

The Cayman Islands National Curriculum 2008

Design and technology Programme of study and attainment targets for Key Stage 3

Acknowledgements

The overview document sets out the guiding philosophy and principles of the new Cayman Islands curriculum. It guides all the subject documents and approaches to teaching and learning in the revised curriculum.

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Alexander Clyne, Teacher, Cayman Brac High
Raymond Lawes, Teacher, Cayman Brac High
Tiffany Rankine, Teacher, John Gray High
Glynese Sinclair, Teacher, John Gray High
Desmond White, Teacher, John Gray High
Arlene King Williams, Teacher, John Gray High

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Helena McVeigh, (Chair)
Herbert Crawford, Senior Education Officer, Education Department
Brian Chapell, UCCI
Jordana Clarke, IT trainer, Walkers (former teacher)
Jacqueline Ebanks, Teacher, Montessori-by-the-Sea
Peter Embleton, Principal (Years 7-13), St. Ignatius Catholic School
Alan Hewitt, Deputy Principal, John Gray High School
Willean Hill, Librarian, George Town Primary School
Vikki Myrie, Teacher, Creek and Spot Bay Primary School
Kiva Powell, Teacher, Savannah Primary School
Malcolm Saunders, Teacher, George Hicks Campus
Pachent Smythe, Senior Inspector, Schools' Inspectorate
Annette Vaughan, Teacher, John A Cumber Primary School
Mark Scotland, Chair of the Savannah PTA
Wil Pineau, CEO, Chamber of Commerce
Pat Bell, Water Authority, representing HR personnel

Aims

Learning about design and technology contributes to the achievement of the curriculum aims for all young people (the 'educated Caymanian') to become:

- Enthusiastic and motivated about learning, and willing to continue to extend his/her knowledge and skills after leaving school
- Well rounded, good at finding solutions to problems, flexible and adaptable to changing circumstances and demands
- Literate, numerate and adept at using information and communication technology
- Have an awareness of global issues affecting life in the 21st century
- Confident individuals who are able to live safe, healthy and fulfilling lives
- Responsible citizens who make a positive contribution to society

The programme of study for design and technology aims to help students develop a number of important attitudes, in particular: curiosity, safety awareness, creativity, integrity, open-mindedness, cooperation, perseverance and commitment, initiative, critical thinking, scientific and technical reasoning, confidence, motivation, and an appreciation of the contribution of design and technology to everyday life.

Overview

Technology is a creative, purposeful activity aimed at meeting needs and opportunities through the development of products, systems, or environments. Knowledge, skills, and resources are combined to help solve practical problems. Technological practice takes place within, and is influenced by, social contexts. People have always adapted resources to meet their needs, from such a far-reaching innovation and invention as the development of the wheel, to innumerable and equally significant uses of resources such as shaping bone to create a hook for fishing, or pressing wool fibres into felt, or applying heat to make foods more edible. In the context of our islands, the need to 'turn a hand' to a variety of tasks, to be creative and adaptable in using what is available continues to be a significant feature of the Caymanian spirit.

Learning about and through design and technology should help students make sense of and interact with their increasing technological world. Technology affects our environment, our standard of living, and our quality of life. Students need to start considering the ethical and social issues associated with advances in design and technology.

Learning in this subject will develop attitudes, skills and knowledge that will help students solve problems and be more prepared for life, further study and future careers in this rapidly changing world. Tomorrow's citizens will need special knowledge and skills if they are to evaluate and deal with change. The subject will also encourage students to seek scientific explanations of natural phenomena, build their confidence and ability to effect changes and improvements in their environment and, most importantly, develop their critical thinking ability.

How teachers should use the programme of study and attainment targets

The programme of study identifies the experiences that students must be given to enable them to achieve the knowledge, skills and understanding specified in the attainment targets.

The strands

The programme for design and technology is divided into four strands:

- i. Investigating
- ii. Designing
- iii. Making
- iv. Evaluating and reporting

This division into strands is a convenient way of emphasising the outcomes for design and technology education in schools. It does not mean that learning in each strand has to be developed independently. In Key Stage 3, students should be given regular planned opportunities to develop the knowledge and ideas of the subject through a practical, hands-on, process-approach.

