Teacher's Manual

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1. Curriculum aims and teaching objectives

The Curriculum Development Council announced the 'Technology Education Key Learning Area Curriculum Guide (Primary 1 - Secondary 3)' in 2002 and mentioned about the curriculum framework. It elaborated the learning elements within the knowledge contexts at different learning stages of S1 to S3 students.

The knowledge contexts of technology education are as follows:

- Information and communication technology
- Materials and structures
- Operations and manufacturing
- Strategies and management
- Systems and control
- Technology and living

Key competencies:

TE aims at preparing students to be valuable human capital amidst the rapidly emerging technologies. It enables students to:

- develop technological capability, understanding and awareness
- critically appraise the impacts of technology on the individual, family, society and environment
- become competent and confident members of the world of technology and the society at large

The TE curriculum is designed to match students' interests and intellectual development at different key stages:

- Key Stages 1 and 2: Awareness and Exploration
- Key Stage 3: Exploration, Experiencing and Familiarisation
- Key Stage 4 and beyond: Exploring Orientation for Life-long Learning and Specialisation

The learning and teaching of TE is:

- purposeful
- progressive and iterative in nature
- involving the coordination of the mind (problem-solving) and hands (hands-on experiences)

This **enriched TEKLA curriculum** is based on and responds to the curriculum guidelines, and enriches the original curriculum framework of Secondary 1 to 3. It covers three knowledge contexts:

KNOWLEDGE CONTEXT 1

MATERIALS AND STRUCTURES

Learning elements of core modules:

(K3) Materials and resources

(K4) Structures and mechanisms

Learning elements of extended modules:

(E2) Material processing

KNOWLEDGE CONTEXT 2

OPERATIONS AND MANUFACTURING

Learning elements of core modules:

(K5) Tools and equipment

(K6) Production process

Learning elements of extended modules:

(E3) Project management

KNOWLEDGE CONTEXT 3

SYSTEMS AND CONTROL

Learning elements of core modules:

(K8) Concepts of System

(K9) Application of Systems

Learning elements of extended modules:

