

Core Curriculum Programme

(MQC – Level 1)

Science and Technology

Form 5

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)

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STRAND 1 – The Physical World		AREA - Forces
Knowledge	Skills	Competences
<p>Students are able to:</p> <ul style="list-style-type: none"> recognise that the stability of an object depends on its shape, weight (the pull of gravity) and position. recall that levers can be used to magnify a force. recall that many appliances make use of electric motors, which depend on electrical and magnetic forces. 	<p>Students are able to:</p> <ul style="list-style-type: none"> observe that stable objects have a wide base. recognize everyday life situations where levers are used. recognize electrical appliances and tools that use electric motors and others that use electricity for other purposes. 	<p>Students are able to:</p> <ul style="list-style-type: none"> follow instructions in practical situations where it is important to ensure stability for safety and security (e.g. use of ladders, scaffolding). use levers as instructed. handle electrical appliances and tools confidently and safely under supervision.
Key Words	Points to note	Resources
<p>Forces, levers, balancing, pivot, fulcrum, centre of gravity, turning effect, beam balance, magnets, magnetic fields, repulsion, attraction, electromagnet, d.c. supply, wire, iron core, switch, d.c. motor, rotation, electromagnetic forces,</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p>Materials:</p> <ul style="list-style-type: none"> Forks, cork top, toothpicks Pulley, nylon string or similar Plastic water bottle Spanner, bolt and nut Metre ruler, pivot and weights Stand and clamp Bar magnets, iron nails, paper clips, insulated wire, d.c. power supply Motor kit 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: Stability

Timeframe: 8 weeks (8 lessons)

Teaching Objectives:

Students will be able to:

1. Learn about the centre of gravity/mass.
2. Learn how the centre of gravity/mass affects stability.

Suggested Activities:

Students can investigate the centre of mass/gravity of regularly (squares, circles, triangles, rectangles, etc.) and irregularly shaped pieces of cardboard. Cardboard may be cut in the shape of letters or numbers.

Students are engaged in the balancing of regularly and irregularly shaped object found in the class/school such as (a metre ruler, broom, tennis racket, etc.).

Students investigate

- the balancing of two forks inserted in a cork top and supported on a thin pin/toothpick. Refer to the picture.



Learning Outcomes for students

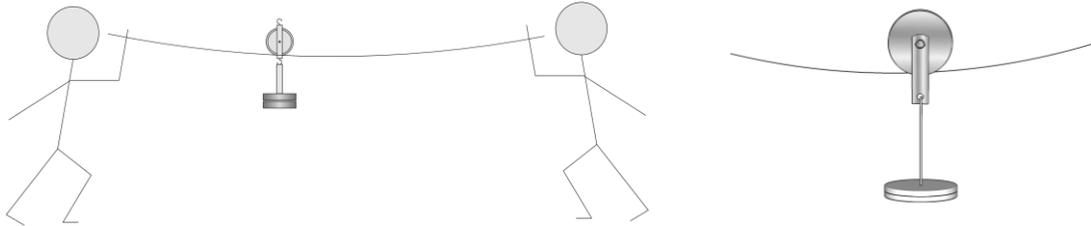
Understand that all laminas have a centre of mass/gravity.

Understand that the centre of mass/gravity of an object is the point under which you can balance the object.

Understand that all 3D objects have a centre of mass/gravity.

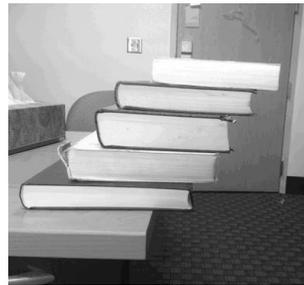
Understand that the lower the centre of gravity of an object, the more stable it is – i.e. the lower the concentration of the mass, the more difficult it is to overturn the object.

- how lowering the centre of mass/gravity increases the stability of an object. This can be done through an activity where two students hold a thin rope/string and a pulley with a mass attached which is made to run from one student to the other. Refer to the picture below.

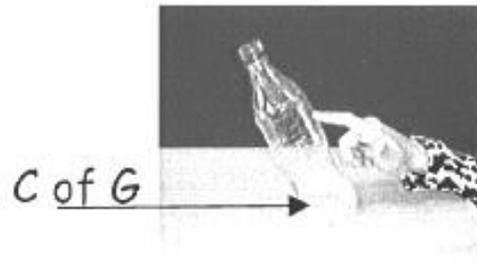
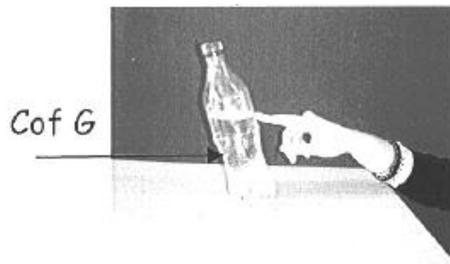


Students can be engaged in simple activities:

- Piling up blocks/books, one on top of each other in the shape of stairway in order to achieve the highest pile before it topples.
- Investigate how different amounts of water affect the centre of gravity and how far the bottle will tilt before it falls over.



Apply the acquired knowledge about centre of gravity in real life situations.



Module 2: Forces and Levers

Timeframe: 8 weeks (8 lessons)

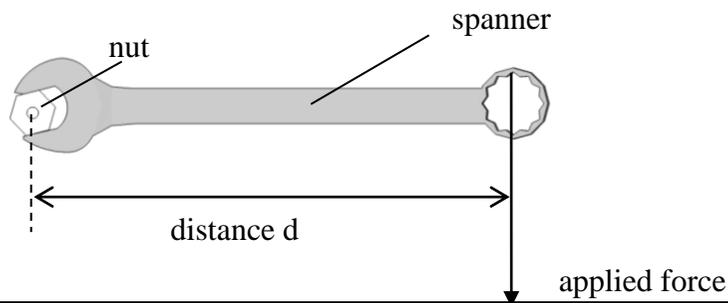
Teaching Objectives:

Students will be able to:

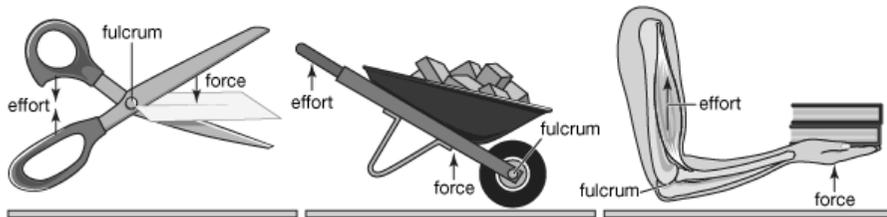
1. Understand what is meant by a turning effect of a force.
2. Understand how levers can magnify a force.

