Core Curriculum Programme

(MQC – Level 1)

Science and Technology

Form 3

Learning Outcomes of Key Competences:

'Scientific competence refers to the ability and willingness to use the body of knowledge and methodology employed to explain the natural world, in order to identify questions and to draw evidence-based conclusions. Competence in technology is viewed as the application of that knowledge and methodology in response to perceived human wants or needs. Both areas of this competence involve an understanding of the changes caused by human activity and responsibility as an individual citizen.'

(Malta Qualifications Council, *Descriptors of Key Competences in the National Qualifications Framework, Levels 1 to 3,* p.32)

CONTENTS:

STRAND 1 – The Physical World		AREA - Matter	
Knowledge		**Skills**	**Competences**
Recall the materials of which common objects in the immediate environment are made of and recall their basic physical properties		Compare and classify objects and materials in the immediate environment based on their physical properties. Use common objects and materials appropriately.	Sort objects and materials by colour, hardness, odour, taste, solubility, and electrical conductivity. Follow instructions in the use of these objects and materials in an appropriate context.
Key Words	**Points to note**		**Resources**
Substances, metals, non-metals, states of matter, solid, liquid, gas, compressible, incompressible, solution, solvent, soluble, insoluble, saturated, brittle, malleable	At level 1, students should attain basic knowledge of scientific facts that relate to their immediate environment, which will help them improve their quality of life. Knowledge of matter implies knowledge of materials that are used in everyday life such at home and in the workplace. Emphasis at this level should be on oral communication, so the use of digital means to collect evidence of learning would be advisable. Thus assessment should be mainly formative, and the use of evidence gathering techniques such as checklists for assessing practical tasks, mini-whiteboards, student mini-presentations and traffic lights could help the teacher (and the students themselves) evaluate their students' attainment of the objectives. Such formative assessment should be reflected upon by the teacher in order to adapt his/ her teaching methods to address better the situation of the particular group of students. The teacher should feel free to alter the suggested activities or omit some to include others of his/ her own devising, if these would be better suited to address the needs of his/ her particular learners. The evidence of the students' learning should be recorded and kept so that a 'profile of achievement' of each student is constructed, that clearly indicates the learning path of the child. Each practical activity itself provides an opportunity to measure student learning.		Materials: • Metals like copper, iron, aluminium and zinc. • Copper, iron and nichrome wire. • Non-metals like sulphur, charcoal and graphite • Natural materials like limestone, marble, wood and soil. • Man-made plastics (eg. polythene and polystyrene). • Air, carbon dioxide (carbonated water) • Common liquids like water, ethanol (surgical spirit), acetone (nail polish remover), oil, lemon juice, vinegar, red wine and milk. • Common solids like salt, chalk, sugar, copper sulfate, potassium permanganate, baking powder, candlewax, butter, polythene and polystyrene (jablow). Appropriate websites and digital content to use on the interactive whiteboard Digital hardware like the interactive whiteboard, cameras, and video cameras for collecting evidence of achievement and to use as tools for students to learn. Laboratory equipment necessary for practical activities. Laboratory technician to help set up practical activities.

Module 1: Solids, Liquids and Gases

Timeframe: 2 weeks

Teaching Objectives:
Students will be able to:
1. Learn about the three states of matter.
2. Learn to classify familiar and unfamiliar materials into one of these states.
3. Learn about the physical properties of solids, liquids and gases.

Suggested Activities:	Learning Outcomes for students
1. Investigating a balloon inflated with some air and another with some water. The latter is then placed in a freezer so water solidifies.	Observe changes of state and shape. Recall that there are three states of matter. Understand that solids retain their shape whilst fluids take the shape of the container.
2. Investigating the compressibility of air, water and plasticine using a plastic syringe.	Investigate compressibility. Understanding that gases can be compressed while liquids and solids cannot.
3. Measuring and comparing the boiling point of distilled and tap water.	Measure temperature. Observe changes of state. Evaluate evidence and draw conclusions
4. Heating common substances like candlewax, butter, chocolate and sugar – measuring and comparing melting points. If safety is an issue, heating can be carried out by placing the substances in a cooking tray and placing a desklamp (with a filament bulb) just above them.	Observe melting. Measure melting point. Understand substances have different melting points. Evaluate evidence and drawing conclusions.
5. Mini project: Observing common materials and determining whether they are solids, liquids or gases. Include some materials that raise discussion such as powders (eg talcum, salt etc), jelly and plasticine.	Classify substances as solids, liquids, or gases. Explain the reasons for each choice.