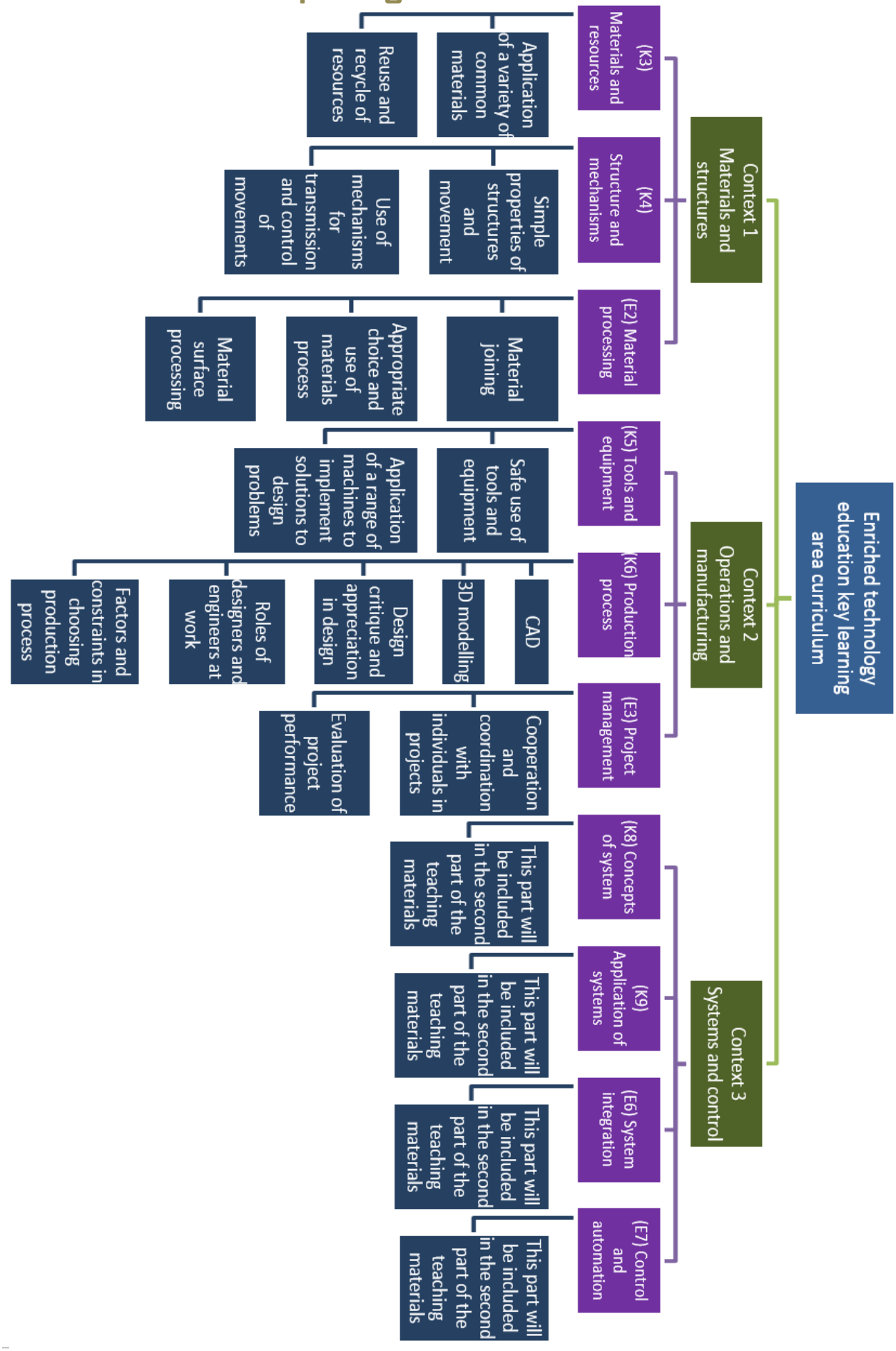
(E6) System integration

(E7) Control and automation

The curriculum adopts the progressive manner and iteratively reinforces students' basic knowledge and skills throughout the curriculum of the three years. In addition to providing related knowledge, exercises and activities are also supplemented. Through project activities, students can coordinate their minds (problem-solving) and hands (hands-on experiences) to achieve excellent learning and teaching results.

II

II. Curriculum concept diagram



III. Recommended teaching time allocation

Core modules (Combination A)					
Module	**Title**	**Learning elements**	**Lessons**	**Teaching Material**	**Remarks**
K3–S3	Materials and resources	• Application of a variety of common materials • Reuse and recycle of resources, and sustainable development	3	Material 1A (Note 1)	Relevant knowledge 1 lesson Exercise 2 lessons Case study
K4–S3	Structures and mechanism	• Simple properties of structures and movement • Use of mechanisms for transmission and control of movements	5	Material 2	Relevant knowledge 2 lessons Exercise 1 lesson Project activity 2 lessons
K5–S3	Tools and equipment	• Safe use of tools and equipment • Application of a range of machines to implement solutions to design problems	8	Material 1B	Relevant knowledge 2 lessons Project activity 6 lessons
K6–S3a	Production process	• CAD • 3D modelling by CAD • Enhancing design effects • Design critiques and evaluation	18	Material 3	Relevant knowledge 5 lessons Exercise 1 lesson CAD Exercise 12 lessons
		(subtotal)	(34)		
Core modules (Combination B)					
Module	**Title**	**Learning elements**	**Lessons**	**Teaching Material**	**Remarks**
E2–S3	Material processing	• Material joining • Equipment used in manufacturing processes • Material surface treatment	13	Material 4A	Relevant knowledge 4 lessons Lesson activity 2 lessons Case study 7 lessons
K6–S3b	Production process	• Product standards • Design evaluation • Intellectual property • Roles of designers and engineers at work • Design presentation • Production process in various fields	25	Material 4B	Relevant knowledge 3 lessons Exercise 5 lessons Project activity 12 lessons Case study 5 lessons
E3–S3	Project management	• Cooperation and coordination with individuals in projects	8	Material 5 (Note 2)	Relevant knowledge 3 lessons Project activity 5 lessons
		(subtotal)	(46)		
		Total	**80**		

Teaching material: Including relevant knowledge (notes), exercises, lesson activities, guidelines for project activities, etc.

Remarks: The proposed teaching plan assumes that there are 33 weeks in the academic year and each lesson lasts for 40 minutes.

If the school arranges an average of 2 lessons per week, the teacher can choose core modules Combination A plus Combination B.

Note 1: No lessons are assigned to the case study of Material 1A. The teacher can conduct it after school or during lessons of other units according to the students' ability and progress.

Note 2: If the teacher intends to let students try to assign the different project roles among themselves for the project activity 'Fitness Park' of Materials 4B and 5, the suggested teaching sequence is Material 5 followed by Material 4B.

IV. The enriched TEKLA curriculum – Learning elements

Knowledge context (1) – Materials and structures

Core modules:

Learning elements	Contents
(K3) Materials and resources	Appropriate application of resources for design work • Application of a variety of common materials, such as wood, metal, plastic & fabric, to design and make simple products Reuse and recycle of resources • Awareness of the use and disposal of materials may affect the natural environment • Understanding of the importance of reusing and recycling resources for the sustainable development of our society • Identification of materials that can or cannot be recycled. Provide evidence that recycling rules and laws reflect them
(K4) Structures and Mechanisms	Simple properties of structures and movement • General concepts of input energy, controlled motion, friction and output work done Use of mechanisms for transmission and control of movements • Application of the common mechanical components to convert and control motion, such as gears, screw mechanisms, lever and linkage, cam and follower, rack and pinion • Selection of an efficient and/or appropriate simple mechanism for a product or system involves movement

IV

Extended modules:

(E2) Material processing	Processing of materials – removal, forming, joining and finishing • Understanding of materials processing methods to implement design solutions, including: - Joining (permanent): soft and hard soldering, riveting, different types of adhesives - Joining (semi-permanent): fastening, knock-down fixtures • Common materials processing methods used in industrial production, e.g. injection moulding, blow moulding, pressing. • The idea of surface finishing, e.g. preparation, coating and polishing. • A range of coating methods, e.g. electroplating, painting, protective films, veneering, enamelling.