Suggested Activities:

Students are engaged in loosening a nut screwed on a bolt. They can first use their bare hands to loosen the nut and then move on to apply a spanner to a nut. Teacher can explain that nuts are loosened if turned in anticlockwise direction and are tightened if turned in a clockwise direction (only applies if operator is facing the nut).



Identify everyday objects which make use of turning forces. (e.g. wheelbarrow, human arm, nut cracker, opening a tin of paint using a screw driver, bottle opener, opening a door etc.)

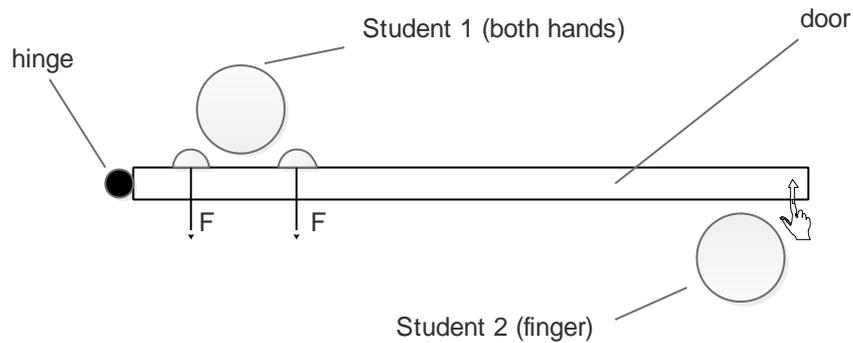
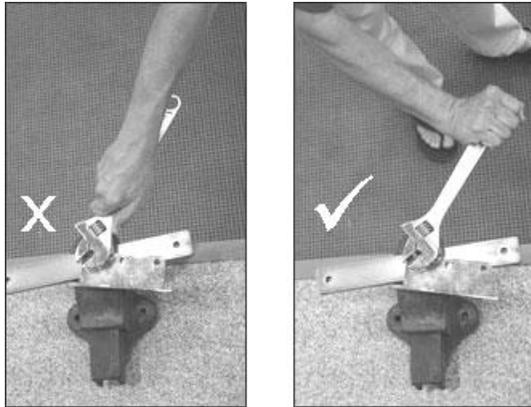


Learning Outcomes for students

Understand that a force acting about a pivot causes a turning effect.

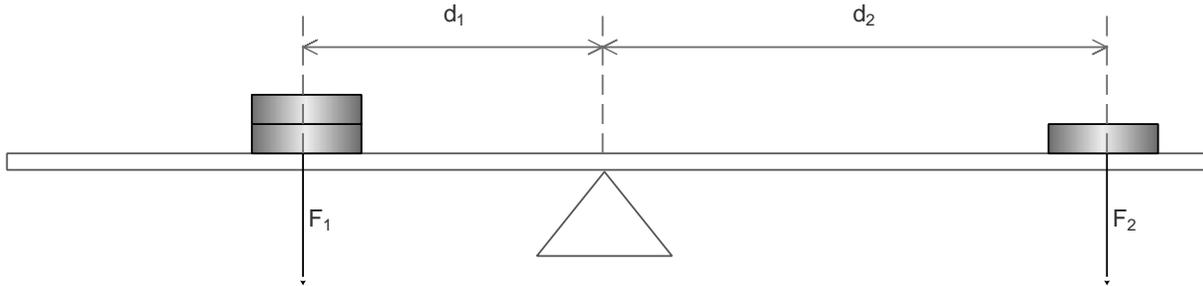
Understand that a force applied at a distance from a pivot can make everyday objects turn.

Turn different objects at different distances from the pivot and find which is most effective.



Understand that this turning effect depends on the size of the force and the perpendicular distance from the pivot.

Investigate how different weights can be arranged so that a ruler balances. Students can then apply this concept in the design and construction of simple beam balance.

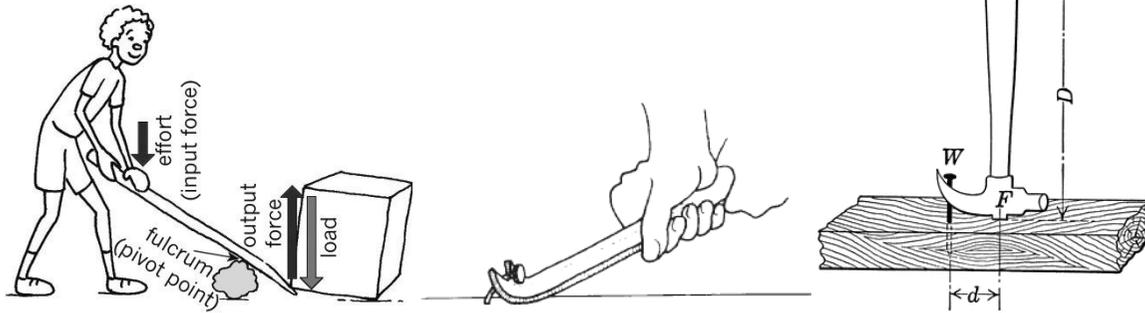


Understand the concept of balancing.

Understand that heavier object in such a system can be balanced by lighter objects that are placed further away from the pivot.

Understand that this concept can be used to determine unknown weights/mass

Explain how levers can be useful. (e.g. crowbar, hammer etc).



Understand that the lever is a simple machine that multiplies a small effort to be able move heavier objects.

Module 3: Magnetic and electric forces

Timeframe: 10 weeks (10 lessons)

Teaching Objectives:

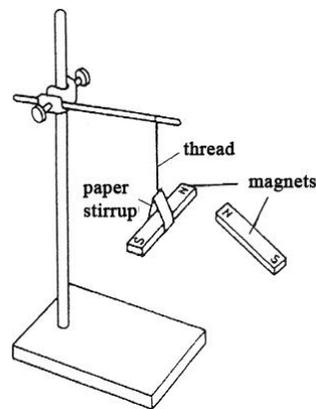
Students will be able to:

1. Learn about basic properties of magnets.
2. Learn about situations in which magnets and electromagnets can be used.
3. Learn about the electric motor.

Suggested Activities:

Students can investigate what materials can be attracted by a magnet. Students are supplied with different materials and plan an experiment to determine which of these materials are magnetic and non- magnetic.