Module 2: Mixing Substances

Timeframe: 3 weeks

Teaching Objectives:
Students will be able to:
1. Learn about the composition of solutions.
2. Learn about solvents, saturated solution and suspensions.
3. Learn about the technique of separating a mixture composted of a soluble solid and an insoluble solid.

Suggested Activities:	Learning Outcomes for students
1. Investigating the solubility of different materials (eg. salt, chalk, sugar, copper sulfate, potassium permanganate, baking powder) in water.	Understand that some substances dissolve in water while others are insoluble. Recall examples of soluble and insoluble substance. Recall that solutions are mixtures consisting of solids dissolved in a liquid.
2. Investigating different solvents – ethanol (surgical spirit), water and acetone (nail polish remover) – using these solvents to dissolve materials like salt, polythene (plastic bags), polystyrene (jablow), sugar.	Understand that different solids might dissolve in different solvents.
3. Investigating how to make salt or sugar dissolve faster.	Problem solving skills and creativity in coming up with new ideas.
4. Investigating how many spoonfuls of solid (baking powder, salt, sugar, copper sulfate) are needed to make a saturated solution and thus discovering the most soluble substance.	Application of problem-solving skills. Understanding the idea of fair testing. Recall what a saturated solution is.
5. Mini project: making a giant crystal of copper sulfate.	Understand how a saturated solution is formed.
6. Making crystals from solutions: crystallising copper sulfate, sugar, salt.	Understand that by heating a solution the solvent can be removed.
7. Separating the components of soil – a suspension. Cleaning water by filtration	Know that fine solids that do not dissolve in a liquid can form a suspension. Understand that filtration can be used to remove the insoluble substances from a suspension.
8. Problem solving experiment: separating a mixture consisting of blue gems (glass beads) and copper sulfate crystals.	Understand the technique of separating a mixture composted of a soluble solid and an insoluble solid. Plan a simple experiment (orally or pictorially) to solve a problem Make observations and drawing simple conclusions. Communicating the findings.

Module 3: Metals and Non-metals

Timeframe: 2 weeks

Teaching Objectives:
Students will be able to:
1. Learn about the properties of metals and non-metals and some of their important uses.
2. Learn to make valid predictions about the use of certain metals using information about the metals as guidelines.

Suggested Activities:	Learning Outcomes for students
1. Carry out small investigations on metals and non-metals such as observing colour and shininess, malleability versus brittleness, conduction of electricity.	Recall the basic differences in properties between metals and non-metals.
2. Investigating the effect of dilute acids (like coke drink and lemon juice) on metals and non-metals.	Understand that metals are prone to attack by acids but not non-metals. Understand that some metals like copper are resistant to acid attack.
3. Separating a mixture of iron and copper filings using a magnet and a strong dilute acid and comparing the two approaches.	Apply previously learnt knowledge and skills to solve a problem. Evaluate evidence and drawing conclusions Compare and contrasting two different approaches.
4. Investigating the conditions needed for rusting.	Recall some of the many important uses of iron. Understand the reasons why it is desirable to prevent rusting.
5. Investigating the strength of different metal wires of the same diameter eg. copper, iron and nichrome.	Understand that metals tend to extend when loaded and only snap when a critical force is applied. Understand that the strength of different metals varies, and consequently, they are used for different purposes.
6. Mini-project: Finding examples where metals and non-metals are used at school, at home and in the community in general. Students prepare and perform mini presentations can be filmed and edited into a video as a class project.	Predict the use of certain metals based on their properties. Students apply ICT skills to gather evidence and data (digital photography, use of IWB etc.). Students enhance communication skills by setting up mini presentations about their findings. Students should be able to relate a certain use to the properties of commonly used metals.

