepare an operations plan for your selected product/service 4. list the components and prepare a marketing plan for your selected product/service	• Encourage class discussion so students/groups can select a challenge previously worked on that has potential as a business opportunity • Introduce - A business plan - An operations plan - A marketing plan • Encourage self-questioning and development of interpersonal skills among students • Advise on the preparation of a marketing plan	• internet websites e.g. www.nedco.gov.tt, www.central-bank.org.tt. • field trips to NEDCO, Youth Business Trinidad and Tobago (YBTT), Agricultural Development Bank (ADB) • directed reading of POB textbook pages from school's library or rental copies in the school or teacher's notes **There is no need for students to acquire a POB textbook.**

Business Planning

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Marketing your Designs***	1. list the activities involved in market research 2. create a simple market research plan 3. design a market research instrument 4. conduct simple market research activities 5. match marketing strategy to a given product/service 6. create marketing media with and without ICTs	• Direct students to appropriate examples of advertisements on internet, television, newspapers, billboards, magazines • Explain the term market research • Give examples of market research instruments • Encourage self-questioning and development of interpersonal skills among students • Support use of different media to create a marketing strategy	Students can utilize the internet, textbooks, brochures, newspapers, magazines, television, billboards, electronic signboards, design software, Bristol Board, colour, pictures, photographs.

Business Planning

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#4 ***Establishing a Business***	1. describe five (5) things to consider in planning and establishing a business 2. list four (4) types of business organisations 3. state at least two (2) characteristics of each of the four (4) types of business organization 4. describe at least two (2) sources of finance for any one (1) type of business organization 5. describe the legal steps to be taken to establish any one (1) type of business organization	• Emphasize the recognition of management's responsibilities to owners and shareholders, customers, employees, society and Government • Identify and explain concepts involved in starting a business like the business idea, market research, resources – capital, human, formulating the business plan, sources of capital funding, business operations • Encourage the comparison and contrast of the different types of business organisations – sole trader, partnership, companies and cooperatives • Discuss characteristics of different types of business organisations in terms of definition, number of owners, profit sharing, legal issues, financing, sharing of work • Identify sources of finance: Internal – personal capital, family and friends, retained profits External – short term (credit cards, overdraft, loans from financial institutions), long term (mortgage, investor or shareholder funds, government grants or loans, venture capital) • Examine legal issues surrounding starting a business – Registrar of Business Names, Registrar of Companies, Food Badge, Statutory Declaration, Articles of Association, Memorandum of Association, Companies Act, Income tax, VAT etc. • Identify reading material for students • Direct students to identified websites • Explain necessary terms • Encourage self-questioning and development of interpersonal skills among students. • Arrange for interviews with business owners • Organize field trips	• design software, power-point presentations, active learning through creation of handbook material • Interviews with business owners • Field trips to different businesses and financial institutions

Business Planning

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#5 ***My Professional Image***	1. state why one's manner of dress is part of a professional image 2. list at least two (2) codes used for dressing for the workplace 3. explain how dress code relates to professional image 4. match dress codes with appropriate settings 5. Describe at least one example of an unsuitable dress ensemble 6. display at least one (1) professional image suitable for a selected job 7. Describe at least one example of an unsuitable dress ensemble	• Guide research on professional image • Arrange for interviews or field trips with professional image consultants • Discuss professional image in relation to the workplace Guide research on professional image • Arrange for interviews or field trips with professional image businesses • Discuss professional image in relation to the workplace • Students might display their professional image using dolls, puppets, labelled drawings, portfolio or might be allowed to organise a professional dress day.	• Internet research • Image consultants • Textbooks

Document Preparation

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***Completing Forms***	1. list one (1) statutory form which employees submit to relevant authorities 2. list at least (1) form which an employee may submit to an employer 3. complete forms 4. organize a training activity	• Encourage students to collect and keep a portfolio of the following application forms - national identification form - passport - driver's permit - national insurance number - BIR - job application • Guide form completion and ensure the evaluation of a training activity plan, i.e. target group, learning outcomes, facilitator, place, time, length, assessment of effectiveness for completion of forms	• field trips to offices of NIB, Election and Boundaries Commission (Identification Card), Passport, Licensing, Inland Revenue, Employment Agencies etc. • Portfolios can assist with documentation of collected pieces • Internet Research and websites like www.immigration.gov.tt, tt.connect.gov.tt, http://mtr.gov.tt, www.ird.gov.tt, www.caribbeanjobs.com would be helpful

Document Preparation

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Job Application***	1. design a job application form 2. justify the information to be gathered from a job application form	• List and explain the components of a job application form - Personal - Education - Work Experience - References • Research can be carried out and examples of a job application form drawn up.	Student guided research involving: textbooks websites e.g. www.molsmed.gov.tt, www.ilo.org, www.caricom.org.