Students need to be given the opportunity to study these strands in the following contexts:

- Food
- Resistant materials and textiles

During the key stage, **students should be offered the following opportunities** to enhance their learning, understanding and enjoyment of the subject, through:

- Analysing products
- Undertaking focused tasks that develop skills, knowledge and understanding in relation to design and make assignments
- Engaging in design and make assignments in different and progressively more complex contexts
- Working individually and in teams taking on different roles and responsibilities
- Working with designers and makers, where possible, to develop an understanding of the product design process
- Using ICT, including CAD/CAM as appropriate, for image capture and generation, data acquisition, capture and handling, controlling and product realisation
- Making links between design and technology and other subjects and areas of the curriculum

Progression in this subject requires students to develop their skills in investigating, designing, making, evaluating and reporting. These process skills should be developed in parallel with the knowledge and understanding of a range of materials, ingredients and technologies outlined in the programme of study. Students should start with activities linked to themselves and their

immediate environment and move on to less familiar situations and contexts.

The attainment targets specify the knowledge, understanding and skills that students should acquire through the key stage. More detail is given about how to interpret them in appendix 1. Exceptionally gifted students will need to be given work from the Key Stage 4 programme of study so they can access work of an examination standard.

Programme of study for design and technology in Key Stage 3

Introduction

Design and technology activities require the integration of the four strands.

Throughout Key Stage 3, teachers should provide opportunities for students to develop a range of skills, knowledge and understanding within the four strands of design and technology. Students should become competent in combining the strands through designing and manufacturing activities.

At times, however, it will be appropriate to focus on one or more of the strands. Such focused work should be used to develop particular skills or specific knowledge and understanding. The knowledge, understanding and skills acquired from these focused tasks should be subsequently drawn upon in the integrated approach to design and technology.

Regular opportunities for students to engage in practical activities that support learning and skills development should be provided. The following skills, knowledge and understanding should be taught at a level that is appropriate to the needs and abilities of individual students.

Students should maintain a **safe and organised immediate working environment** and should be encouraged to adopt safe practices, particularly when using hand tools, machines and equipment. They should be aware of potential hazards in the manufacturing

environment and of actions to take when dangerous situations arise.

Students should be given the opportunity to investigate, generate and evaluate design proposals. Activities should be structured so that students plan their work in an increasingly independent and creative manner throughout Key Stage 3. Aspects of designing will be taught both through short tasks and through holistic designing and manufacturing activities.

Students should be encouraged to consider the form, function and safety of their design. The design activities may originate from a range of starting points. Students should be helped to develop further their understanding of designing through engaging in design activities that begin from different starting points.

Investigating

Students should be given opportunities to:

- Talk about what they like or dislike about the design of products and natural objects
- Ask questions and suggest ideas for making things
- Talk about the form and function of products
- Gather, evaluate and use information relevant to a design brief
- Generate and develop a range of ideas in response to a design brief
- Evaluate ideas against the specification and select the most appropriate

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- Justify the selection they have made

Designing

Students should be given opportunities to:

- Design imaginative and creative activities that bring together knowledge and understanding of communication techniques, materials and components, manufacturing processes, and the use of energy and control
- Communicate orally, graphically and in writing as a means of exploring and developing ideas, defining design briefs and specifications
- Sequence a manufacturing process
- Write a specification that reflects relevant design factors
- Use line and shape to communicate design ideas visually
- Use recognised symbols when drawing diagrams
- Explore and explain ideas using sketching
- Develop ideas through annotated freehand sketches which use colour and form
- Use formal drawing techniques to develop and present ideas
- Use recognised symbols and drawing conventions
- Use enlargements or exploded views, when appropriate
- Combine and use a range of media to present ideas

Making

Students should be given opportunities to:

- Manufacture materials, components, techniques and processes
- Work independently and safely
- Assemble and rearrange materials in simple constructions
- Construct by joining materials in a variety of ways
- Use appropriate methods to cut, shape and join materials including plastics, metal and wood
- Be accurate when marking out, cutting and joining materials
- Incorporate more than one material in products which they make
- Use hand and machine tools to produce quality products
- Incorporate a number of materials in products which they make

Evaluating and reporting

Students should have the opportunity to:

- Evaluate and appraise the outcomes of designing and manufacturing
- Analyse factors relevant to a given design brief
- Gather, evaluate and use information relevant to a design brief
- Evaluate ideas against the specification and select the most appropriate
- Justify the selection they have made

- Evaluate the product they have made against the specification
- Suggest and evaluate possible modifications
- Identify adjustments to initial design proposals during manufacture
- Use ICT
- Talk about what they are making or have made
- Talk about what they like or dislike about their work

Contexts

As far as possible subject knowledge should be developed through the contexts of practical activities for designing and manufacturing products. The contexts should include working with: **food, resistant materials, textiles**. Students should be enabled to develop skills and associated knowledge of materials and components. As students progress through Key Stage 3, they should have opportunities to make products that include more than one material.