Students can investigate the fact that magnets have two different poles which cause attraction or repulsion. Students are supplied with bar magnets and ring magnets to have a hands on experience of the magnetic forces.



Learning Outcomes for students

Understand that not all objects are attracted to magnets.

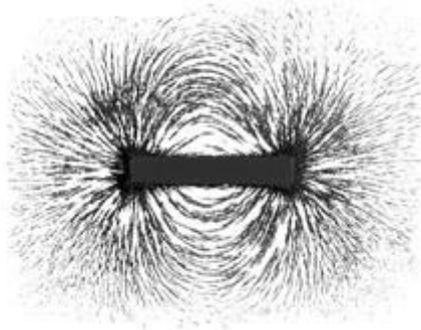
Use the principle of fair testing.

Develop better their sorting skills.

Understand that all magnets of different shapes have two ends where magnetism is strongest.

Use of a plotting compass to appreciate that the Earth has a magnetic field.

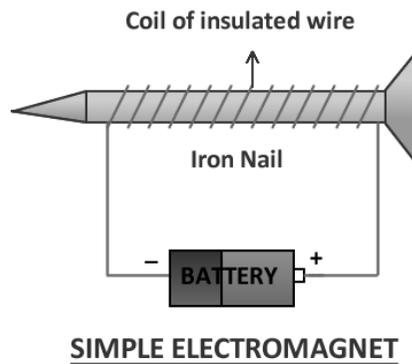
Students can demonstrate the magnetic field pattern around a bar magnet by using iron filings.



Understand that the iron filings are attracted mostly to the poles of the magnet.

Understand that the magnetic field pattern surrounds the 3D space around the magnet.

Students are engaged in building a simple electromagnet that consists of an iron core, some insulated wire wound on the same iron core, a switch and a DC power supply. Students can then investigate what makes the electromagnet stronger – either increasing the number of turns of wire or increasing the flow of current. The strength of the electromagnet can be measured by the number of paper clips attracted or the number of weights it can hold. Students are to take pictures at each of the three stages of design, construction and testing so that they can be used later in the mini-project.



Understand that unlike permanent magnets, magnetism in this type of magnet can be switched on and off.

Understand that there are various factors that affect the strength of the electromagnet; namely the number of turns of wire, current flow and the use of the iron core.

Understand that a correct investigation requires that only one variable is changed at a time.

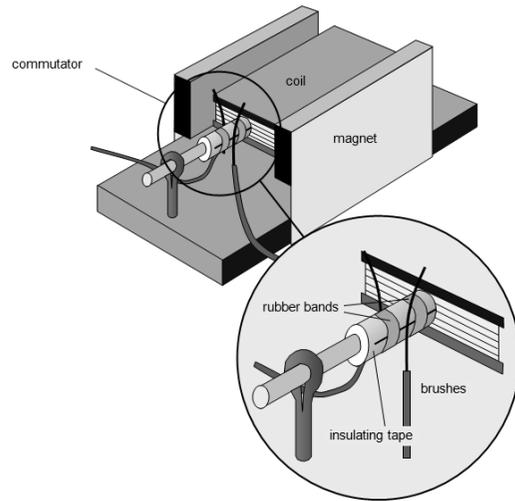
Understand the idea of fair testing.

Students can design and construct a simple d.c. motor. Students can compile a list of the materials required, construct the motor and test it out. Students can investigate the effect that the number of turns of wire has on the rotating speed of the motor and how the polarity of the battery/d.c source affects the direction of rotation. Students can explore how the permanent

Understand that the magnetic field from the two face magnets is necessary for the motor to turn.

Understand that the interaction of the magnetic field from

magnets should be set up for the motor to work and how altering their position affects the direction of rotation of the motor. Students are to take pictures at each of the three stages of design, construction and testing so that they can be used later in the mini-project.



the coil and the magnets produces the turning effect.

Understand the necessity to design the motor such that rotating parts are free to move and that friction is a minimum.

Understand that a d.c is needed for the motor to turn.

Mini-project: Students in small groups can prepare a PowerPoint presentation that contains photos and diagrams of the resources they created in the previous activities. This Powerpoint presentation is delivered to the rest of the class.

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 recognise strengths and areas of improvement in the design used for the resources produced for the activities.

STRAND 2 – The Living World		AREA – Heredity	
Knowledge		Skills	
Students are able to: <ul style="list-style-type: none"> describe similarities between parents and their offspring in various organisms. 		Students are able to: <ul style="list-style-type: none"> recognise that the similarity is a result of genetic material that is inherited from both parents and from one generation to the next. 	
Competences			
Students are able to: <ul style="list-style-type: none"> identify and describe similarities between parents and offspring. 			
Key Words	Points to note	Resources	
Puberty, Secondary Sexual characteristics, hormones, ovary/ies, fallopian tube, uterus, cervix and vagina; boys- testes, penis, seminiferous glands (including prostate gland), menstruation, sperm, egg, fertilisation, conception, chromosomes, genes, gamete, dominant, recessive, pure organism, hybrid organism, co-dominant.	<p>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.</p> <p>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.</p> <p>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.</p>	Materials: <ul style="list-style-type: none"> Computer with internet access Fact sheet- physical body changes (link in module 1 description) Diagram/Poster of male and female reproductive system Animation of the process of fertilisation. (link in module 2 description) Sheet on inherited traits. (link in module 3 description) Making paper pets (link in module 3 description) Photographs/ Pictures of animals and plants showing characteristics of co-dominance	

Module 1: Exploring Human Reproduction

Timeframe: 4 weeks (4 lessons)

Teaching Objectives:

1. To provide students with a basic understanding of puberty, secondary sexual characteristics and sexually maturity.
2. To elicit from students secondary sexual characteristics of males and females.
3. To familiarise students with the fact that a sexually mature person produces eggs or sperm.
4. To provide a basic understanding of the main sexual structures in males and females.

Suggested Activities:

Learning Outcomes for students

Starter suggestion

Students explore changes in their bodies that are occurring in the last year or so. E.g. growing of facial hair/ breaking of voice (boys) or growth of breasts/ menstruation (girls)

Work collaboratively in a group

Main activity

Teacher explains that these changes are a result of puberty. Elicits from students a simple definition to puberty (to include physical and sexual changes). Discusses with students the time when puberty takes place.

Understand that body physical changes are a result of growing up and becoming sexually mature.