Document Preparation

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Hiring Practice***	1. Prepare job advertisements using at least two (2) different media 2. Devise a method to select persons for a job 3. Prepare form letters for a particular purpose	• Guide in the: - preparation of form letters to all job applicants - the essentials of a job advertisement - research and drawing up of examples of job advertisements - utilization of software to design job advertisements • Encourage creation of rubrics for shortlisting and selection of the person for a job	• interviews of resource personnel • textbooks and internet sources • rubrics • templates from computer programs and textbooks is necessary • directed reading of EDPM/OA textbook pages from school's library or rental copies in the school or teacher's notes. **There is no need for students to acquire an EDPM/OA textbook.**

Document Preparation

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#4 ***Document Retrieval***	1. list examples of business-related documents 2. identify items and equipment used in storage and retrieval systems 3. devise a method to store and retrieve documents easily 4. demonstrate with the use of examples how the method works	Examples of business-related documents include memoranda, letters, invoices, receipts, purchase and sales orders, quotations, payroll documents, employee records, customer records, supplier records, brochures, catalogues etc. Types of filing systems • Manual system - filing cabinets, hanging folders, manila folders, labels, naming tabs, • Electronic system – files and folders and sub-folders • Discuss how one arrives at names or labels for folders, files and sub-folders e.g. alpha, numeric, chronological, subject, geographical Discuss the benefits to developing a chart or key to organise the naming system you choose to use	• EDPM/OA textbooks • Internet research • Visit to school office

Record Keeping

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***Recording Information from Meetings***	1. Prepare a template to record group meetings 2. Use a template to record group meetings 3. Present at least one Minutes of meeting in acceptable form 4. Appreciate the value of Minutes of meetings	• Encourage students through group work to conduct meetings and record Minutes for actual practice. This should include: - Essential elements of Minutes - Acceptable formats of Minutes - Software that produces Minutes formats - Advantages of Minute taking	• internet websites on recording of minutes OR teachers' notes simplifying the information from the website. • directed reading of EDPM/OA textbook pages from school's library or rental copies in the school or teacher's notes. • use of software like Microsoft Word for available templates. • actual attendance and minute taking at school clubs, community or youth groups. **There is no need for students to acquire an EDPM/OA textbook.**

Record Keeping

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Recording Business Information as Accounts***	1. organize for a training activity 2. draw the accounting cycle 3. classify business items into five categories 4. prepare simple accounting records 5. prepare a balance sheet 6. prepare an income statement	• Teacher demonstrates and students can practice: - Opening journal entry with rules of entry for assets and liabilities - Simple Statement of Affairs or unclassified Balance Sheet - Concept of profit/loss as difference between income and expenses - Simple Income Statement • Teacher can identify the components of - a training plan, i.e. Assess, Design, Develop, Implement, Evaluate - a training activity plan, i.e. target group, learning outcomes, facilitator, place, time, length, assessment of effectiveness • Teachers can direct research and draw up example of a training activity plan. Teachers can introduce: - The accounting cycle with explanations for each task in the cycle and then asked to research or create a labelled diagram of the cycle. - The ALICE items with simple definitions of each term. Students can be asked to give examples of assets from a site visit to a business place. Students can brainstorm examples of liabilities, expenses and incomes for different scenarios. - The balance sheet equation as link between capital, loans (forms of liabilities) and acquiring assets. Calculation of value of missing part of equations. - Principle of separate entity (important to enterprise management). Student can write story or scenario on problems caused by violating this principle.	Internet websites on planning a training activity e.g. managementhelp.org/training/systematic/guidelines-to-design. OR Teachers' notes simplifying the information from the website Directed reading of POA textbook pages from school's library or rental copies in the school or teacher's notes. **There is no need for students to acquire a POA textbook.**

Record Keeping

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Proposal Writing***	1. define the term proposal 2. identify items found in a standard proposal 3. write a proposal for a school related activity using appropriate media 4. present your proposal to your classmates	• Identify the components of a proposal, i.e. Summary, Background information, Statement of Need, Project Description, Impact, Budget, Supporting Materials • Encourage research and drawing up an example of a proposal	• internet research • teacher guided research using reference books

DESCRIPTORS FOR ACTIVITIES IN

- CLOTHING AND TEXTILES TECHNOLOGY

- CONSUMER TECHNOLOGY

- FOOD TECHNOLOGY

Clothing &Textiles

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***Fabric Design***	1. state the characteristics of dyes and paint 2. state the characteristics of a good fabric design 3. utilize various methods of fabric design 4. create a design that fits the selected theme	• Guide student research: man- made fibres and natural fibres • Introduce students to the colour wheel and ask probing questions in relation to the sequence of colours and functions of the colour wheel • Guide student discussions on the use of colour to create various moods • Supervise students in blending colours using poster paints • Supervise students in creating designs on fabric: the designs should include but are not limited to tie dye, fabric painting and applique. Based on the level of skill of the students, they could be introduced to batik designs	• Teacher's notes • fabric, tee shirts, fabric dyes, fabric paint, accessories, glue, rubber bands, twine and other materials approved by the teacher • Digital resources: http://www.colormatters.com/color-and-design/basic-color-theory

Clothing &Textiles

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Textile Technique***	1. identify four types of embroidery stitches 2. state the characteristics of embroidery design 3. design and sketch embroidery patterns 4. select appropriate tools and equipment 5. decorate an item using embroidery stitches	• Introduce students to the colour wheel and ask probing questions in relation to the sequence of colours and functions of the colour wheel • Guide student discussions on the use of colour to create various moods • Demonstrate four types of embroidery stitches • Demonstrate the process of transferring a pattern from paper to the fabric • Supervise students in creating embroidery designs	• Teacher's notes • fabric, tee shirts, embroidery needles, embroidery thread, sewing accessories, sewing machines and other materials approved by the teacher • reliable internet sources