Module 4: Natural and Man-made Materials

Timeframe: 2 weeks

Teaching Objectives:
Students will be able to:
1. Learn about the properties and uses of natural materials like limestone, marble, wood.
2. Learn about the properties and uses of Man-made plastics like polythene and polystyrene.

Suggested Activities:	Learning Outcomes for students
1. Investigating the physical properties of limestone, marble, wood and plastics (eg. polythene and polystyrene). Simple investigations regarding floating/ sinking, solubility in water, hardness/ brittleness, behaviour on heating mildly. Discussion of the uses of these materials in relation to their properties.	Recall the physical properties of common natural and Man-made materials. Understand the uses derived from specific properties of these materials.
2. Investigating the effect of common household chemicals like water, oil, lemon juice, red wine, vinegar, acetone (nail polish remover) on natural materials like limestone, marble and wood, and on Man-made plastics like polythene and polystyrene.	Understand that some materials will react with chemicals irreversibly. Understand that other materials are resistant to certain chemicals. Recall some common examples of the above two circumstances.
3. Descaling a kettle using citric acid and vinegar and finding which is the most effective substance for the purpose.	Understand that limestone is deposited from local tapwater. Apply the principle that acids react with limestone to a common use. Evaluating evidence and drawing conclusions. Understand that science can be applied to help people live better.
4. Mini-project: Identifying objects at school, at home and in the community made out of plastic, wood, limestone and marble, relating their uses to the properties of the respective material.	Recall the uses of natural materials like limestone, marble, wood. Recall the uses of Man-made plastics like polythene and polystyrene. Students apply ICT skills to gather evidence and data (digital photography, use of IWB etc.). Students enhance communication skills by setting up mini presentations about their findings

STRAND 2 – The Living World		AREA – Diversity of Life	
Knowledge		**Skills**	**Competences**
Students are able to: Distinguish between different plants and animals. Classify simple animals (with special emphasis on local species) into different chordates.		Students are able to: Conduct simple sampling methods during fieldwork activities. Take care of plants and animals in their immediate environment.	Students are able to: Demonstrate an awareness of the interaction between plants and animals in a selected environment. Demonstrate an awareness of ways to safeguard the environment.
Key Words	**Points to note**		**Resources**
stems, leaves, flower, roots, fruit, seeds, germination, budding, indigenous, afforestation, vegetation, woodland, ecosystem, rubble walls, pollution, vertebrates (chordates), invertebrates, classification, mammals, birds, reptiles, amphibians, fish, nature reserve	At level 1, students should attain basic knowledge of scientific facts that relate to their immediate environment, which will help them improve their quality of life. Knowledge of matter implies knowledge of materials that are used in everyday life such at home and in the workplace. Emphasis at this level should be on oral communication, so the use of digital means to collect evidence of learning would be advisable. Thus assessment should be mainly formative, and the use of evidence gathering techniques such as checklists for assessing practical tasks, mini-whiteboards, student mini-presentations and traffic lights could help the teacher (and the students themselves) evaluate their students' attainment of the objectives. Such formative assessment should be reflected upon by the teacher in order to adapt his/ her teaching methods to address better the situation of the particular group of students. The teacher should feel free to alter the suggested activities or omit some to include others of his/ her own devising, if these would be better suited to address the needs of his/ her particular learners. The evidence of the students' learning should be recorded and kept so that a 'profile of achievement' of each student is constructed, that clearly indicates the learning pattern of the child. Each practical activity itself provides an opportunity to measure student learning.		Materials: • Plant pictures • Potted Plants • Plant pictures for cut outs • http://urbanext.illinois.edu/gpe/case1/c1m1a.html (online game) • Seedlings for tree planting • Photo cameras • Pictures of indigenous trees • Computer • Vegetation video clips • Hand-lenses • Quadrats • Line transects • Materials for bird table • Images of logos/pictures with animals • Animal pictures

Module 1: Exploring Plants

Timeframe: 3 weeks

Teaching Objectives:
1. To provide students a basic understanding of plants as a form of life.
2. To familiarise students with the different structures and functions of plants.
3. To provide students with an understanding of the life cycle of a plant.
4. To instil a general appreciation of the importance of plants.