Teacher asks students to explore and list all physical changes that occur in females and males. Teacher explains why these changes occur (very brief reference to an increase in hormonal activity).

Students can compile a fact sheet of the physical changes occurring in their body.

<http://teachers.teachingsexualhealth.ca/wp-content/uploads/Elementary-Puberty-Quick-Lesson.pdf>

This can be followed by a discussion on how the students feel regarding these changes – “How comfortable are you in your skin?”

List different secondary sexual characteristics occurring in males and females.

Discuss how physical changes has affected students on how they perceive themselves.

<p>Using a poster /picture/ slide presentation students can be shown diagrams of male and female reproductive system. Biological terms such as girls- ovary/ies, fallopian tube, uterus, cervix and vagina; boys- testes, penis, seminiferous glands (including prostate gland) can be included. Teacher can explain the function of the above mentioned structures.</p>	<p>Name the various structures of a male and female reproductive system and relate each structure with its function.</p>
<p>The teacher elicits from the students the site of production of gametes: In female eggs are produced in ovaries while in males sperms are produced in testis.</p>	<p>Identify the organs of production of eggs and sperms</p>
<p><i>Other possible activities:</i></p> <p>Drawing/filling in of parts of both human male/female reproductive system.</p> <p>True or false - group activity with some statements being correct and others incorrect.</p>	

Module 2: Exploring reproductive sex cells and conception

Timeframe: 4 weeks (4 lessons)

Teaching Objectives:

1. To provide students with a basic understanding of gametes their structure, size, function and how many are produced per day/cycle.
2. To familiarise students with the process of fertilisation.
3. To provide understanding on the fact that the fertilised egg carries traits from both gametes.

Suggested Activities:

Learning Outcomes for students

Starter suggestion

Students explore their impressions on what is a sperm and egg; a discussion on the size of the gametes and which has the ability for movement.

Work collaboratively as a group.

Main activity

Teacher introduces students to drawings of sperm and egg. The following characteristics: cell size, sperm tail, large nucleus in both gametes when produced, and life span of gametes could be discussed with students.

Recognise the shape of egg and sperm sex cells.

Teacher can explain the menstrual cycle and describe briefly menstruation and the fertile period of a female. Students explore the fact that sexual intercourse during the fertile period may result in fertilisation and conception.

Distinguish that males produce sperm continuously while female produce usually one egg per menstrual cycle.

Understand that when a female produces an egg she is fertile for a few days.

The teacher may show an animation of the process of fertilisation.

<http://www.mydr.com.au/babies-pregnancy/animation-fertilisation-of-egg-by-sperm>

<http://www.bbc.co.uk/learningzone/clips/human-fertilisation/12227.html>

Comprehend that when eggs and sperms meet, a process called fertilisation, a new being is formed.

<p>Students can explore that within the nucleus of the gametes are threads called chromosomes which contain codes called genes. The gametes carry half the number of chromosomes found in any other cell of the body.</p> <p>http://anthro.palomar.edu/biobasis/images/meiosis.gif</p>	<p>Relate that eggs and sperms carry traits to the offspring.</p>
<p><i>Other possible activities</i></p> <p>Show a video on the menstrual cycle:</p> <p>http://www.bbc.co.uk/learningzone/clips/the-female-menstrual-cycle/1847.html</p>	

<p>Module 3: Exploring inherited traits</p> <p>Timeframe: 4 weeks (4 lessons)</p> <p>Teaching Objectives:</p> <p>1. To provide students with a basic understanding of inheritance.</p>	
<p>Suggested Activities:</p>	<p>Learning Outcomes for students</p>
<p><i>Starter suggestion</i></p> <p>Teacher can identify several inherited traits and ask students which of them have these traits.</p> <p>http://www.sln.org/guide/knox/Traits/traitsexamples.pdf</p> <p>http://learn.genetics.utah.edu/content/begin/traits/activities/pdfs/inherited%20human%20traits%20quick%20reference_public.pdf</p>	<p>Work collaboratively as a group.</p>
<p><i>Main activity</i></p> <p>Students engage in an activity on inherited traits by ticking a sheet showing which inherited traits that they have. Students can link these traits with their biological parents and/or grandparents. Below are two different work sheets that may be modified for students.</p> <p>http://web.archive.org/web/20070116174426/http://www.dmns.org/NR/rdonlyres/BEBD062C-06CD-400E-86B6-5B9C99C67655/0/InheritedTraitsInventory.pdf</p> <p>http://www2.gsu.edu/~mstnrhx/worksheet.htm</p>	<p>Understand that physical traits have a genetic component.</p> <p>All organisms are a result of the codes found in chromosomes.</p>
<p>The teacher explains that a gene is the code for a specific trait. All organisms are a result of the codes found in the chromosomes. A gene has 2 codes which may be either dominant or recessive.</p>	<p>Comprehend that genes are passed on in sex cells.</p>

<p>Teachers can explain the difference between dominant and recessive characteristics. Several examples showing simple gene characteristics can be given. Terms of pure organism and hybrid organism can be included in the explanation.</p>	<p>Identify that some traits are dominant while other are recessive.</p>
<p>Making paper pets – an activity by which students can explore dominant and recessive crosses.</p> <p>http://www.biologycorner.com/worksheets/paperpets.html#.UudpMNJwa1s</p>	
<p>Explanation of co-dominance. Different examples (through photographs and pictures) of animals or plants showing co-dominance can be given to students such as roan cows/bulls; roan horses and turtle doves. A brief explanation of blood groups and that one group AB is an example of co-dominance. Students can take photographs of co-dominant characteristics in animals and plants e.g. calico cats.</p>	<p>Recognise that certain organisms have co-dominant characteristics.</p>
<p><i>Other possible activities:</i></p> <p>Watching a video http://www.youtube.com/watch?v=ubq4eu_TDFc&list=PLF9969C74FAAD2BF9</p> <p>Design a species http://biologycorner.com/worksheets/genetics_project.html#.UudoqtJwa1s</p> <p>Soap opera genetics - Story (or the gist of it) can be translated into Maltese and read to students. Students can then discuss the genetics of the story. http://serendip.brynmawr.edu/exchange/bioactivities/SoapOperaGenetics</p>	