Clothing &Textiles

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Costume Making***	1. identify historical events in your country 2. design and sketch a costume that fits the selected event 3. state the characteristics of costume design and construction 4. make a costume	• Guide student research: man- made fibres and natural fibres (emphasis should be placed on the characteristics of the fibres) • Introduce students to the colour wheel and ask probing questions in relation to the sequence of colours and functions of the colour wheel • Guide student discussions on the use of colour to create various moods • Supervise students in blending colours using poster paints • Supervise students in creating designs on fabric: the designs should include but are not limited to tie dye, fabric painting and applique. Based on the level of skill of the students, they could be introduced to batik designs	• Teacher's notes • fabric, tee shirts, embroidery needles, embroidery thread, sewing accessories, sewing machines, fabric dyes, fabric paint, accessories, glue, rubber bands, twine and other materials approved by the teacher. • reliable internet sources

Consumer Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***Developing Beauty Products from Local Plants and its Derivatives***	1. identify local plants that can be used for medicinal or beauty purposes 2. identify methods of making herbal products from plant material 3. develop a herbal product using appropriate methods 4. develop a test to evaluate the herbal product 5. package and label herbal products	• Guide students research on medicinal properties of local plants • Guide students research on facial cleansing • Demonstrate the proper method of facial cleansing • Supervise students in the making of facial cleansers • Guide students on the labelling of herbal products and the requirements of making medicinal and nutritional claims on a product	• Teachers' notes • suitable plants or derivatives, air drying oven, electrical grinding mill, sieve, distilled water, measuring tools, blender, ceramic mortar or any other materials approved by the teacher • reliable internet sources

Consumer Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Out with the old, In with the new***	1. use the internet and other sources to gather information on recycling 2. identify materials that could be recycled 3. state three advantages and disadvantages of recycling 4. use recycled material to produce household items	• Guide student research and presentation on effects of pollution and the definition of terms related to recycling • Guide student research and discussion on characteristics used for soft furnishings e.g. a clothing rack should be strong enough to hold the weight of more than two pieces of clothing therefore paper would not be a suitable material to construct the frame of the clothing rack.	• Teacher's notes • plastic containers, glue, wood, paper, wire and other materials approved by the teacher • reliable internet sources

Consumer Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***More room in the Inn***	1. describe the characteristics of the 3-6 year old pre-schooler 2. list the needs of the 3-6 year old 3. discuss factors to be considered in caring for the 3-6 year old in the home 4. state housing factors that contribute to the physical and aesthetic wellbeing of the family	• Guide student discussion on the characteristics and needs of the 3-6 year old: student discussions can originate from real life experiences in relation to their younger siblings • Guide student research on the factors that contribute to the physical and aesthetic wellbeing of the family • Guide student research and discussion on factors to be considered in preparing a child friendly space • Guide students in preparing a model of a child friendly space	• Teacher's notes • plastic containers, glue, wood, paper, wire, paint and other materials approved by the teacher • reliable internet sources

Food Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#1 ***Breakfast on the go***	1. list food sources of fats and sodium 2. identify the components of the breakfast pattern 3. demonstrate basic food preparation skills 4. prepare food items using the components of the breakfast pattern 5. select suitable packaging	• Ask relevant questions to assist students in creating a definition of breakfast • Facilitate discussions on the importance of breakfast • Prepare lecture notes on the breakfast pattern: include the components of the breakfast pattern as well as examples of each component • Guide student research • Demonstrate correct methods of measuring and weighing • Guide discussion on personal and kitchen hygiene **Supervise students in the preparation of breakfast items** **Students will need to know the components of <u>the six (6) food groups</u>, i.e. foods that belong to each group with emphasis on local foods**	• Teacher's notes • Home Economics in Action - Book 1 • reliable internet sources • food items necessary for production of breakfast: oats, cream of wheat, eggs, milk, fruit, fish, sausages, boxes, plastic and any other materials approved by the teacher

Food Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#2 ***Cheap but healthy Dinner meals***	1. list at least two food sources of each of the following: protein, carbohydrates and fats 2. explain the link between food sources and nutritional status 3. explain the link between poor eating habits and nutritional status 4. list the components of the dinner pattern 5. demonstrate basic food preparation skills 6. plan a nutritious low-budget meal 7. prepare a low- budget meal that conforms to the dinner pattern	• Facilitate discussions on the importance of dinner • Prepare lecture notes on the dinner pattern: include the components of the dinner pattern as well as examples of each component • Guide student discussion on the factors influencing the choice of foods • Guide student research • Demonstrate correct methods of measuring and weighing • Guide discussion on personal and kitchen hygiene • Supervise students in the preparation of dinner items	• Teacher's notes • Home Economics in Action- Book 3**.** • reliable internet sources such as: Healthy meal planning https://www.healthykidshealthyfuture.org/content/dam/hkhf/filebox/naccrra/newnaccrra/menuplan.pdf • food items necessary for production of Dinner

Food Technology

ACTIVITY	LEARNING OUTCOMES	TEACHING CONTENT AND STRATEGIES	RESOURCES
#3 ***Fruit for later***	1. identify various local fruits 2. discuss three factors that affect the post-harvest quality of foods 3. identify three causes of food spoilage 4. define four terms commonly used in food preservation 5. describe four methods of preserving food 6. list five guidelines to follow when selecting fruits and vegetables for preservation	• Guide discussion on food spoilage • Demonstrate correct methods of measuring and weighing • Guide student research • Demonstrate basic food preparation skills in relation to food preservation e.g. blanching, sterilizing etc. • Supervise students in the preparation of preserved items	• Teacher's notes • Home Economics in Action- Book 3 • reliable internet sources • food items necessary for production of preserved items and any other materials approved by the teacher

Part 3

Assessment Strategies

Introduction

In this section, teachers are informed of the assessment strategies which are closely interwoven with the delivery of the Technology Education (Tech Ed) curriculum. The most valuable item included is the mark scheme which is a criterion-referenced assessment tool. This is the method used to award marks to students for their application of the IDEATE model to problem solving. It lists the criteria to be assessed, performance standards and levels of performance. The main criteria for the award of marks are the portfolio, demonstration of teamwork, and safety, employment of the IDEATE process, products as solutions to challenges and presentations. Each one of these can stand alone as ways of measuring student interest and progress. Teachers should ensure each student is familiar with the mark scheme and that the student's concerns should be adequately addressed if there is disagreement with the given mark. Also in this section are short passages exploring each criterion in order to orient teachers to the aims and implications of these areas of assessment. It is hoped that teachers will find these brief essays useful in their facilitation of students in Tech Ed.