Knowledge context (2) – Operations and manufacturing

Core modules:

Learning elements	Contents
(K5) Tools and equipment	Safe use of tools and equipment • Introduction of measuring instruments such as multi-meter & data-capturing devices Appropriate choice and use of tools, equipment and machines for realisation of design solution Application of a range of machines to implement solutions to design problems Lathe Vacuum former • Laser cutter

IV

(K6) Production Process	<u>Basic elements of design</u> • Basic concepts of CAD and 3D modelling • Application of IT tools such as CAD software to present design ideas • Animating of design ideas in computer animation or video clips. • Design critiques and appreciation in design • Contemporary design movement. <u>Design consideration</u> • Ergonomic concerns and industrial standards in making appropriate solutions • Critical assessment on products and system design • Technological advancements that may be accompanied by negative side effects, in respect of legal issues • Value of intellectual property and possible ways of protection <u>Product design</u> • Roles of designers and engineers at work • Organisation of resources and processes for making simple products or models of proposed solutions. • Comparison of appropriate processes, instruments and materials to be used for the making processes. • Evaluation of the quality of production system, products or environments against various essential factors. • Product maintenance (e.g. techniques, parts replacement and disposal, maintainable design) • Safety measures, precautions and standards required for making the products. <u>Skills, procedures and resources for production process</u> • Know how to apply cost-benefit principles to technological processes • Selection of appropriate tools and equipment and apply proper skills to implement solutions to design problems • Selection and application of appropriate methods of material removal processes • Selection and application of appropriate methods of material forming processes • Selection and application of appropriate methods of joining materials or assembling components • Selection and application of appropriate surface-finishing methods for aesthetic purposes, to prevent corrosion and to prolong working life • Proper use of a range of appropriate machines to implement solutions to design problems

Extended modules:

(E3) Project Management	<u>Cooperation and coordination with individuals in projects: decision making, planning, organisation and evaluation procedures</u> • Roles and responsibilities of project leaders and team members. • The importance in managing groups and individuals in order to increase the effectiveness of the team. • Evaluation and control planned cost. • Monitoring of schedule implementation. • Evaluation of overall project performance.

Knowledge context (3) – Systems and control

Core modules:

Learning elements	Contents
(K8) Concepts of system	** *This part will be included in the second part of the teaching materials.*
(K9) Application of systems	** *This part will be included in the second part of the teaching materials.*

Extended modules:

(E6) System integration	** *This part will be included in the second part of the teaching materials.*
(E7) Control and automation	** *This part will be included in the second part of the teaching materials.*

V. Main contents of the teaching materials

Material 1A: Appropriate use of resources, and reuse and recycle of resources

Relevant knowledge	Learning activity / exercise	Case study
I Application of a variety of common materials 1. Categorisation 2. Properties 3. Choice of use II Reuse and recycle of resources and sustainable development 1. Reducing the impact of the use and disposal of materials on the natural environment 2. Appropriate exploitation of natural resources 3. Limited natural resources 4. Identification of materials that can or cannot be recycled 5. Common practices and laws on recycling	Class discussion After-school study	3G: Green Design, Green Technology and Green Enterprise

Material 1B: Tools and equipment

Relevant knowledge	Learning activity / exercise	Project activity
I Safe use of tools and equipment 1. Multimeters 2. Data-capturing devices II Application of a range of machines to implement solutions to design problems 1. Lathes 2. Vacuum formers 3. Laser cutters	Lesson activity After-school exercise	Solar-powered car

Material 2: Structures and mechanisms

Relevant knowledge	Learning activity / exercise	Project activity
I Simple properties of structures and movement 1. Energy sources on the Earth (a) Non-renewable energy (b) Renewable energy 2. Conversion of energy (a) Direct conversion (b) Indirect conversion 3. Choice and use of energy resources II Use of mechanisms for transmission and control of movements (a) Cam and follower (b) Ratchet and pawl (c) Rack and pinion (d) Worm and wheel (e) Bearing and lubricant	Class discussion Class Exercise After-school exercise	Solar-powered car

Material 3: Production process

Relevant knowledge	Learning activity / exercise	Project activity
Basic elements of design I CAD II 3D modelling by CAD (a) Wireframe Model (b) Surface Modelling (c) Solid Modelling • Primitives and features • Constructive solid geometry • Boolean operation • Solid modelling III Using computers to aid presenting design ideas 1. Enhancing design effects 2. Outputting animations IV Design critiques and evaluation 1. Requirements of product design 2. What is a good design	Class discussion After-school exercise	CAD exercise

Material 4A: Material processing

Relevant knowledge	Learning activity / exercise	Project activity
Removal, forming, joining and finishing I Material joining 1. Permanent joining (a) Soft soldering (b) Hard soldering (c) Electric arc welding (d) Gas welding (e) Riveting (f) Pop riveting (g) Seaming (h) Gluing 2. Semi-permanent joining (a) Screw thread joining (b) Knock-down fitting (c) Other fasteners II Equipment used in manufacturing processes III Material surface treatment 1. Surface smoothing 2. Surface coating (a) Electroplating (b) Dip coating (c) Painting (d) Plastic covering (e) Wax and protective films (f) Veneering (g) Enamelling 3. Surface polishing and buffing (a) Polishing (b) Buffing	Appendix 1: Injection moulding (School internal) Appendix 2: Casting (School internal) Appendix 3: Industrial injection moulding	Open day souvenirs