STRAND 2 – The Living World		AREA – Physical Health
Knowledge	Skills	Competences
Students are able to: <ul style="list-style-type: none"> recall that a balanced diet is the key to good physical health; recall ways of increasing the body’s resistance to disease and minimising the bad effects.¹ 	Students are able to: <ul style="list-style-type: none"> describe regular exercise as essential for the prevention of obesity and good health; prevent disease by following guidelines on hygiene, sanitation and suppression of harmful organisms and inoculations.¹ 	Students are able to: <ul style="list-style-type: none"> recognise that drugs, alcohol and smoking have an adverse effect on the overall well-being of the individual; demonstrate social awareness and commitment in the prevention of the transmission and spread of disease.¹
Key Words	Points to note	Resources
Carbohydrates (simple and complex sugars), fats, protein, mineral ions, vitamins, water, fibre, balanced diet, healthy lifestyle, exercise, heart beat rate, respiratory rate, smoking, alcohol, drug abuse, diseases, cancer, hygiene, sanitation, vaccines	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p>Materials:</p> <ul style="list-style-type: none"> Food mobile (link in module 1 description) Flash cards with food category and importance

¹ Kindly note that these learning outcomes are taken from the area of Health and Safety that forms part of the strand “The World of Technology”. This has been included on the request of the D&T department.

<p>Module 1: A Balanced Diet</p> <p>Timeframe: 6 weeks (6 lessons)</p> <p>Teaching Objectives:</p> <ol style="list-style-type: none"> 1. Reinforce food categories and their importance. 2. Promote a basic understanding of a balanced diet. 3. Encourage the understanding of a healthy eating. 4. Encourage hygiene and sanitation in preparation of food. 	
<p>Suggested Activities:</p>	<p>Learning Outcomes for students</p>
<p><i>Starter suggestion</i></p> <p>Remote preparation - Students can engage in an activity to find pictures or take photographs of what they usually eat during a normal day and make a day diary including breakfast, snacks, lunch and dinner (main meal). Students can present this picture/photo diary to the class and discuss with the class if what they eat each day constitutes a balanced diet.</p> <p>Students engage in a discussion on being healthy. The teacher can write on the board “A healthy person is one”. Students can brainstorm and then discuss their comments.</p>	<p>Work collaboratively in a group.</p> <p>Identify food and food types they eat each day.</p>
<p><i>Main activity</i></p> <p>Students can explore different food categories and how these affect the human body. The teacher can hand out several pictures/photos of several different foods. Students in groups can be asked to identify the foods and to put them into the five different food categories being fruit and vegetables; milk and its products; meat and fish; food high in simple sugars and fat; bread, pasta and cereals.</p>	<p>Recognise what a healthy eating diet should be.</p>
<p>The students can then create a food mobile as in below link:</p> <p>http://www.familylearning.org.uk/images/fgmobile.pdf</p>	
<p>The teacher can hand out flash cards with a brief function of each of the five groups of food</p>	<p>Comprehend that a balanced diet consists of specific</p>

mentioned above. Flash cards can be made as attractive as possible. The students can combine the importance of the food group to the food category such as the following:

Food Category	Importance
Fruit and vegetables	Provide vitamins and fibre
Milk and its Products	Provides protein and minerals ions for strong bones and teeth
Meat and fish	Provides protein and help in the building up of body
Food high in simple sugars and fats	Supplies body with too much energy and causes obesity
Bread, pasta and cereals	Contain complex carbohydrates and provides the body with energy .

(Words in bold are terms easily identified and to be recognised by students)

Students can explore via a discussion on the amount of food (servings) from each category they need to eat each day to have a healthy balanced diet.

Students should be made aware of the link of large meals with obesity. Importance should be given on the excess intake of simple sugars and fats. Students can be made aware of the high fat/sugar content in junk foods and processed snack (e.g. crisps).

Students can ultimately construct a food pyramid of a balanced diet. The following link shows a simple food pyramid that can be constructed:

http://playtimerecipe.com/wp-content/uploads/2012/04/food_pyramid_for_kids_playtime_Recipe.jpg

Students can explore the importance of water as an agent for dissolving food, helps in keeping the body temperature constant and maintain the balance of body fluids in a balanced diet.

servings of different food components.

Realise that water is an essential component of a healthy

<p>Students can appreciate the fact that drinking water is much healthier than drinking sugar-loaded drinks (soft drinks).</p>	<p>diet.</p>
<p>The students can extend their knowledge on healthy lifestyle by planning a healthy meal for themselves and their family.</p> <p>http://www.teachingideas.co.uk/more/pshe/contents_healthy_lifestyle.htm</p>	<p>Plan a healthy eating diet for themselves.</p>
<p>Students can explain hygienic conditions in the preparation of food and day to day activities such as washing of hands; using different bowls for different foods and different boards for cutting different foods; not sneezing, coughing on food etc, refrigeration; cooking food properly; using latex gloves and coloured plasters to stop blood seepage into foodstuffs.</p> <p>Preparation of charts or other visual material by students. In assembly students can explain the importance of hygiene in food preparation.</p>	<p>Comprehend the importance of hygiene and sanitation in the prevention of disease.</p>
<p>The role of inoculation in the suppression of pathogens entering the body. Teacher can ask students to bring their inoculation cards to school. In group work students realise that in most cases they all have been given the same inoculations. The teacher can then explain the importance of vaccinations. The following website is a good resource site.</p> <p>http://www.mybestshot.org/tools-for-teachers/</p> <p>Students can also debate the necessity of vaccination.</p>	<p>Understand the role and importance of vaccination.</p>
<p><i>Other possible activities:</i></p> <p>Creating a balanced plate activity.</p> <p>http://www.food.gov.uk/multimedia/flash/a_balanced_plate_intro.swf</p> <p>Showing students a power point presentation on a balanced diet</p> <p>http://www.familylearning.org.uk/balanced_diet.html</p> <p>An activity where the students have to choose between a healthy diet plate and a less healthy diet plate.</p> <p>http://www.curriculumbits.com/prodimages/details/biology/a-balanced-diet.html</p>	

Module 2: Exercise and physical health

Timeframe: 3 weeks (3 lessons)

Teaching Objectives:

1. Encourage students to comprehend that an exercise regime is important for a healthy person.
2. Identify changes in breathing and heart beat rate.
3. Link aerobic exercise with an increase in metabolism and an increase in nutrients uptake by the cells of the body.

Suggested Activities:

Learning Outcomes for students

Starter suggestion

Breathing rate investigation - The teacher takes students to school ground and asks them to describe their breathing. Students read their breathing rate by counting the number of inhalations. Then s/he gets them to do some physical exercise (e.g. running on the spot or around the school ground track). On completion of the activity the teacher asks the students to describe the change in their breathing and to explain any further physical changes that they may feel e.g. feeling hot; feeling sweaty; increase in heart beat, dizzy etc. Results may be included in the form of a table.