Portfolio Development

The production of a portfolio has always been part of the Tech Ed curriculum. It is concrete evidence of work done by the student. In general, portfolios not only teach students to think critically, but also to become active, independent and self-regulated learners (Bergman and Pintrich et al. in Kakkar and Zitkute, 2001). Additionally, the use of portfolios by students allows them to accept greater responsibility for their learning, better understand their strengths and limitations, and learn to set goals (Hillyer and Ley, 1996).

In Tech Ed, the portfolio is used to accomplish three (3) main objectives. The portfolio is an authentic assessment method for both formative and summative purposes and marks are awarded based on the particular needs of the challenge undertaken. Secondly, as the portfolio is built up over the length of the activity period, it can be used to provide feedback

to the student and his/her group on whether they are following the model and achieving the learning goals. In addition, it provides information to the teacher on how he/she can facilitate the work of each student and/or team.

The Tech Ed portfolio consists of *inter alia*, written entries, visual aids, sketches, charts, research instruments, research summaries or analyses, descriptions, meeting notes and personal observations of the problem-solving process collated into a well-labelled manila folder. The contents of the portfolio should be arranged so that the student demonstrates his or her application of the IDEATE model as it is used for problem solving. For example, in the early pages of the portfolio, the student should place evidence of how the group (and student) has gone about **identifying** what the actual problem is while in the ending pages, there should be evidence of how the group has gone about, **evaluating** the success or failure of their problem-solution**.** The Tech Ed mark scheme and the specifications are used to inform the particular content of the portfolio for any particular activity sheet.

The Tech Ed mark scheme allocates twenty-eight percent (28%) of marks to the portfolio. Each student is expected to develop an individual portfolio for assessment as part of the Continuous Assessment Framework of the National Certificate in Secondary Education (NCSE). Under this
circumstance, teachers are advised to make a deliberate effort to teach portfolio development as a key supportive skill in Tech Ed in accordance with the needs of one's class.

Technology Education Mark Scheme

Portfolio	Marks	Max. Mark
Problem defined		
Challenge is rephrased without specifications being listed	1-3	
Challenge is rephrased with specifications listed	4-6	
Challenge is rephrased with specifications listed and includes a definitive statement regarding the problem to be solved	7-14	
		14
Evidence of research		
Included reference page	1-2	
Use of text based materials (relevant, adequately summarized, all entries should be cited)	1-4	
Interacted with persons (interviews, guest speakers, surveys – at least one)	1-4	
Use of non-text based materials (relevant, adequately summarized, all entries should be cited)	1-4	
		14
Possible solutions and rationale		
Two (2) possible solutions presented	1-2	
Rationale for possible solutions (any advantage, at least one (1) per possible solution, reason/s for rejection of the other solution)	1-10	
		12
Chosen solution		
Chosen solution clearly identified	1-2	
Possible limitation/s or weakness/es of chosen solution	1-4	
Use of instrument to justify choice (rubric, survey, voting)	1-6	
		12
Development work (Procedure)		
Tools/equipment listed (where applicable)	1-2	
Materials listed	1-2	
Procedures/methods of production listed in sequence	1-8	
		12
Testing		
Evidence of testing	1-4	
Testing related to the specifications stated in the challenge	1-8	
		12
Evaluation		
Evaluation of solution with reference to test results	1-6	
Opportunity for further work identified (not limited to given criteria)	1-6	
		12
Presentation of portfolio		
Cover design: Relevance to challenge	1-4	
Sequence of portfolio	1-4	
Formatting (font size, type and colour, numbering of pages, headings)	1-4	12
Total		100

Technology Education Mark Scheme (Continued)

TEAMWORK	Marks	Max. Mark
Self/peer evaluation of experience	1-4	4
Participates willingly e.g. asks about meeting times, attends all meetings, helps decide times, volunteers for duties	1-4	4
Participates constructively e.g. gives suggestions, asks questions, fulfills assignments	1-5	5
Sustains positive interaction within the group e.g. welcomes suggestions, urges others to participate in a positive manner	1-5	5
Total		18

SAFETY	Marks	Max. Mark
Safety practices were observed	1-3	3
Wore suitable safety gear (where applicable)	1-3	3
Manipulated tools in a safe manner (where applicable)	1-3	3
Cared for equipment (proper cleaning, replaced in designated area)	1-3	3
Cleaned work area (voluntarily, properly)	1-3	3
Total		15

PROCESS	Marks	Max. Mark
Collected information for use in decision-making: Read textbooks/journals/ magazines, accessed internet, conducted survey/ interview	1-5	5
Used technology: Computer, camera, scanner, printer, photocopier, drawing tools, etc.	1-5	5
Efficient use of time: Met deadlines, to show (attended meeting on time, came with assigned work ready, completed product, portfolio, presentation within 3 hour period.	1-5	5
Manipulated tools- took part in actual production of group solution or presentation	1-5	5
Total		20