During Key Stage 3, students should give increasing attention to the quality of the finished product. Activities should be devised to ensure that they have opportunities to work safely with a range of hand and machine tools. As they progress through Key Stage 3, increasing emphasis should be placed on the use of machine tools.

Food - suggested activities

Students could be given opportunities to:

- *Experience a broad range of practical skills, techniques and equipment, using standard recipes to develop, plan and cook meals and single or multiple products*
- *Plan and carry out a broad range of practical cooking tasks safely and hygienically*
- *Design healthy eating models relating to balanced diets, nutritional needs of different groups in society and factors affecting food choice, which should be taken into account when planning, preparing and cooking meals and products*
- *Investigate the characteristics of a broad range of ingredients, including their nutritional, functional and sensory properties*

Resistant materials and textiles - suggested activities

Students could be given opportunities to:

- *Experience a broad range of techniques, including handcraft skills and CAD/CAM, and how to use them to ensure consistency and precision when making single and multiple products*
- *Investigate the behaviour of structural strands in a variety of materials*
- *Learn how to use materials, technology and aesthetic qualities to design and make products of worth*
- *Learn how to prepare and assemble components to achieve functional results*

*In manufacturing students should take account of aspects of **safety** by being given the opportunities to:*

- Understand the safe handling characteristics of ingredients, materials, tools and equipment for a range of manufacturing processes, including mixing, heating, marking-out, holding, cutting, wasting, joining and forming*
- Understand the purpose and safe operation of machines including those used for mixing, cooking, heating, joining, drilling, sanding, polishing, vacuum forming, cutting and plastics bending*
- Select and use correctly and safely, with increasing confidence and accuracy, hand and power tools, and machines, and to develop a range of manufacturing skills associated with these tools and machines*

Appendix 1 Attainment targets

The learning outcomes or attainment targets are expressed at eight levels of increasing difficulty. These levels are the same for all key stages and are not age or year-group-dependent, which will make it easier to see how a student progresses as he/she moves up the year groups and from primary to secondary school.

Students learn at different rates and, therefore, individual students or groups of students of the same age could be working towards different levels within and across the key stage boundaries. By the end of a key stage, **most** students should be performing at the '**expected**' level, but some will be above this level and others will be below.

The range of levels covered by the key stage and the 'expected' levels for the end of each key stage are given in the table below:

Key Stage	Year Groups	Range of levels covered by the programme of study	Expected level at end of the Key Stage
1	1 - 3	1-3	2
2	4 - 6	2-5	4
3	7 - 9	3-7	5 or 6

Teachers will be expected to make judgements about the levels attained by each of their students, particularly at the end of a key stage. In deciding on a student's level of attainment, teachers should judge which description in the attainment targets best fits the student's performance. When doing so, each description should be considered alongside those for adjacent levels. It is not necessary for a student to have satisfied the entire range of a particular level to be awarded it.

It can be helpful to divide levels into three sub-levels to support tracking of progress and target setting.

For example:

- 3a – Represents a performance that demonstrates a good understanding of all the descriptors in level 3
- 3b – Represents understanding of the majority of level 3 descriptors
- 3c– Represents understanding at level 2a (ie the full understanding of the previous level) plus an understanding of some of the descriptors at level 3

Appendix 2

The design and technology process

The design and technology process is not necessarily linear. Often the reporting phase will give rise to new problems or projects that will start the process again. Consequently the design and technology process is best described as cyclic. Students should become skilled in moving through the process within each of the strands. The process can be applied sequentially, where students move directly from investigating to designing, producing and evaluating. Alternatively, students might have to return to any of the phases in order to solve a problem: for example, students continually evaluate during each phase and therefore will often have to return to a preceding phase, as they apply their learning to real world problems and projects, which can be generated by teachers and students.

In implementing the design and technology curriculum, students should be encouraged to engage in the process fully and teachers should try to use all of the outcomes relevant to a strand in planning a design and technology learning experience.

The strand organisers are illustrated in the diagram on the next page and described below.