Work collaboratively in a group.

Identify physical changes such as changes in respiratory rate/ heart beat rate and changes in body temperature brought about by exercise.

Main activity

In class, the teacher lists these changes on the board and discusses them with the students. Changes in breathing and breathing rate – Breaths are larger and the breathing rate increases. Feeling hot/sweating- The muscles of the body which make an individual move work hard during exercise and this heats up the body. Changes in heart beat rate- More blood is pumped to the muscles of the body during exercise. The teacher can explain that for the muscles to work hard they need carbohydrates from food and oxygen from air. When a person exercises, the muscles uses up energy, produced when simple carbohydrates react with oxygen.

Understand the benefits of physical exercise on health.

<p>Students can then brain storm on the beneficial effects of exercising including</p> <ul style="list-style-type: none"> • Reducing/preventing obesity by use of body fat and excess sugars • Decreasing heart disease and strokes as more blood flows through body and decrease bad fat (cholesterol) which deposits in arteries • Prevents/control diabetes • Controls high blood pressure <p>The students can be given a worksheet in which they can include exercises they do throughout the week.</p> <p>http://homeschooling.about.com/od/recforms/ss/homeschoolforms_2.htm</p>	
<p>Students can use the following simple movements as part of one’s daily routine:</p> <ul style="list-style-type: none"> • Climb stairs instead of using lifts or escalators. • Ride a bike or walk whenever you can. You only need to plan your day a little better and you will save money and the environment. • Walking the dog is a good way of improving your fitness, and your dog will love it too. • At lunchtime, go for a walk with a friend instead of sitting down talking - you can talk while you walk. • Have a game of soccer, footy, cricket or basketball (or any other game) during your lunch break. • Play school sports, even if you don't think you are very good at sports. You can learn as you go, and it can be a lot of fun even if you are not in the elite sports group. • Throw a ball to each other - this improves coordination and can be fun. • Go dancing with friends. • Look for activities around your neighbourhood. Are there tennis courts, a beach, playground, a skateboard ramp, cycling trails or any open area where you can practise skills alone or play games with friends? • Cook healthy meals at home - you will save money on food and learn new recipes. • Make use of whatever is around you to fit physical activity into everyday life. You 	<p>Recognise ways of improving one’s lifestyle by finding simple movements.</p> <p>Acknowledge that exercise has to be regular to cause a better healthy lifestyle.</p>

don't need expensive gym equipment to help you exercise.

Students can adopt the following motto:

Any movement is an improvement!

And try to encourage other students of their form/school to change their lifestyles by altering their diet and exercise programme.

Module 3: Agents of adverse effects on physical health

Timeframe: 5 weeks (5 lessons)

Teaching Objectives:

1. Identify and explain the agents of adverse effects on physical health.
2. Recognise that ill –health may be the result of specific pathogens and infectious diseases may be prevented.
3. Identify the importance of hygiene, sanitation and inoculations in infectious disease prevention and control .
4. Elicit effects/problems/harm caused by smoking, alcohol and drug abuse.
5. Preparation and use of survey on the use of agents of adverse effects on physical health.

Suggested Activities:

Learning Outcomes for students

Starter suggestion

Teacher can start this module by asking students who smoke or drink alcohol. A simple survey on students who smoke or drink alcohol can be explored in school. (This survey can be presented during assembly at the end of the module.)

Identify the agents of adverse effects on physical health.
Work collaboratively in a group.

Main activity

The teacher can explain agents of ill health including microbes and the spread of infectious disease. Elicit from students ways to prevent disease.

The teacher can remind students on the 5 in 1 vaccination. (last booster shot given in form 4/5) Relate the importance of these shots to prevent the epidemics of harmful/fatal diseases. The teacher may mention that small pox vaccination is no longer given as the disease has been eradicated.

Work collaboratively in a group.
Identify that microbes cause ill-health and people can be infected by the spreading of microbes.

The teacher can prepare a demonstration on cigarette smoke. (Ideally the teacher can demonstrate this activity using a fume cupboard. If a fume cupboard is not available, this should be done in regions of the school where there are no smoke alarms. Also the school

<p>administration should be informed of this investigation.) The link describes the investigation - http://www.nuffieldfoundation.org/practical-biology/going-smoke.</p>	
<p>Teacher can show students a series of photographs of harmful effects of smoking such as the one in the link</p> <p>http://www.csmngt.com/smokers%20lung.jpg.</p> <p>The teacher can ask students to comment on the appearance of the lung and relate the former investigation with the photograph.</p> <p>A list of the effects of smoking including difficulty in breathing, heart disease and lung cancer can be compiled by the teacher and student.</p>	<p>Explain several effects/problems/harm caused by smoking.</p>
<p>The teacher and students can compile a simple survey on smoking and/or alcohol abuse. The following questions can be inserted:</p> <p>Age of student; Gender; Do you smoke? ; If yes, how many cigarettes do you smoke every day? ; What made you start smoking? – A list can be given such as peer pressure; seeing parents/siblings smoke; feeling stressed etc.</p> <p>Such type of questions can be compiled on alcohol abuse. Ideally students should be involved in the building of the survey questions.</p>	<p>Prepare a simple survey.</p> <p>Explain results of survey on effects on physical health.</p>
<p>The teacher can then involve students in the effects of alcohol and drugs. Students can distinguish between legal and illegal drugs and recognise that in the case of prescribed drugs, deviating from prescription may also cause harm to the human body. Students can describe the effects both short-term and long term of alcohol abuse and use of drugs from what they see around them at recreational areas.</p>	<p>Explain several effects/problems/harm caused by alcohol and drug abuse.</p>

<p>A list of problems caused by alcohol abuse which may be elicited from students:</p> <ul style="list-style-type: none"> • drinking leading to arguments and fights • being drunk or hung-over • problems at work like being late, not turning up for work, and causing accidents at work because of being drunk or hung-over • being in road accidents because of being drunk or hung-over • money worries because of the amount spent on alcohol • being arrested for drink-driving, having drink-driving fines to pay, loss of driver's licence, and going to jail • health problems - alcohol can be pretty rough on the body • becoming dependent on alcohol (sometimes called alcoholism) • drinking more and more alcohol to feel the effects. • drinking making it harder to resist smoking <p>At the end of the module the students can prepare a brief presentation during assembly using the information they gathered during the survey and by using charts they prepared on the consequences of these agents which cause harm to human body.</p>	
<p><i>Other possible activities:</i></p> <p>A video on the effect of smoking such as http://www.youtube.com/watch?v=TqqApcqKcY0 can show the diverse effects of smoking on the human body.</p>	
<p><i>Site visits related to the theme</i></p> <p>National Blood Transfusion Centre</p>	