PRODUCT	Marks	Max. Mark
Met design objectives (specifications)	1-4	4
Work is neat, orderly, attractive, pleasing	1-4	4
Product reflects solution sketched out	1-4	4
Some degree of creativity or innovation	1-4	4
Product completed	1-4	4
Materials provided were used efficiently –amount of waste	1-4	4
Total		24

TECHNOLOGY EDUCATION MARK SCHEME

PRESENTATION	Marks	Max. Mark
Use of media and/or technology		
Use of text-based material as part of the presentation	1-2	
Use of non-text based material as part of the presentation (speech, music, skits, dance, etc.)	1-2	
Use of other media (video, still pictures, etc.)	1-2	
Creativity and innovation		
Attempted something innovative to catch audience attention	1-2	
Use of colours, shapes, fonts, animation in media	1-3	
Effectiveness of presentation		
Presented group members and individual tasks	1-2	
Good use of voice and movement by group member/s	1-2	
Participation of group members- over 50%	1-2	
Demonstrated enthusiasm for the material being presented	1-3	
Maintained audience interest	1-3	
Total		23

Evaluating the Process

Evaluating the process in Tech Ed involves constant monitoring of students' behavior while they engage in the IDEATE process. This means that the teacher needs to spend time interacting with each group and observing each member of the respective groups during the activity. The teacher can also rely on peer and self- evaluation exercises and/or instruments after having taught students to complete instruments or write observations of their group-members to assist in the evaluation process. All observations and judgements should be based on the rubrics system and should measure the following:

Portfolio

In Technology Education, a portfolio is a collection of a student's work and is an authentic form of assessment. This type of assessment facilitates real world experiences in the classroom. Three objectives are accomplished with the use of a portfolio: (i) an assessment of the student's application of the problem solving methodology- the IDEATE model (ii) opportunity for the teacher to judge what help is needed by the student (iii) whether the layout of the portfolio demonstrates logical application of the IDEATE model. The content of the portfolio is informed by the mark scheme and activity sheets used in Tech Ed. Teachers can use the mark scheme and the activity sheets to guide students in developing an excellent portfolio.

Teamwork

A distinctive feature of Tech Ed is teamwork. In Tech Ed, it can be regarded as a collaborative effort of several students working together to accomplish a common goal. Teamwork encourages and facilitates the development and practice of life skills among students which are critical to the development of students, if they are to efficiently and effectively fulfill their roles in modern society.

Safety

Safety is about preventing the risk of experiencing or causing injury to others or one's self. It is also the practice of taking precautions so that we can minimize the risk of damage to tools,

equipment and machinery. A lack of safety practices in homes, schools and industries have resulted in financial and material loss, physical injuries and even fatalities. In schools, teachers and students expect the environment to be conducive to good health; consequently, it is important that all persons involved in the teaching-learning process be aware of their responsibilities in creating and maintaining a safe environment.

Process

Process refers to the sequential steps agreed to by a group in order to produce the chosen solution. Groups are expected to outline in a logical sequence the steps used in the process of making the product. Duplication of the product should be possible if other groups were to follow the stated process.

Evaluating the Product

One of the most appropriate strategies for assessing performance-based activities where students actually create a product is Performance Assessment. Thus, product-based assessment becomes the gathering of evidence of learning through learner-created products, with the intention to evaluate the outputs that are essential to successful learning. These forms of assessments often focus much of their attention on the product of the learning experience, as well as the learning process, which also offers opportunities to include embedded assessments that should not be overlooked.

With Tech Ed it is therefore imperative that evidence of work done can be gathered by reviewing products completed by the students. Tech Ed products include project plans, presentations, posters, prototypes/models, practical projects, and actual size artifacts. Each of these product types will need to be assessed and marked using an appropriate rubric or rating scale with clear and established criteria. Product evaluation, thus provides experiences that normally involves what is called authentic or problem-based assessment, which is similar to performance-based assessment. It should be noted that authentic assessments typically (a) mirror the challenges, work performance, and standards engaging students'

practices; and (b) involve the individual interactively through opportunities for explanation, dialogue, research, creativity, and inquiry through questions and responses.

Project plans of the product should be developed as this is an important part of the designing process. These plans should include information on the intended target group, expected learning outcomes, assessments strategies, as well as orthographic drawings to construct the device or product selected by the students. The drawings are created in detail to show as many aspects of the product to be constructed. They may contain rough sketches with comments, which can be followed by more formal drawings with detailed specifications using the necessary technical drawing instruments. The plan should also include detailed listings of resources that consist of tools and equipment, materials, time requirements, and the budget as well.

Additionally, presentations, posters, prototypes, practical projects, and artifacts of products made by students are an integral aspect of the assessment process, which must be completed by the teacher with timely feedback provided to clarify any pre-conceived misconceptions, or to revisit the design process. As a result, the teacher will therefore be required to develop suitable rubrics or rating scales to conduct the process and product evaluation. These instruments must be developed with clearly defined statements of achievement or performance. With Tech Ed, it is therefore recommended that the following should be given attention with regards to product evaluation:

- Design objectives are achieved
- Pictorial and orthographic drawings are submitted
- Product reflects the solution arrived at
- Creativity and innovation are demonstrated
- Materials provided are used efficiently with minimum amount of wastage
- Product completed to plans without errors
- Product completed with high quality finish and suitable surfaces
- Product is completed, neat, orderly, and attractive
- Methods of construction are appropriate
- Communication of information is done in a logical way

- Use of colour and photographs are provided

Product evaluation allows the teacher to determine whether the designed solution has been effective and achieved the specifications. This exercise also provides the opportunity for the teacher to document the strengths and weaknesses of the design, and establish how the product can be improved, as well as the information gathered can be used in the design of future projects.