Suggested Activities:	Learning Outcomes for students
Starter suggestion 1. Students are engaged in observing a range of pictures and/or photos of different plants. Students observe typical potted plants in the school garden/ or school grounds.	1. Work collaboratively in a group.
Main activity 6. Teacher elicits the parts of plants: stems, leaves; flower; roots; fruit; seeds. Students relate the plant part to the appropriate function.	2. Name the different parts of a plant and relate each part of the plant to the respective function.
7. Students cut out the different main parts of a flowering plant and collate them on a blank paper to form a whole plant. Students label the plant structures.	
3. Students participate in an online matching game. http://urbanext.illinois.edu/gpe/case1/c1m1a.html	

4. Students take part in a tree-planting activity in the school grounds/garden or sow seeds in a pot. Students discuss the care necessary for the plant to grow/for the seed to germinate and the season the seeds are sown. Students monitor plant growth and observe changes during the growth process. Students record their observations in simple forms such as in tabular format or photographs taken each week. Plant milestones could be when the seed germinates i.e shoot seen emerging from soil; first leaves; length of stem as plant grows; no. of leaves; length of leaves; budding; flowers; wilting.	3. List the requirements of a plant necessary for growth. 4. Observe changes in a plant's growth process and record simple observations.
5. Students explore local indigenous trees and discuss the importance of planting such trees in the local environment (such as public gardens, parks, roundabouts). List of indigenous trees can include the Holm Oak (il-Balluta); Carob tree (il-Ħarruba); Bay Laurel (Randa); White Poplar (il-Luq); Aleppo Pine (iż-Żnuber).	5. Appreciate the importance of planting local indigenous trees. 6. Recognise some examples of indigenous plants / trees.
6. Students compile a simple ppt presentation or a project book about indigenous trees. Observation of these indigenous trees can be promoted during fieldtrips too.	7. Compile simple presentations to disseminate their findings and observations.
Other possible activities Students explore local afforestation projects (such as at Xrobb l-Ghagin; Wied Ghollieqa; Foresta 2000; ta' taħt Chambray afforestation projects) Students discuss local tree vandalism issues (eg. Foresta 2000 vandalism and Xrobb l-Għagin tree theft and vandalism). Students can design their own garden on paper or using computer. Teacher can include different themes such as a local garden; or a rock garden; garden with shrubs etc.	8. Discuss local environmental issues.
Site visits related to the theme Wied Għollieqa; San Anton Gardens; Argotti Botanical Gardens; a greenhouse or plant nursery	

Module 2: Exploring Animals – chordates

Timeframe: 3 weeks

Teaching Objectives:
1. To provide students a basic understanding of classification.

Suggested Activities:	Learning Outcomes for students
Starter suggestion 1. Students explore the use of animals in symbols such as the WWF, jaguar cars, road symbols and zodiac symbols. Students can search the net to find images of symbols including animals.	
Main activity 2. Students cut out pictures of different animals (chordates) from a range of magazines. Students are encouraged to get photos of their pets too. Students are engaged in a classification exercise of the animal pictures into groups based on different criteria such as size and type of habitat.	1. Distinguish between vertebrates and invertebrates. 2. Classify different types of chordates and list typical characteristics.
3. Teacher introduces body covering as a criterion for classification. Students discuss the classification of organisms in the chordate group – namely mammals; birds; fish, reptiles and amphibians. Students discuss the physical features of the different types of chordates.	3. Observe different characteristic features of each group of organisms within the 5 different vertebrate classes.
4. Teacher/s and students choose a specific animal group such as birds and conduct hands-on activities related to the group. The list below includes some activity ideas related to birds. Bird watching- students observe birds in the school grounds. Students' observations can take place through photos/drawings of the different bird species and/or recording of bird songs/chirps. Students observe different types of beaks, plumage, size, behaviour, type of food.	4. Observe and record simple behavioural patterns of a specific vertebrate class. 5. Relate structural characteristics to function and behaviour patterns to habitat and seasonality.