Material 4B: Production process

Relevant knowledge	Learning activity / Case study	Project activity
Design and production of products I Product standards 1. What are product standards? 2. Benefits brought by international standards to society 3. International and regional standards (a) ISO – International Organisation for Standardisation (b) GB – Chinese standards (c) CE – European standards (d) BS – British standards (e) Advantages and disadvantages of international and regional standards II Design evaluation 1. Design stages 2. Selection of design ideas 3. Evaluation of initial ideas III Intellectual property 1. Value of intellectual property and principles of protecting designs by laws (a) Copyright (b) Patent (c) Trademark (d) Registered design 2. Summary 3. Balance of intellectual property IV Roles of designers and engineers at work 1. What is a designer? 2. What is an engineer? 3. Similarities between a designer and an engineer 4. The line V Design presentation 1. Verbal description 2. Flowchart 3. Realistic illustration on paper or screen 4. Model 5. Virtual prototyping 6. Simulation 7. Rapid prototyping VI Production process in various fields	Case study 1: Toy design Case study 2: Evaluation matrix Case study 3: Product design protection Case study 4: Roles of a designer and an engineer Case study 5: K Series motorcycles Case study 6: Water taps Similar studies The technology behind game console	Fitness park

Material 5: Project management

Relevant knowledge	Case study	Project activity
Project management I Cooperation and coordination with individuals in projects 1. Roles of team members 2. Formation of teams 3. How to increase the effectiveness of a team 4. Main stages of a collaborative project 5. Objectives of a project 6. Project stakeholders 7. Evaluation and control of project costs 8. Implementation and monitoring of schedules 9. Evaluation of overall project performance	Case study 1: The eagle and the mole Case study 2: Interview about Hong Kong Design Industry	Design model of a fitness park

VI. Recommended teaching progress

Material 1A

Learning Units	Elements
(K3) Materials and resources	Relevant knowledge – Application of a variety of common materials Reuse and recycle of resources and sustainable development Case study – 3G: Green Design, Green Technology and Green Enterprise

1. OBJECTIVES

Students acquire a basic understanding about the properties of materials, choose the appropriate materials and understand the sustainable development of materials.

2. ON COMPLETION OF THE PROJECT ACTIVITY, STUDENTS SHOULD BE ABLE TO MASTER:

- choice of materials
- reuse and recycle of resources and sustainable development

3. RECOMMENDED TIME

1.5 weeks × 2 lessons = 3 lessons (120 minutes)

4. CONTENT OF ACTIVITIES

Weeks	Teaching Activities	Learning Activities	Assessments
1	Choice of materials	Class discussion	Understand and choose appropriate materials
	Reuse and recycle of resources and sustainable development	Class discussion	Understand the sustainable development of materials

No lessons are assigned to the case study of this unit. The teacher can conduct it after school or during lessons of other units according to the students' ability and progress.

Weeks	Teaching Activities	Learning Activities	Assessments
1-2	Case study – 3G	Study on Green Design, Green Technology and Green Enterprise	Complete the study report

VI

Material 1B

Learning Units	Elements
(K5) Tools and equipment	Relevant knowledge – Safe use of tools and equipment Application of a range of machines to implement solutions to design problems Project activity – Solar-powered car (production)

1. OBJECTIVES

Students acquire a basic understanding about tools and equipment, and use appropriate tools and equipment for production properly.

2. ON COMPLETION OF THE PROJECT ACTIVITY, STUDENTS SHOULD BE ABLE TO MASTER:

- safe use of tools and equipment
- selection, operation and maintenance of equipment

3. RECOMMENDED TIME

4 weeks × 2 lessons = 8 lessons (320 minutes)

4. CONTENT OF ACTIVITIES

Weeks	Teaching Activities	Learning Activities	Assessments
1	Safe use of tools and equipment	Use of relevant tools and equipment	Use the relevant tools and equipment safely to obtain correct readings
2	Application of a range of machines to implement solutions to design problems	Class Exercise	1. Collect information on solar-powered cars 2. Sketch freehand the exterior design of the solar-powered car to meet basic requirements
3		Production of the solar-powered car	1. Test the parts of the solar-powered car 2. Preliminary production of the solar-powered car
4		Production of the solar-powered car	Make the solar-powered car

VI

Material 2

Learning Units	Elements
(K4) Structures and mechanisms	Relevant knowledge – Simple properties of structures and movement Use of mechanisms for transmission and control of movements Project activity – Solar-powered car (design)

1. OBJECTIVES

Students acquire a basic understanding about structures and mechanisms, design the structures for various needs, and apply them in the transmission and control of movements.

2. ON COMPLETION OF THE PROJECT ACTIVITY, STUDENTS SHOULD BE ABLE TO MASTER:

- energy resources of the Earth
- conversion of energy
- use of mechanisms for transmission and control of movement

3. RECOMMENDED TIME

2.5 weeks × 2 lessons = 5 lessons (200 minutes)

4. CONTENT OF ACTIVITIES

Weeks	Teaching Activities	Learning Activities	Assessments
1	Energy resources of the Earth and their conversion	Class discussion and Exercise	Complete the exercise and meet the basic requirements
2	Use of mechanisms for transmission and control of movements	Class Exercise	1. Complete the exercise and meet the basic requirements 2. Design the solar-powered car
		Solar-powered car design	Design the solar-powered car

VI

Material 3

Learning Units	Elements
(K6) Production process	Relevant knowledge – CAD 3D modelling by CAD Enhancing design effects Design critiques and evaluation Project activity – CAD exercise

1. OBJECTIVES

Students acquire a basic understanding about CAD and apply it on 3D modelling.
Students acquire a basic understanding about design critiques and evaluation.