Presentation Skills

A **presentation** is a means by which information is imparted to an audience. Presentations are typically meant to inform, entertain or present arguments. The quality of the presentation goes towards determining the reception of the information or argument by the audience. Effective presentation skills are important in business, teaching, learning and many aspects of social life. Acquiring good presentation skills demonstrates self-development and professional growth. Developing the confidence and capability of standing up in front of an audience, and speaking clearly in making presentations are important competencies in social situations. The Tech Ed curriculum seeks to develop effective presentation skills in students as part of their acquisition of 21st century skills of more effective communication.

Presentation skills are also part of the drive towards developing entrepreneurship in our young people. Presenting a finished product or describing a process undertaken is an integral part of the marketing process in the product development cycle.

Information is presented in four basic ways, that is, in writing, orally, electronically and through other media. Written presentations include portfolios, reports, responses, pamphlets, brochures, charts, posters, and flyers. Oral presentations can be made as an informal talk, a lecture, a scenario or role play and can be formally accompanied by another presentation method such as a chart; storyboard or power point slides. Media presentations can incorporate a range of formats such as videos, storyboards, power point slides, audio recordings and other sound formats. Electronic presentation methods may overlap with

media or incorporate some media formats but can be presented to one audience or many audiences at various locations. This can be achieved through platforms such as Skype, Google talk, and Microsoft 365 to name a few.

Most presentations in Tech Ed use a combination of at least two (2) methods. The choice of the combination of methods of presentation is influenced by the audience, the material being presented, the budget limitations, and the time allocation among other factors. Sometimes the particular specifications listed in the challenge will influence the choice. For example, a challenge may ask for a presentation on a specific topic or for a particular purpose for a designated audience. In that case, the problem to be solved is how to put the presentation together. The bulk of the research and thinking, student efforts, the budget and the teacher's allocation of marks will be spent on this problem. In contrast, the challenge may focus on the construction of a device. In that case, the presentation assumes a lower profile in terms of student effort. Students should be exposed to as many of these methods of presentations as possible. They should also be provided with the knowledge for the most effective application of the various methods for the particular purpose.

A good presentation resembles a well-written essay. It should contain the three (3) main elements, the introduction, body and the conclusion. Within the main body of the presentation, the key message should be divisible into at least three (3) elements and each element further divided into, perhaps, three (3) sub-points. The following can be used as a guide when preparing a Tech Ed presentation:

- 3 key points are sufficient for a 10-15 minute presentation.
- 6 key points are sufficient for a 30 minute presentation.
- 8 key points are sufficient for a 45 minute presentation.

The key points should be arranged with some kind of logic behind it with supporting material, such as examples, visual aids and actions placed nearby. Students should be advised to think about questions that may be asked and include the answers in the presentation beforehand or be ready to expand their prepared remarks on demand. Students should practice speaking properly and using appropriate language. Most presentations have

an oral component, so it is important to choose words that are easily understood and to explain technical terms. Avoid the use of slang and jargon. Short sentences with simple structures, similes, metaphors and examples will keep the audience listening as the presenter talks through ideas rather than simply reading. Use visual materials to aid audience understanding and retention.

In summary, when talking through a presentation or creating a video to be presented, students should be taught and encouraged to:

- Prepare and structure the presentation carefully
- Talk naturally with the audience
- Stand rather than sit, moving around while presenting
- Make eye contact with the audience
- Use visual aids where appropriate
- Rehearse the oral presentation and practice timings
- Stay focused throughout the presentation
- At the beginning of the presentation state when questions would be answered and answer questions honestly.

In order to help students gain confidence when presenting, teachers should dedicate time for practice. Afford all students an opportunity to do one to three minute individual presentations giving feedback immediately at the end of the session. Start with positive feedback and end with corrective feedback. The importance of **preparation** and **practice** to excellent presentations cannot be over-emphasized**.** Presentation skills are life skills.

Curriculum Adaptation

The nature of the Tech Ed curriculum makes it very adaptable to the diverse needs of the students in a mixed ability classroom or in a more homogenous classroom. The Tech Ed curriculum seeks to engage students in activities which require exposure to technical knowledge such as drafting and use of equipment, acquisition of transferable skills such as organizational and self- management skills and involvement of social and emotional qualities such as empathy and responsibility. The Tech Ed curriculum is truly a guiding document without any demands for sequencing of content except as needed within the tasks of a selected activity. The experience of Tech Ed teachers has been that students of all abilities find the properly managed Tech Ed classroom a welcoming and safe place to express their creativity and are therefore motivated to attend class and to learn. A number of tips are provided on the section on classroom management with additional material set out in this section.

Special Needs Students

If you are working with students who require additional pedagogical support, you might want to choose simpler activities; create your own challenges or you might adapt an activity from any of the 2003, 2008 or 2014 guidelines for your particular circumstance. There are several ways to adapt the curriculum guidelines and your teaching practice to meet students with special learning needs. Here are a few suggestions:

- At any one period of time focus the students on only a few of the particular, specific learning objectives shown at the start of each Activity Sheet.
- If there are safety concerns, have students focus on earning marks for teamwork, or process or portfolio or presentation rather than product.
- Give student groups more time to complete activities.
- Provide more direction, when necessary, to move the process along by sitting with student groups, assigning roles early, giving tight deadlines, providing quick feedback and dealing with team conflict rapidly, decisively and fairly.