5. Students build a bird-table. Students are engaged in the design and construction of the bird/table feeder. Teacher can access the BirdLife Malta website for some tips related to this activity: http://www.birdlifemalta.org/Content/kids/things_to_do/makeabirdtable/931/#.UXaCcqKnBvk 6. Students monitor and record the birds visiting the bird-table at different times of the year (autumn/winter/spring/summer). Students take pictures of the visiting birds and display them in a simple class/school exhibition. Students are encouraged to look up and write the Maltese and/or English names of the visiting birds.	6. Work collaboratively in a group. 7. Plan, design and construct simple projects (eg. pond, aquarium, bird-table) 8. Conduct simple research. 9. Compile simple presentations to disseminate their findings and observations.
Other possible activities Students are engaged in building a nest box. http://www.birdlifemalta.org/Content/kids/things_to_do/Nestbox/976/#.UXaEdqKnBvk Students plan a school based activity for World Animal Day (4th October). Students can build an aquarium in their class or a pond in school grounds. Students can monitor lizards: observe when they are hunting for food or basking in sun. Recognise the difference in activities between winter and spring.	
Site visits related to the theme Għadira/Simar Nature Reserve; Bird Park Malta; the Petting Farm; Malta National Aquarium; Nature History Museum.	

Module 3: Fieldtrip/Nature walk

Timeframe: 2 weeks

Teaching Objectives:
1. To provide students the opportunity to engage in discussions about the local environment.
2. To familiarise the students with aspects of the local environment.
3. To provide students with an activity where they can think in scientific terms.

	Students should be able to:
Suggested Activities:	**Learning Outcomes for students**
Starter suggestion 1. Students shown a brief video clip of different local areas. Students discuss the different vegetation in each.	1. Observe differences in vegetation in a range of areas.
Main activity 2. Teacher selects a preferred accessible site for a fieldtrip. This activity can be held in a woodland area such as Buskett, a garigue area such as Selmun, a coastal shore such as Buġibba or a valley such as Chadwick Lakes. Such an activity can also be held in areas (such as a valley or abandoned field) in the vicinity of the school.	2. Appreciate local flora and fauna.
3. During the fieldtrip students carry out observations of the different flora and fauna. Students' observations can include leaf size, shape and colour, location of different plants (eg shady/damp place for ferns); type of insects visiting flowers; different types of ecosystems (woodland, garigue, watercourse); typical reptiles (such as Maltese wall lizard, geckos, skink, chameleon); agricultural practices (rubble walls, terraced fields).	
4. Building of rubble wall and its ecological importance: Students can identify plants which grow in rubble walls as well as habitat of small vertebrates and invertebrates. Identify the importance of rubble walls in terracing. A rubble wall builder could give a demonstration on how to build these walls.	3. Discuss positive and negative practices in agriculture.

5. During the fieldtrip students are engaged in simple sampling activities, using the quadrats and line transects.	4. Work collaboratively in a group. 5. Conduct simple sampling practice using quadrats and line transects.
6. Students explore different forms of pollution in the area – land pollution (e.g. by dumping of rubbish, lead pellets from hunting, oil spills, noise pollution.)	6. Analyse the positive and negative effects of human impact on the environment.
7. Students explore different interactions between the plants and animals present in the studied area. Students can construct a food web or simple food chains.	7. Indentify differences in local ecosystems. 8. Construct simple food web/s based on observations.
8. Following the fieldtrip students compile a simple fieldwork project book – recording their observations, measurements and sticking photos/pictures of the organisms found in the area.	9. Compile simple presentations to disseminate their findings and observations.
Other possible activities Nature walk – students participate in a nature walk along a typical local environment such as Selmun or the Majjistral Nature Park or a rural environment close to the school. During the walk students can explore the green country code, habitats, different types of trees, soil structure, conservation practices, environmental issues, different plants/animals. Wind prevalence, nature of growth of trees as a result of wind. Teachers can support students to set up a photo competition/exhibition related to a selected theme linked to Nature walk – e.g. Biodiversity, Soil conversation, Ecosystems.	
Site visits related to the theme Gaia Foundation Centre; Ħaġar Qim Nature Trail; Majjistral Nature Park	