2. ON COMPLETION OF THE PROJECT ACTIVITY, STUDENTS SHOULD BE ABLE TO MASTER:

- 3D modelling by CAD
- design critiques and evaluation

3. RECOMMENDED TIME

9 weeks × 2 lessons = 18 lessons (720 minutes)

4. CONTENT OF ACTIVITIES

Weeks	Teaching Activities	Learning Activities	Assessments
1	1. CAD 2. 3D modelling by CAD	CAD software exercise	Complete the exercise and meet the basic requirements
2-5	3D modelling by CAD	CAD exercise	Complete the exercise and meet the basic requirements
6	Enhancing design effects	Exercise on enhancing design effects	Complete the exercise and meet the basic requirements
7	Outputting animations	Exercise on outputting animations	Complete the exercise and meet the basic requirements
8-9	Design critiques and evaluation	Exercise	Complete the exercise and meet the basic requirements

VI

Material 4A

Learning Units	Elements
(E2) Material processing	Relevant knowledge – Material joining Equipment used in manufacturing processes Material surface treatment Case study – Open day souvenirs

1. OBJECTIVES

Students acquire a basic understanding about material processing, and select appropriate materials and processing methods for various needs.

2. ON COMPLETION OF THE PROJECT ACTIVITY, STUDENTS SHOULD BE ABLE TO MASTER:

- material joining technology
- selection of appropriate materials and processing methods

3. RECOMMENDED TIME

6.5 weeks × 2 lessons = 13 lessons (520 minutes)

4. CONTENT OF ACTIVITIES

Weeks	Teaching Activities	Learning Activities	Assessments
1	Material joining technology	1. Exercise 1 2. Class discussion	Complete the exercise and meet the basic requirements
2	Equipment used in manufacturing processes	1. Exercise 2 2. Prediction of the tools and equipment to be used	Complete the exercise and meet the basic requirements
3-4	Material surface treatment	1. Open day souvenir design 2. Prediction of the materials, tools and equipment to be used	1. Complete the open day souvenir design 2. Predict reasonably the materials, tools and equipment to be used
5-7		1. Design and production of open day souvenirs 2. Complete design folio	1. Complete the design and production of the open day souvenirs 2. Complete the design folio according to the guidelines

VI

Material 4B

Learning Units	Elements
(K6) Production process	Relevant knowledge – Product standards Design evaluation Intellectual property Roles of designers and engineers at work Design presentation Case study – The technology behind game console Project activity – Design model of a fitness park

1. OBJECTIVES

Students acquire basic understanding about product standards, evaluation and intellectual property of designs, and take them into account when designing. Students consider the importance of different roles during designing.

2. ON COMPLETION OF THE PROJECT ACTIVITY, STUDENTS SHOULD BE ABLE TO MASTER:

- product standards, design evaluation and intellectual property
- roles of designers and engineers at work
- design presentation methods

3. RECOMMENDED TIME

12.5 weeks × 2 lessons = 25 lessons (1000 minutes)

4. CONTENT OF ACTIVITIES

Weeks	Teaching Activities	Learning Activities	Assessments
1	Product standards	Case study 1	Complete the lesson activity and meet the basic requirements
2	Design evaluation	Case study 2	Complete the exercise and meet the basic requirements
3	Intellectual property	Case study 3	Complete the exercise and meet the basic requirements
4	Roles of designers and engineers at work	Case study 4	Complete the exercise and meet the basic requirements
5-6	Design presentation	Case studies 5-6	Complete the exercise and meet the basic requirements
7		Case study – The technology behind game console	Complete the study report
8-12		Design and production of a 'fitness park'	1. Make the production schedule 2. Use the tools safely to finish the production
13		Complete design folio	Complete the design folio according to the guidelines

VI

Material 5

Learning Units	Elements
(E3) Project management	Relevant knowledge – Cooperation and coordination with individuals in projects Project activity – Design model of a fitness park

1. OBJECTIVES

Students acquire basic understanding about project management, and understand the cooperation and coordination with individuals in projects.

2. ON COMPLETION OF THE PROJECT ACTIVITY, STUDENTS SHOULD BE ABLE TO MASTER:

- the way to form project teams, and the way to cooperate and coordinate
- project evaluation

3. RECOMMENDED TIME

4 weeks × 2 lessons = 8 lessons (320 minutes)

4. CONTENT OF ACTIVITIES

Weeks	Teaching Activities	Learning Activities	Assessments
1	Project team forming, and cooperation and coordination in projects	Case study 1	Reflect on the study
2	Project evaluation	Case study 2	Reflect on the study
3-4		Design model of a fitness park	1. Form teams for the 'fitness park' project 2. Members conduct research on their own and report 3. Preliminary design of the 'fitness park'

VII. Design of teaching materials and guidelines for learning and teaching activities

(a) Design of teaching material

Traditional teaching emphasis on lecturing by the teachers, students are to listen, then imitate and exercise repetitively. This learning model is relatively boring and lacking creativity. In order to enhance students' motivation to learn and induce their active learning, they must first realise about the need to learn. This method of learning has to cope with different learning and teaching activities in order to achieve the desired results

To experience the main strands in technology education, including technology knowledge, technology process and the impact of technology, technology education always encourages the approach of learning through problem solving, design and realisation, from which students realise the needs for learning and application of technology. They also will understand the purpose of learning, which will increase their motivation and interest to learn.