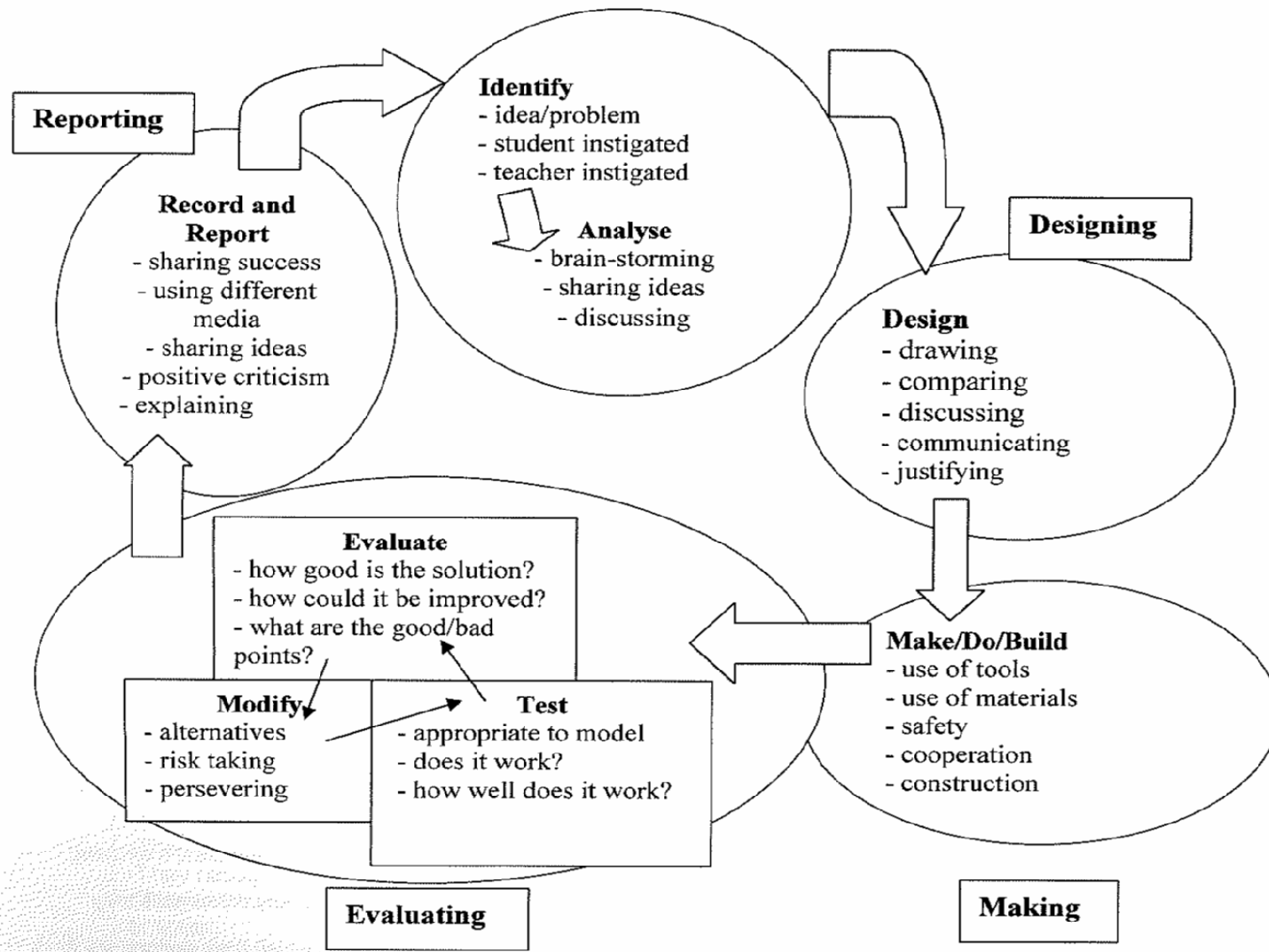
Investigating - Investigation involves the identification of a particular problem and the broad analysis of a variety of possible solutions. Often the analysis calls for further exploration to gain knowledge about materials, information or systems required, to analyse possible solutions to the problem.

Designing - This phase results in the completion of a design brief, which gives a direction for the remainder of the process. A design brief should describe simply and clearly what is to be designed. The design brief involves assessment of design alternatives and decisions about resources and equipment. A design brief may be presented using a combination of text and graphics.

Making - Making is the physical manifestation of the design brief. During this process, the students develop skills through a variety of techniques and using a range of equipment. Students learn to work cooperatively and discover appropriate levels of safety.

Evaluating - Evaluation is a process of testing and modification in which the end result is measured against the original problem. This testing and modification process can continue through several cycles until the students believe that, within the constraints of the resources available, no further improvements can be made. Students should learn to assist others in making evaluations of their own and each other's products.