- Provide resources as soon as possible including parents or other human resources so that students get even more support and you are not overwhelmed by their enthusiasm.

Gifted Students

If you are working with high-achieving students, they are more likely to take advantage of activities where the challenges are more ambiguous or manifold. You might want to involve these students in

- those activities that include objectives across all the domains
- adding additional complexities to existing activities e.g. adding to the specifications
- negotiating their own curriculum by providing only a context at the beginning and having them perceive possible problems. Eventually, even the context e.g. the environment of other planets or a water-scarce world, and the problem might be left up to them.

Your focus as the Tech Ed teacher will still be facilitating the development of the hard, transferable and soft skills focused on in Tech Ed.

Mixed ability/underachieving students

One key to adapting the curriculum for mixed ability groups is researching effective ways of creating groups based on your growing knowledge of the students in your class.

Tips for choosing group members

1. Generally the largest recommended group has five (5) members. In smaller groups each member participates more, and smaller groups can work more quickly.
2. Letting young people select their own teams may not be best but you could consider their opinion. Other means are random selection by assigning colored cards or numbers and having all with the same color or number forming groups.
3. Groups should stay together for the duration of an activity (six (6) to twelve (12) weeks) to strengthen bonds, develop more complex collaborative skills, perform more complex

tasks and bring projects to fruition. However, a dysfunctional group may need to be re-assigned.

From the first day, students might be asked to talk about themselves and they think they will learn in this school and this class. Having students write out what they said will help you remember. You will also discover students who have some difficulty with writing and/or verbalising their thoughts and those who might become leaders and facilitators in Tech Ed groups. Other techniques for adapting the curriculum for mixed ability groups might include:

- providing opportunities for brainstorming as a class first before further working in their groups. This might help to put low-achieving students on possible paths to problem solutions.
- helping them to structure tasks through role assignments e.g. team leaders, recorders, reporters, timekeepers etc. with clear directions as to the functions and responsibilities of the role.
- providing groups with supportive techniques such as the KLW/D Chart and an Activity planning template (Appendix).
- allowing all groups to undertake the same challenge thereby making use of competitive spirits. Later as leaders grow in confidence, groups might be allowed to make their own choices or adapt challenges in the Tech Ed curriculum guidelines.

The characteristics of your students will help to determine the depth and breadth of the adaptations you will need to make. Knowing the backgrounds and interests of your students will serve you in your attempt at meeting the needs of all your students. The Tech Ed teacher might choose to treat with facing a new class of students as if it were a Tech Ed challenge deserving the employment of the IDEATE model for problem-solving!

The KWL/D chart

The KWL/D chart is an evaluation tool to be used at the beginning and end of each activity to help students (and you) to gauge progress and to assess learning at the end of the activity. KWL/D stands for what we Know; what we Want to know; what we have Learned/Done. For example, for an activity on the use of forests as a source of medicinal products, a group should be able to complete the following table on a large sheet of paper by the end of the activity.

Example:

WHAT WE KNOW	**WHAT WE WANT TO KNOW**	**WHAT WE HAVE LEARNED**
Trees can be used for firewood, to build boats, and houses and to make furniture.	What else can we use trees or tree products for so as to solve the problem before us? What has been the effect of the use of trees for these purposes?	Paper, ink, glue, medicines can be made from trees and tree products. How to produce one or more of the items The amount of forests is rapidly being depleted all over the world.

Groups should be encouraged to document their approach to meeting the challenge. Mixed ability groups can be helped if all persons keep a copy of an activity planner like the one below.

PART 4: Useful Resources

Bibliography

Engineering Technologies

Electrical Technology

Garratt, J. (1996). *Design and Technology*. Cambridge University Press: Cambridge.

Design Technology

Duncan, M. (2005). *First steps in Technical Drawing*. Blesse Digital Services Rep.: Trinidad and Tobago.

Morling, K. (2010). *Geometric and Engineering Drawing*. Taylor and Francis Publishers: New York. 3rd Ed.

Mechanical Technology

Reid, P. P. J. & Reid, V. C. (2000). *Motor Vehicle Technology for Mechanics.* Macmillian: Oxford.

Entrepreneurship

Holdip G., Lamorell C. & Lamorell C. (2010). *Principles of Accounts for CSEC Examinations.*

Ramsingh, D., Waterman, I. & Ramsaroop, A. (2011). *Principles of Business for CSEC Examinations.*

Campbell, H. & Bogle-Graham, O. (2012). *Electronic Document Preparation and Management for CSEC Examinations.*

Human Ecology

Caribbean Association of Home Economists. (1992) *Caribbean Home Economics in Action Books 1,2 and 3.* Heinemann Education.