The activities designed in our teaching materials also adopt this learning model. To cope with the characteristics of the teaching contents, the structure of the teaching and learning materials is grouped into "Relevant knowledge", "Lesson activity", "Case study", "Project activity / Design project", etc.

(i) "Relevant knowledge"

The selected contents of each set of teaching material cover in whole or in part of those learning elements in the knowledge contexts of the learning modules. The rich descriptions and illustrations elaborate those related knowledge according to different levels and serve as references for students and teachers. "Glossary of terms" and "Interactive information" were added as references and extended reading material. Teachers need to select the appropriate part, while adding some interesting or latest materials to enrich the teaching contents.

(ii) "Lesson activity"

Each set of material provides learning and teaching activities or exercises for teachers to choose. Exercises are commonly used to strengthen students' technology knowledge and skills, such as sketching exercises. The learning and teaching activities may suggest teachers to organise group discussions, guide students to collect data and conduct problem synthesis and analysis.

(iii) "Case study"

Through practical case studies, students will understand how technological principles can be applied in different products and environment. With technology knowledge and skills, it helps further develop students' critical thinking, problem solving and conducting study capabilities. Through exploration approach of learning, students will have a better understanding of the impact of technology to the society.

(iv) "Project activity"

The main objective of "Project activity" is to develop students' technological capabilities through problem solving and realisation. Activities are generally in the form of learning through problem-solving situation and design at working, which is to accomplish the purpose of solving problems for a fixed problem subject to pre-determined constraints. Students are to consider the situation of problem and conditions of constraints and then set the design needs. Various solutions are then designed after taking into account the different affecting factors. The final design is selected after catering for the strengths and weaknesses of different solutions, and then put into practices to complete the solutions according to plan. Finally the effectiveness of the solutions is evaluated to see whether they can solve the needs of the original problems.

As the "Design project" requires the making of artefacts or models, so more time is needed and it usually takes six to eight teaching weeks to complete. Through the design exercises, students have to make the artefact or model of the product and put into practice their design ideas, thus they can experience the technological process in a more comprehensive manner.

"Project activity" can also be conducted in a variety of forms including the mode of experiment, such that students can appreciate those technological principles from the experiments. Students take into consideration requirements of the situation and equipment limitations, then design solutions and use technological devices (such as electronic modules, pneumatic components, microcomputer controller, etc.) to conduct experiments and tests. Students can also experience how to apply technological principles in their daily lives, for example pneumatic principle is a more difficult technological knowledge to comprehend, but through "Project activity", students understand how to make use of pneumatic principles to operate the opening and closing of MTR train and bus doors.

Since the production and testing time is shorter, some of the "Project activity" may need less teaching time, and can be completed in only one to three weeks of teaching. Students do not need to make a complete design model, they may simply write up a project report.

(b) Teaching activity

After selecting the teaching materials, teachers can flexibly use different teaching modes to conduct activities. Similarly, "Project activity" and "Design Project" also have different methods to conduct activities at the right time in order to increase the interest of learning. For example, teachers may use individual or group, oral report or submission of project report, making models or artefacts, etc. in their lessons. While selecting the methods, things to be considered include the nature of the activities, the time required, limitations in making and provision of the school equipment. Different teaching models are provided as follows for reference:

(i) Individual project

Some exercises emphasise on the design aspect, so if the school has sufficient resources, individual assignments should be adopted. Such kind of exercises enables students to realise their creativities, train their skills in operating machinery and preparing project reports.

(ii) Group project

Some teaching packages are insufficient to have a separate copy for each student and require them to do the research together to find out the answers. These packages focus on some conceptual theories and group activities will be more appropriate.

Some complicated exercises can be conducted in groups also. For example, in designing an intelligent work table, due to the large amount of data to be collected and the task needs a large number of people, such exercises are suitable to be conducted in groups.

In designing an ideal office, as there are a lot of office equipment so each group can be responsible for some different parts. After all groups have completed, the combination will become a large-scale finished product.

(iii) Demonstration and explanation

Teachers can explain and elaborate the contents of those related knowledge through demonstrations and explanation to the students. This allows students to understand manipulation of hand tools and machinery, working procedures and safety measures.

(iv) Group discussion

Students share and exchange their personal views and findings with each other, so as to develop collaborative skills, communication skills, critical thinking skills and self-management capabilities.

(v) Explorative learning

Through experiments, students can test their hypothesis, designs and solutions, etc., so as to develop their creativity, numeracy skills, problem solving skills and the ability to conduct study.

(vi) Computer simulation software

Through computer simulation software, students can design the arrangements of electric circuit or pneumatic circuit devices. Some of these designs can even be simulated for testing so that improvements can be made.

(vii) Visits and interviews

Students can conduct visits or interviews to gain experience or knowledge outside the classroom,

so as to develop their communication skills and the abilities to carry out study, critical thinking, etc.

(viii) Collaboration with the industry or professional bodies

Teachers can recommend or arrange students to collaborate with companies or professional organisations in related industries to establish learning models, such as work experience programme. Experts are invited as design or technical consultants, whereas the organisations can provide some actual design requirements for students to carry out problem-solving and design. This mode of learning will greatly increase students' interest towards learning.

(ix) Mobility use of learning modules

As teaching equipment are limited, certain equipment are insufficient for the whole class to carry out project activities or design exercises at the same time, such as electronic modules, pneumatic modules, etc. When conducting such activities, mobility use of learning modules will be adopted, that is simultaneously performing multiple activities in the lessons for better usage of resources.