Reporting - Reporting involves sharing with others the information that has been gathered during the technology process. Students may demonstrate their work, report on their success or failure, or outline the reasons for their design choices or modifications. Reporting and recording may use a variety of different approaches and media.



Appendix 3

Attainment targets for Key Stage 3 design and technology

Strand i Investigating

Level 3	Level 4	Level 5	Level 6	Level 7	Level 8
<ul style="list-style-type: none"> •Students generate ideas and recognise that their designs have to meet a range of different needs. 	<ul style="list-style-type: none"> •Students generate ideas by collecting and using information. 	<ul style="list-style-type: none"> •Students draw on and use various sources of information. 	<ul style="list-style-type: none"> •Students draw on and use a range of sources of information, and show that they understand the form and function of familiar products. 	<ul style="list-style-type: none"> •Students use a wide range of appropriate sources of information to develop ideas. •They investigate form, function and production processes before communicating ideas, using a variety of media. 	<ul style="list-style-type: none"> •Students use a range of strategies to develop appropriate ideas, responding to information they have identified.

Strand ii Designing

Level 3	Level 4	Level 5	Level 6	Level 7	Level 8
<ul style="list-style-type: none"> •Students make realistic plans for achieving their aims. •They clarify ideas when asked and use words, labelled sketches and models to communicate the details of their designs. •They think ahead about the order of their work, choosing appropriate tools, equipment, materials, components and techniques. 	<ul style="list-style-type: none"> •Students take users' views into account and produce step by step plans. •They communicate alternative ideas using words, labelled sketches and models, showing that they are aware of constraints. 	<ul style="list-style-type: none"> •Students clarify their ideas through discussion, drawing and modelling. •They use their understanding of the characteristics of familiar products when developing and communicating their own ideas. 	<ul style="list-style-type: none"> •Students make models and drawings to explore and test their design thinking, discussing their ideas with users. •They produce plans that outline alternative methods of progressing and develop detailed criteria for their designs and use these to explore design proposals. 	<ul style="list-style-type: none"> •Students recognise the different needs of a range of users and develop fully realistic designs. •They produce plans that predict the time needed to carry out the main stages of making products. 	<ul style="list-style-type: none"> •When planning, students make decisions on materials and techniques based on their understanding of the physical properties and working characteristics of materials. •They identify conflicting demands on their design, explain how their ideas address these demands and use this analysis to produce proposals.

Strand iii Making

Level 3	Level 4	Level 5	Level 6	Level 7	Level 8
<ul style="list-style-type: none"> •Students use tools and equipment with some accuracy to cut and shape materials and to put together components. 	<ul style="list-style-type: none"> •Students work with a variety of materials and components with some accuracy, paying attention to quality of finish and to function. •They select and work with a range of tools and equipment. 	<ul style="list-style-type: none"> •Students work from their own detailed plans, modifying them where appropriate. •They work with a range of tools, materials, equipment, components and processes with some precision. 	<ul style="list-style-type: none"> •Students work with a range of tools, materials, equipment, components and processes and show that they understand their characteristics. 	<ul style="list-style-type: none"> •Students work with a range of tools, materials, equipment, components and processes, taking full account of their characteristics. 	<ul style="list-style-type: none"> •Students organize their work so that they can carry out processes accurately and consistently, and use tools, equipment, materials and components with precision.

Strand iv Evaluating and Reporting

Level 3	Level 4	Level 5	Level 6	Level 7	Level 8
<ul style="list-style-type: none"> •Students identify where evaluation of the design and make process and their products has led to improvements. 	<ul style="list-style-type: none"> •They reflect on their designs as they develop, bearing in mind the way the product will be used. •They identify what is working well and what could be improved. 	<ul style="list-style-type: none"> •They check their work as it develops and modify their approach in the light of progress. •They test and evaluate their products, showing that they understand the situations in which their designs will have to function and are aware of resources as a constraint. •They evaluate their products and their use of information sources. 	<ul style="list-style-type: none"> •They check their work as it develops and modify their approach in the light of progress. •They evaluate how effectively they have used information sources, using the results of their research to inform their judgements when designing and making. •They evaluate their products as they are being used, and identify ways of improving them. 	<ul style="list-style-type: none"> •They adapt their methods of manufacture to changing circumstances, providing a sound explanation for any change from the design proposal. •They select appropriate techniques to evaluate how their products would perform when used and modify their products in the light of the evaluation to improve their performance. 	<ul style="list-style-type: none"> •They identify a broad range of criteria for evaluating their products, clearly relating their findings to the purpose for which the products were designed and the appropriate use of resources.