STRAND 3 – The World of Technology		
Knowledge	**Skills**	**Competences**
Recall general scientific and technological facts to improve personal quality of life.	Use basic equipment and common devices to obtain and transmit information.	Follow instructions and complete tasks under supervision.
Recall ways of reducing exposure to threats to health.	Recognize and take action to minimize basic threats to health and safety.	Recognize and take action regarding threats to health of self.
Recall ways of reducing waste and avoiding pollution of the immediate environment.	Carry out simple tasks showing concern about waste and pollution of the immediate environment.	Demonstrate awareness of procedures for avoiding waste and maintaining a clean and healthy environment.

Keywords	**Points to note**	**Resources**
research, specifications, ideas, development, planning, making, testing, evaluating Safety, environment, waste, pollution	At Level 1, students should be able to put in practice their general knowledge and understanding of materials and processes to improve their individual life or immediate environment. Therefore, any given situation and design brief should be related to students' experiences either at home, at school or during leisure activities. Projects should be kept as simple as possible, but still offer a reachable challenge for the students. Teaching approach should include design-and-make and hand-on activities. The stages of the design process shall be followed but not into great detail. Emphasis should be put on research, development of ideas, recognising hazards in a work plan and finding suitable safety precautions, making of the artefact and evaluation. The suggested activities are only indicative and teachers can devise other activities to target their students' particular needs and interests. However, all activities should be in line with the stated learning outcomes. Students work, including notes, sketches, drawings and any photographic evidence or recordings, shall be compiled in a short design folio. Teacher can use a template for the design folio in which students can organize their work.	Materials in various standard forms: natural and manufactured wood, metals, thermoplastics Tools need to complete the focus tasks and artefacts Access to the internet

TECHNOLOGY PROJECTS

Teaching Objectives	Learning Outcomes
Student should learn:	Students will be able to:
– about the general classification of materials	– identify major difference between the various classes of wood, metals and plastics.
– about basic properties and uses of materials	– recognise that different resistant materials are used for different purposes because of their properties.
– how to analyse existing products to find common design criteria	– use one source to research about materials.
– how to communicate and develop design ideas	– understand, respond to and discuss the main criteria of a basic product design.
– how to follow a work plan	– use 2D/3D sketching and few annotations to communicate two similar ideas and then select one idea for development with some help.
– how to reduce health and safety risks by following precautions	– express design concepts verbally and apply them as they produce the artefact.
– how to manipulate resistant materials using basic hand tools	– use basic hand tools with some accuracy and under supervision to manipulate resistant materials.
– how to evaluate a product and the process	– evaluate a finished artefact against the design brief and the specification criteria.

Possible Situations & related Design Briefs:

SITUATION	DESIGN BRIEF
At school, you were asked to study the effects of planting seeds in a controlled environment but you do not have access to a greenhouse.	Design and make a model greenhouse in which to plant few seeds.
You would like to have the chance to observe the different birds that live around your neighbourhood.	Design and make a bird feeder or watering station to be place outside your house.
You have the habit of leaving the mobile phone running about while at home, many times ending up searching for it when you need it. Therefore you need a place where you can leave your mobile phone.	Design and make a stand which can hold your mobile phone while you are at home.
The container from which your pet feeds need to be replaced. This container holds both food and water.	Design and make a pet feed container which can hold both food and water.
You were made responsible of the green areas around the school. In order to take care of these areas, you have to carry around a set of gardening tools from one place to another. These gardening tools need to be organised in one box.	Design and make a portable box which holds a set of basic gardening tools.
In your kitchen at home, your family is separating waste into two different bins. It would be more convenient if waste is put in one container which is divided into two compartments.	Design and make a waste bin which has two compartments: one for recyclable waste and the other for organic waste.