STRAND 3 – The World of Technology		AREA – Efficiency and Cost-Effectiveness
Knowledge	Skills	Competences
Students are able to: <ul style="list-style-type: none"> Recall general scientific and technological facts they need to improve their personal quality of life at home, at work and during leisure activities 	Students are able to: <ul style="list-style-type: none"> Receive and understand basic scientific and technical information and instructions presented orally, in print, pictorially and in simple electronic formats 	Students are able to: <ul style="list-style-type: none"> Use basic equipment and common means of print and electronic communication confidently and prudently Demonstrate social awareness and commitment in the prevention of the transmission and spread of disease
Keywords	Points to note	Resources
research, specifications, ideas, development, planning, making, testing, evaluating linear motion, reciprocating motion, rotating motion, oscillating motion; wheel & axle, crank, gear, lever, linkage, pulley, chain and sprocket, d.c. motor, relay switch	In this concluding year of the CCP Science and Technology Programme, so D&T projects can include material covered in the previous two years. It is suggested that Form 5 projects are linked to future employment interests of the students so that they can appreciate the relevance of technology within the industrial and entrepreneurial world. Students can therefore find their own problem to solve, however keeping within the context of the teaching objectives which have to be covered. Some examples of possible situation related to the world of work are given in this section. It is suggested that two substantive projects are completed this year, along with other ongoing minor tasks. More emphasis should be put on the design process, so that by the end of the course, students acquire the basic skills needed to follow and put into practice such a process. If more than one substantive project is covered, one project should be completed by January and the other till the end of scholastic year. This would allow students who opt to move on to ALP courses, to complete at least one project while others to have additional opportunities in exploring Science and D&T in a final, group based project. Health and safety issues remain highly important throughout all lessons, especially competences related to social awareness and commitment which should be covered this year.	Materials, tools and equipment needed to complete the focus tasks and project work Access to the internet, school/public library Digital photo camera, printer, scanner Mechanical systems construction kits Electronic systems assembly kits Circuit simulation software

TECHNOLOGY PROJECTS

(First) Individual project (September- January)	
Teaching Objectives	Learning Outcomes
<ul style="list-style-type: none"> • Teacher will provide opportunities for students to learn: • how to follow a design process to solve a problem; • how to obtain information from different sources; • about the purposes of a specification list; • about the different types of motions; • about forces and motions that are acting in different types of mechanical systems; • how to build a simple machine; • about the application of electro-magnetism in simple electronic systems; • about the procedures to be followed in case of burns, scalds and cuts. 	<p>Students will be able to:</p> <ul style="list-style-type: none"> • recognise that a problem can be solved through a process, and with guidance follow such a process; • search for and understand information from printed and electronic material; • appreciate the purpose of a specification list; • distinguish between linear, reciprocating, rotating , and oscillating motion as applied to different mechanisms; • build at least one of the following mechanical systems: wheels and axles, cranks as an inputs, spur gears, levers and linkages, pulleys and belts, sprockets and chains; • use electromagnetic components such as d.c. motors and relay switches in an simple electronic circuit; • follow standard procedures in case of burns, scalds and cuts.
Final Group Projects- extended content (Feb- May)	
<p>Teacher will provide opportunities for students to learn:</p> <ul style="list-style-type: none"> • how to collaborate, share ideas and have common goals; • how to be responsible for shared commitment, group achievement and public exposure; • how branding can aid entrepreneurial success. 	<p>Students will be able to:</p> <ul style="list-style-type: none"> • discuss ideas and contribute towards a team common goal; • being responsible and play an active role in the industry and community; • formulate brand names, group identity and create visual or commercial impact.

Possible Situations & related Design Briefs:

SITUATION	DESIGN BRIEF
Your school laboratories are currently equipped with bottles of soap to be used before and after practical work. These bottles sometimes end up misplaced, thus creating disorder when they need to be used.	Design and make fixed soap dispenser to be placed near the wash-hand basins of the school laboratories.
Patients and healthcare workers in hospitals need beds which are specially designed for the requirements of such institutions. One requirement of such beds is that of adjustable height.	Design and make a model of a mechanical system which helps patients and healthcare workers adjust the height of a hospital bed.
Your younger sibling just started to make the first steps and explore his/her surroundings. A new toy which increases the awareness of movement would encourage further exploration.	Design and make a push/pull along toy with in-built movement for your younger sibling who has just started to walk.
Food safety and hygiene standards should be taken care of even in domestic kitchens. Hence, waste bins should be kept covered and should not be touched by hands while handling food.	Design and make pedal-operated bin for a domestic kitchen.
A friend of yours has a retail shop and would like to embellish the shop window with a moving display of a particular item being sold inside. You were asked to create such a display.	Design and make a moving display to hold one particular item in the window of retail shop.

Suggested Final group based projects	
A Design and Technology Fair being organised yearly has invited a group of CCP students to produce a large group installation that will be showcased during this event. This installation needs to represent aspects from Science and D&T on a large scale, be interactive and include an educational aspect.	Design and make a large format (consider maximum lab door width) Science related stand or installation to convey the message that Science and D&T can be fun for everyone. It needs to be attractive to families with young children visiting the fair.
Many new food-stalls have been set up for outdoor retailing like coffee-on-wheels, fruit shaped 'Granita' stalls, etc. Set up a small business for outdoor retail based on Natural or Physical Science related products, e.g.: novelty products, healthy food items (packed), jars, gems, etc.	Design and make: the product range being proposed; your group's company branding; a half size model of the mobile stall; related marketing material, along with representative products being sold. This stall needs to be towed with a bicycle, be visible at night and protect products from typical, local weather conditions.
Continuation of a group combination of their first project into a wider context and refined product quality. ²	Design and make an improved new prototype of the best ideas from your group within the first project undertaken, showing product development and focused market relevance.
<i>It is recommended that Final group projects are kept as school exhibits and given some school/public exposure. Each student keeps own folio.</i>	

² group projects expanding on the same situation of the first individual project.