This approach encourages the independent learning spirit of students through practices. Teachers need to prepare worksheets for students to enable them to complete the required practices according to the instructions and steps in the worksheets. Teachers should also allocate appropriate amount of time to provide students some guidance and for answering questions.

Mobility use of learning module makes learning more flexible. For example, twenty students are initially divided into five groups and the teacher has to arrange the activities of each group of students for the coming six weeks, as shown in the following table. The first group will carry out activities related to electronic modules in the first week, while at the same time the second and third groups conduct pneumatic modules, and the fourth to the fifth groups do design projects. In the third week, the first and third group will work with the design projects; the second group conducts electronic module related activities, while the fourth and fifth groups conduct pneumatic activities, and so on.

Group 1	Group 2	Group 3	Group 4	Group 5
Electronics module	Pneumatics module	Pneumatics module	Design project	Design project
Design project	Pneumatics module	Pneumatics module	Design project	Design project
Design project	Electronics module	Design project	Pneumatics module	Pneumatics module
Design project	Design project	Electronics module	Pneumatics module	Pneumatics module
Pneumatics module	Design project	Design project	Electronics module	Design project
Pneumatics module	Design project	Design project	Design project	Electronics module

VIII. Assessment methods of learning

Appropriate assessment can reflect whether students' learning achieve the desired objectives. The traditional assessment is to assess students' learning effectiveness through written examinations (such as tests or examinations), completion of assignment works and design folios. But in fact, even though the design work of a student failed to meet some requirements; it does not mean that the student failed to achieve the expected learning objectives. Therefore, the teacher needs to choose different assessment methods according to the learning objectives of individual projects or assignments, and also determine the assessment criteria. Also the tasks need to be carried out in stages in order to assess the overall performance of students.

(a) Functions of assessment

There are many forms of assessment methods in terms of functions. For examples,

formative assessment (進展性評估), summative assessment (總結性評估), diagnostic assessment (診斷性評估), evaluation assessment (檢討性評估), etc.

(i) "Formative assessment" means to assess students' progress and performance and directly review with the students together, such that they can clearly understand what the next step will be and why it is so. Such assessments are suitable as medium term assessments during the course of the assignments to facilitate students to complete the entire work more effectively.

For example, when conducting S1 "Project activity - Book buckle", when students complete the design sketches, the teacher will have to do formative assessments to make students understand what areas in the designs need to be modified, and the next step is to choose the appropriate materials and tools. When conducting project activities or design assignments, teachers need to do formative assessments at the right time in order to know students' progress and difficulties in order to help them. Students will also understand what steps need to be taken next and the reasons.

(ii) "Summative assessment" is a more comprehensive and systematic assessment of students' performance, it is suitable for a comprehensive assessment at the end of the semester.

For example, at the end of the first term of S1, a summative assessment should be conducted such that both the teacher and students know whether the teaching effectiveness in this term achieves the expected objectives. Students can also know about their learning outcomes.

(iii) "Diagnostic assessment" is to find out the reasons for learning difficulties, so as to provide appropriate assistance and guidance. Such assessments are used after conducting formative assessments or summative assessments. If it was found that certain aspects of learning objectives cannot be attained, the sources of the problems can be identified through diagnostic assessment, which enables the teacher to take appropriate remedial actions more easily.

For example, when conducting the "Project activity - Robotic pet race walking competition", if the robotic pets of some students failed to meet the requirements of the design specification, the teacher should conduct diagnostic assessment to explore the reasons of the problem. Is that some students failed to understand the principles of mechanical theories, the problems with design ideas failed to master those consideration factors in the choice of materials, or unsatisfactory techniques of making, etc.? When the teacher finds out the sources of the problem, he can make appropriate arrangement to tackle the problem and make students' learning become more effective.

(iv) "Evaluation assessment" is to compare students' learning performances against the expected objectives. In assessing the curriculum design, factors such as whether the establishment of objectives is appropriate or whether the requirements are too high or too low, etc. will be assessed to review if the curriculum is properly designed. Such assessments are applicable at the end of a term to assess the curriculum design of the past six months or a whole year. The curriculum for the new term

will be re-organised based on the results of assessments.

For example, when the S2 curriculum has been implemented for one year, the teacher will need to conduct the evaluation assessment, checking problems such as whether some requirements are too high or too low, whether the time for teaching activities and the teaching materials were insufficient, and whether the teaching sequences were appropriate, etc. After reviewing, the S2 curriculum for the coming year can be adjusted accordingly. Such assessments enable the curriculum to get much improvement.

(b) "Assessment criteria"

Assessment criteria are to assess students' performance and learning effectiveness in accordance with the aims of those learning elements. They also describe the standards the teacher expects students to achieve and the score weightings in various aspects. Students can clearly understand the teachers' expectations in their learning process or during the conduction of learning activities. They can also set the learning directions and abilities for development for themselves clearly.