<u>Suggested Activities</u>

1. A batch of different wood samples of the same size will be given to groups of students. The samples can be labelled with the name of the respective wood. As a form of competition, students will analyse the samples to divide them into two categories: "natural" and "man-made/manufactured". Teacher can refer to these links:
    http://www.mr-dt.com/materials/hardwoods.htm
    http://www.design-technology.org/lesson5e.htm
    http://www.youtube.com/watch?v=oux_vdIaS4Q
    Students do a focus task related to wood, for example producing a quadrant to be used during sampling activities on fieldtrips. Students briefly discuss the impact of wood use on the environment and society:
    http://environment.nationalgeographic.com/environment/photos/rainforest-deforestation/

2. Students are given different samples of plastic objects or parts of objects to analyse according to uses and properties (mainly weight, texture and colour). Using a hot air blower and observing all safety precautions, they heat strips or scraps of plastics, try to bend them into new shapes and notice results. They categorize the samples into "thermosetting" and "thermoplastics". Teacher can refer to the following links:
    http://www.thermoplasticprocesses.com/
    http://www.design-technology.org/lesson4b.htm
    Students do a focus task related to plastics, for example producing a picture frame by bending. Students discuss the benefits of recycling plastics after watching a video-clip or going for a visit at Sant'Antnin Waste Treatment Plant:
    http://www.youtube.com/watch?v=zyF9MxlcItw

3. Student are shown a video clip on the uses of metals in everyday life:
    http://www.youtube.com/watch?v=XJdG2OFDQBA&feature=related
    They are given a number of labelled samples of metals such as copper, aluminium, cast iron, mild steel which to test against attraction to a permanent magnet. Students categorize the metals as "ferrous" and "non-ferrous". Teacher can refer to the following links:
    http://www.design-technology.org/CDT10metalsproperties.htm
    http://www.eural.com/
    Students do a focus task related to metals, for example bending metal wire to form a key-chain.

Research
4. Students are given ready-made artefacts or pictures of existing artefacts related to the chosen brief. They draw the object or use the same pictures to label the different resistant materials (i.e.: wood, metal, plastic, etc.) being used. Through magazines and internet, students find other pictures of the same product.

5. Through their observations of other products and other related investigation (such as measuring out and disassembly), students answer a set of questions related to size, function, end-user, material, safety, cost, etc. to elicit a common set of specifications.

Ideas & Development

6. Students draw a sketch of the ready-made artefact. After a brainstorming session, students sketch a minimum of two other ideas for their artefacts, keeping in mind the specifications given. Teachers can refer to this link:
    http://www.design-technology.info/IndProd/drawings/page15.htm
    If necessary, teacher gives out one other idea which can be modified by the students. Once ideas are generated, students choose one idea for further development.

7. Students make a model of their chosen idea. Model can be flat or three-dimensional. Students decide upon most suitable material, form, joining methods, etc. and make labelled drawing of parts of the chosen artefact.

Planning & Making

8. Students suggest the amount of material/components needed to produce their idea. Teacher explains the work plan to be followed for making the artefact while students suggest suitable tools which should be used and point out the safety hazards and suggest precautions. Teacher can refer to the following site:
    http://www.technologystudent.com/equip1/equipex1.htm

9. Students follow the work plan and safety precautions to produce their artefact.

Testing & Evaluation

10. Students test their artefact against specifications and functionality. Students verbally evaluate results of tests and suggest any possible modifications. They also evaluate their design and practical work.

Assessment Method

The Science Technology Core Curriculum Programme assessment includes a portfolio and an end-of-year summative task. The portfolio is allocated 70% while the end-of-year task is allotted 30%.