Suggested Activities

1. Students are given a small mechanical object, such as a paper stapler, hairdryer, scanner, etc. which they can disassemble. They are to highlight the moving parts, and suggest from where the objects is obtaining the energy to work and what is the ultimate output. The teacher can remind students about the concept of systems which was covered in Form 4 so that students use block diagrams to explain how each object mechanically works. Teacher will explain that mechanical parts can make changes on both forces and motions inside a machine. Teacher can use animations to explain particular mechanisms and also refer to content found in the “Physical World” section of this programme.

<http://www.robives.com/mechs>

<http://www.mekanizmalar.com/>

<http://507movements.com/>

2. Students are to build models of mechanical systems out of cardboard and analyse each one of them to understand the change in forces and motion occurring in each mechanism. They can also build mechanical systems using available kits.

http://www.exploratorium.edu/pie/downloads/Cardboard_Automata.pdf

<http://www.ss42.com/pt-animated.html>

They are to mimic the motions which the moving parts are making, so that the teacher can introduce the terms linear, reciprocating, rotating and oscillating motion. They are to highlight the type of motion present at the input and output of each of the following mechanism: wheels and axles, cranks as an inputs, spur gears, levers and linkages, pulleys and belts, sprockets and chains.

Students are shown pictures of larger everyday objects which contain mechanical parts such as bicycles, skateboards, lifts, cranes, etc. and mention the different types of motion and mechanical systems present in such machines.

Students can also visit a production line in a factory, the loading/unloading of shipments in a port or an old windmill so as to appreciate the intricacies of having several different mechanical systems working in synchronization and/or automation.

3. Teacher will show how electromagnetism can generate movement by using copper coil, a permanent magnet and wire. Students can also build their own d.c. motor using the same materials.

<https://www.youtube.com/watch?v=J9b0J29OzAU>

<http://babbledabbledo.com/steam-project-tiny-dancers-homopolar-motor/>

<https://www.youtube.com/watch?v=DsZCW34LktU>

Teacher shall quickly remind students about the basics of electronics systems covered in Form 4. Students will build a simple circuit which has a low-voltage d.c. motor as its output. They will experiment to find a way how to make the motor turn in an opposite direction.

Students will be introduced to circuit simulation software to simulate circuits which make d.c. motors turn in forward and reverse: namely an H-bridge circuit with four SPST switches and another circuit with a DPDT switch controlling the direction of the motor. Students will also model these circuits on a breadboard.

4. Students are to build their own relay switch to as to understand how it works and why it is used.

<http://www.nuffieldfoundation.org/practical-physics/making-your-own-relay>

Then they are introduced to the standard relay switches used in electronic circuits and their graphical symbols. Teacher will highlight the terms common (C), normally-open (NO) and normally-closed (NC).

<http://electronicsclub.info/relays.htm>

Students will simulate and model two simple circuits which interface with each other by means of a SPDT relay switch.

Research

5. Students will analyse a particular simple machine, if possible related to the chosen design brief. They will identify what happens at the different stages of the mechanical system, i.e.: the input, process and output stages and report them in block-diagram form. Students will also name the type of motion present at each stage.

** In case of further development during final group project, they are expected to analyse their first individual projects in detail.

6. Students will analyse the context of the chosen design brief. Where possible, students should visit the physical area concerned by the given situation. They can draw a web-diagram to explore the possible answers for the following questions:

What does the product have to do?

Who shall use the product?

Where shall it be situated?

How will it work?

Why is there the need for such a product?

Students can also investigate further by posing questions to the interested parties involved in the design situation.

7. With the guidance of the teacher, students will collate research results and discuss together in class the possible design criteria needed to in order to guide their selection of the most suitable solution. Students should come up with the basic design specifications, such as size and material requirements, health and safety issues and functionality. The teacher can encourage further discussion by referring to the product analysis performed earlier.

http://www.technologystudent.com/despro_flsh/specific1.html

Ideas & Development

8. Students will draw annotated sketches of the possible design solutions to the given problem. They have to draw conceptual sketches of both the mechanical parts and structure. The teacher can remind students about the product analysis they had completed earlier. Students can start sketching by slightly modifying the design of that particular product.
http://www.technologystudent.com/despro_flsh/desidea1.html
9. Students will refer back to the specifications to choose the most suitable idea for further development. Students will draw block diagrams for the chosen system to explain further how it will work. They will point out which electrical/mechanical components are needed to fulfil the functions at the input, process and output stages. In case of electronic systems, the students will then draw a schematic diagram of the circuit using symbols. Students will also make other drawings to explain how parts will be fixed and joined together.

http://www.technologystudent.com/despro_flsh/devell.html

When possible, students are to produce a simple working drawing showing at least the main parts of their product.

**If the project is being refined as a second, final group project, any improved features need to be highlighted.

Planning & Making

10. Students will suggest ways how to produce their designs. With the guidance of the teacher, they will draw an info-graphic (e.g. flowchart) to explain the main steps involved in the making of their artefact. They will also highlight the tools/equipment needed at each stage, suggesting any safety precautions which they should follow.
11. Students will follow the work plan and safety precautions to produce their artefact.

Testing & Evaluation

12. Students will test their artefact for functionality and report results. They will also give the product to a possible user for testing. Students will collect user's feedback through a short interview.
13. Students will verbally evaluate results of both tests and suggest any possible modifications. They will also evaluate their personal design work and practical work.

14. ****In case of continuation of this project into a refined Final group project students need to start their new project by highlighting strengths and weaknesses of individual peer projects and derive new specifications to address the developments required. The whole design process is started again as a group with relative low guidance. Technical guidance will however be essential.**

***exclusive for students choosing to use their first projects to develop a new, improved group project as their Final group project in the second part of the form 5 course.*

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 CM 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 & Completeness 10 All components of the portfolio are included in a neat, well organized fashion with a table of 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 of 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:

- | | |
|---|---|
| <input type="checkbox"/> make observations | <input type="checkbox"/> support ideas with evidence or reasons |
| <input type="checkbox"/> take measurements | <input type="checkbox"/> evaluate products and processes |
| <input type="checkbox"/> make predictions | <input type="checkbox"/> organize related ideas |
| <input type="checkbox"/> collaborate with team mates | <input type="checkbox"/> describe observations in writing |
| <input type="checkbox"/> describe observations verbally | <input type="checkbox"/> participate in discussion |
| <input type="checkbox"/> other: _____ | |

In this task:

My strengths include:

I can improve:

Student Signature: _____