References

Biological technologies

- http://www.slideshare.net/monivijay/post-harvest-handling-of-fruits
- http://www.fao.org/3/a-y5431e.pdf
- http://2003.64.245.61/fulltext_EB/2001-2010/eb0146.pdf
- http://www.extension.iastate.edu/NR/rdonlyres/B0D64A49-9FA9-410E-849A-31865EFECE91/146402/GAPSpostharvest.pdf
- http://www.gardeningknowhow.com/garden-how-to/soil-fertilizers/soilless-
- http://www.instructables.com/id/...a-super-easy-**hydroponics-system**
- **http://www.hydroponics**101.com/sw63175.php
- http://www.finegardening.com/choosing-right-soilless-mix
- http://edis.ifas.ufl.edu/hs1186
- http://www.**ornamental-fishes**.com/2009/07/**meaning-of-ornamental**...
- http://animals.howstuffworks.com/pets/choosing-aquarium-fish.htm
- http://www.aquariumfish.net/pages/new_pictures_8.htm
- http://www.lib.ncsu.edu/documents/vetmed/research/slides/fishpresentation4.ppt
- http://www.pininterest.com/maggiepi508/garden-raised-beds-layout/
- http://www.download.cnet.com/Garden-Planner/3000-18499_4-10285889.html
- http://www.tomsguide.com/us/download/Planner-Garden,0313-4444.html
- http://www.instructables.com/id/The-Simple-water-purification-System/
- http://www.natureskills.com/survival/water-purification-process/
- http://www.safewaterscience.org/Downloads/Lesson2.pdf
- www.gardenguides.com/114407-**types-soil-erosions**.html
- www.ehow.com/facts_5615012_**types-soil-conservation**.html
- http://www.preservearticles.com/2012040429881/what-are-the-methods-of-soil-conservation-18-methods.html

Entrepreneurship

- http://www.doingbusiness.org/data/exploreeconomies/trinidad-and-tobago/starting-a-business
- www.nedco.gov.tt
- www.central-bank.org.tt
- www.legalaffairs.gov.tt
- www.ttconnect.gov.tt
- www.immigration.gov.tt
- http://mtr.gov.tt, www.ird.gov.tt
    - www.caribbeanjobs.com

- www.molsmed.gov.tt
- www.ilo.org
- http://managementhelp.org/training/systematic/guidelines-to-design-training.htm

Engineering Technologies

Electrical Technology

- https://www.youtube.com/watch?v=fOqfjliNtT8
- https://www.youtube.com/watch?v=VnnpLaKsqGU
- https://www.youtube.com/watch?v=x2EuYqj_0Uk
- https://www.youtube.com/watch?v=RQ3djos_LY8
- http://www.eleccircuit.com/pir-motion-sensor-alarm-circuit/
- http://www.youtube.com/watch?v=4UVIysfZo_M

Mechanical Technology

- www.youtube.com
- www.howautoworks.com
- www.education-portal.com
- www.ethyl.com
- www.targetjobs.com
- www.mic.co.tt
- www.nta.org/apprenticeship/
- www.careersinwelding.com
- www.moe.gov.tt/Docs/Students/DOTT.pdf
- www.nesctt.org

Design Technology

Sketching in the design process –

- http://design.tutsplus.com/tutorials/the-role-of-sketching-in-the-design-process--psd-153
- www.visual-arts-cork.com/**sketching**.htm

Tutorials on sketching –

- http://www.drawinghowtodraw.com/drawing-lessons/things/drawing-cubes-boxes.html
- http://www.dueysdrawings.com/drawing_tutorials.html

Geometric shapes –

- http://www.math-salamanders.com/list-of-geometric-shapes.html

Tutorials on constructing shapes –

- http://www.drawingandpaintinglessons.com/Drawing-Lessons/Basic-Geometric-Shapes.cfm
- http://www.mathopenref.com/constsquare.html
- http://www.mathopenref.com/consttriangleasa.html
- http://www.wikihow.com/Draw-Geometric-Shapes-With-Open-Office-Draw

Learning Theories and Principles

- *http://www.ascd.org/publications/educational_leadership/summer09/vol66/num09/Brain-Friendly_Learning_for_Teachers.aspx*

Appendix 1-Activity Planning

OUR ACTIVITY PLAN

OUR ACTIVITY NAME ……

GROUP MEMBERS ……..

WHAT IS THE TASK?	WHO WILL DO THE TASK?	WHEN WILL THEY DO THE TASK?	WHAT IS NEEDED TO DO THE TASK?	HOW WILL WE KNOW WHEN THE TASK HAS BEEN DONE?

Appendix 2: Example of Instrument for Personal SWOT Analysis

- ❖ **SWOT** stands for Strengths, Weaknesses, Opportunities and Threats.
- ❖ Strengths and weaknesses are personal characteristics.
- ❖ Opportunities and threats are personal perceptions.
- ❖ If you know your strengths and opportunities you can make good use of them.
- ❖ If you know, your weaknesses and threats, you can do something about them.

- ✓ A personal **SWOT** analysis is a way of discovering your skills, abilities, and interests. You may also discover new things about your habits and circumstances that support or work against your becoming an ENTREPRENEUR.

- ✓ A number of statements appear in groups below. Carefully read each statement and rate yourself on the following scale according to how truly the statement describes you.

1-False 2-True 3-Very True

1. I can read and write well.
2. I can do basic mathematics operations.
3. I like to talk and interact with people.
4. I like to direct others when we work in teams.
5. I want to have my own business one day.
6. I would give up doing certain things to start a business now.
7. I manage to stay on a task as long as it takes to complete it.
8. I have good attention span for people who are talking.
9. I express my ideas easily
10. I find it easy to make decisions.
11. I have members of my family or friends who have their own business.
12. I have some experience in the world of business.
13. I am responsible.
14. I am organized.
15. I have my family support if I were to start a business
16. I work well with other people.
17. I have an idea for a business right now.
18. I can work hard.
19. I do not let poor grades or reports stop me from trying again.
20. I like to read or hear about successful businesses