Summative task

An end-of year summative task will take the form of a paper and pen test including a range of select type response tasks (e.g. multiple choice, true/false, fill in type questions). The paper shall be centrally set from the CMeLD and will gauge students' knowledge, skills and competences from the three strands in an equal proportion. Samples of select-response type questions from the three strands are included in **appendix 1**.

Portfolio Assessment

Cross-disciplined Portfolio

This type of portfolio includes collections of work from Science and D & T. The Portfolio is compiled over the course of a scholastic year. The aim of this type of portfolio is to capture the individual student's developmental changes.

The Portfolio may include:

- written materials – handouts, student logs, sketches, simple lab reports, basic research.

- Video of presentations

- Photographs – interim stages, a final record of product

- Student reflections

- Measures of achievement/performance records.

The portfolio should be developed on the principles that:

1. The practices are on-going and display students' developmental process

2. It includes authentic work.

The selection and collection of items may be:

- teacher selected

- student selected

- a negotiated selection between teacher and student.

The material in the portfolio should be organised by chronological order and category (relevant to subject area).

The organisation of the portfolio may include the following:

1. A table of contents

2. An introduction title page that identifies the student and briefly explain the purpose of the portfolio

3. Brief description of selected tasks/work assignments for readers less familiar with the operation in the classroom

4. Dates on all entries

5. A review section that includes student reflections/self-assessment (e.g. using a checklist such as the one on p.23) together with teacher's comments and possible peer comments.

Criteria for evaluating the Portfolio

Organisation and Completeness   :   10%

Self Evaluation   :   10%

Included Items   :   50%

Example of Portfolio Rubric

Organisation &   10   All components of the portfolio are included in a neat, well organized fashion with a table of
Completeness   contents included.

        8   All components of the portfolio are included.

        6   Most components of the portfolio are included (1 – 2 missing items).

        4   Several components of the portfolio are missing (3missing items).

        2   The portfolio is largely incomplete (more than 3 missing items).

        0   The portfolio was not handed in.

Self Evaluation   10   All components of self-evaluation are completed. Student shows clarity of thought and insight.

        8   All components of self-evaluation are completed. Student responses show evidence of thought
          and careful consideration.

        6   Most components of self-evaluation are completed or student responses show only some evidence
          of thought and careful consideration.

        4   Several components of self-evaluation are missing or student responses little evidence of thought
          and careful consideration.

        2   The self-evaluation component is largely incomplete or student responses indicate little effort to
          complete the self-evaluation.

        0   The self-evaluation component was not completed.

Included Items 50 Included portfolio items indicate an excellent level of work or a significant improvement throughout the term or a consistent effort to learn from previous evaluations (corrections completed for all materials, work re-done, etc.).

40 Included portfolio items indicated a good level of work or an improvement throughout the term and an effort to learn from previous evaluations (corrections completed, work re-done for most materials).

30 Included portfolio items indicate a satisfactory level of work or an improvement throughout the term and some effort to learn from previous evaluations (corrections completed, work re-done for several of the materials).

20 Included portfolio items indicate a satisfactory level of work or an improvement throughout the term and/or a minimal effort to learn from previous evaluations (corrections completed, work re-done for a few materials).

10 Included portfolio items indicate a poor level or work and/or no effort to learn from previous evaluations (corrections not completed, work not re-done).

0 There were no portfolio items included.

Adapted from Bentley, D. 2001

Student Reflection: Sample Self-Assessment Sheet

Student Name: _____   Date: _____

The attached portfolio item is (e.g. simple report, concept map, ppt.)

This piece of work demonstrates that I can:

□   make observations   □ support ideas with evidence or reasons

□ take measurements   □ evaluate products and processes

□ make predictions   □ organize related ideas

□ collaborate with team mates   □ describe observations in writing

□ describe observations verbally   □ participate in discussion

□ other: _____

In this task:

My strengths include:

I can improve:

Student Signature: _____