Example - Design the classroom library corner (model):

Items of assessments	Detailed contents	Percentage
(a) Investigation and analysis of the problem	Students can list the functions and analyse the classroom library corner List the design requirements to be achieved	10%
(b) Propose the design	Creative thinking and expression of different design ideas	20%
(c) The presentation techniques for drawing	Design ideas clearly expressed Effective drawing methods Proficient drawing technique Appropriate composition and ratio	30%
(d) Level of rigorous and accuracy of the design	Use the design ideas to explicitly and comprehensively express the design specifications	10%
(e) The expression ability of the library corner model	Choose appropriate materials and methods to make the library corner model	20%
(f) The library corner satisfying the design requirements	Evaluate whether the library corner model can satisfy those stipulated design requirements Make proposals for modification	10%

In the above example, the teacher listed the assessment items and requirements that students are expected to learn in detail, and obviously the proportion of scores for drawing technique was set relatively high. Students certainly understand that this design project is mainly to develop their drawing technique.

(c) Forms of assessment

Assessment methods can be in many forms and being conducted in a variety of ways. In addition to the teachers conducting the assessment and providing feedbacks to students, they can also consider the following forms of assessment.

(i) "Student self-assessment" refers to the self-assessments and reviews by the students themselves on the quality of their artefacts or projects, as well as their learning attitudes in the process. A deeper understanding of their own strengths and weaknesses in learning can be achieved in the reflection, so as to make improvements or consolidation in practices. Such assessments are more subjective and profound than the teachers' assessments in general.

(ii) "Peers / small group assessment" refers to assessing peer students' artefacts or projects as an individual or in groups, such that students can observe each other and look for improvements. Such healthy assessment can effectively strengthen the exchange among students and the learning atmosphere among themselves. The peers can also take the chance to exchange their learning experiences and make the learning process more interesting. Anyhow, the teacher has to prevent insulting criticism among students, and let students be more candid in accepting different opinions raised by the peers or students within the group.

(iii) "Scoring marks / Verbal / Written assessment" means that there can be different feedback methods to assess students' performances, the teacher may choose marks, verbal or written modes, or their combinations to provide feedbacks to students, and all these modes have their own characteristics. For example, scoring marks is fast and direct in letting students understand their level of learning performance, but there is not much feedback and so the impression is not deep enough. Verbal interaction can increase mutual understanding of ideas so that students clearly understand the resulting assessment. The use of text for assessment can clearly express how the teacher assesses the performance of students' artefacts and projects. If the comments are appropriate the students' benefit will be even greater and the impression deeper, it also allows students to reflect on their own learning performance and areas that need improvements.

Teachers should choose the appropriate assessment methods at different stages and learning strands based on the requirements of the curriculum, so as to understand students' performance and progress, improve the teaching methods, review appropriateness of the curriculum design, and suitability of materials selected, etc. Hope all these can enhance the effectiveness of learning and teaching, and create a more ideal learning environment for students and increase their interest in learning

Teacher's Guide

Case Study

3G : Green Design,Green Technology and Green Enterprise

(Teacher's Guide)

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Teacher's Guide

Case Study

3G - Green Design, Green Technology and Green Enterprise (Teacher's Guide)

1. General Information

1.1 **Level:** S3

1.2 **Learning elements:**

Knowledge Contexts	Process	Impact
Common topics • Technology & Society (Environmental issues, Green Design, Green Technology and Green Enterprise) • Design & Application (Design consideration, Product design) • Consumer education (Consumers' rights and consumers' choice) **Systems & Control** • Application of systems (Electronic products: Fluorescent Light) . **Operations & Manufacturing** • Project management (Planning and organizing work, Cooperation and coordination in projects)	• Information search from Internet on environmental issues • Apply knowledge in "3 Green" • Writing a proposal on Green policy for a school • Develop communication and organization skills	• Reflection from different views of different stakeholders • Green sense to the enterprise operation • Response to climate change and global warming

1.3 Key Features and Task Definition

Case Study: Students should be made aware of the relevance of the technology they are studying to the real world. Case studies on technology and design enable students to put their learning into an authentic context, and so provide an additional resource that can add a new dimension to learning about technology and design.

Authentic Context: Students could understand the issues of Green design, Green Technology and Green Enterprise in response to environmental issues through an example, namely energy saving lightings.

Knowledge Context Covered: Common Topic – Technology & Society (Environmental issues)

Students in this generation are going to face the "third" industrial revolution of Green economy whilst the "second one" is said to be the emerging of IT industry. A report from the American Solar Energy Society stated that one in every four Americans would work in environmental related enterprise in the next generation. They would be regarded as 'Green Worker". The "Green Ability" would also be an attribute to be considered by the employer.

In this case study, students should build up a clear concept of "Green Design", "Green Technology" and "Green Enterprise". Students should understand the effect from consumers' Green sense to enterprise operation. Students should build up a sense about what technologies have developed in order to respond to the climate change and global warming and what policy and operation the enterprises have made in response to the increasing demand from Green conscious consumers.

In the study, students will apply their knowledge to propose a sustainable Green policy for their school. It will be conducted in form of a competition. Each group needs to make a presentation of their plan. The winning group will put their plan into action in their campus with other group members as their partners.

1.4 Learning Outcomes

Students are expected to:

1. Have a sense of global economy regarding the environmental issue;
2. Understand the detrimental effect of electronic products to the environment;
3. Understand what the Green design concept is;
4. Understand what Green technologies are being used and developed for;
5. What policies are being adopted by "Green Enterprise" in response to environmental conscious consumers;
6. Consider the economical factor in Green policy;
7. Propose a sustainable Green policy for the school or propose a conceptual design of a Green electronic gadget;
8. Develop their communication and organisation skills by implementing their plan.

2. Teaching Notes

2.1 The story

Please refer to the Resource Materials

2.2 Learning and Teaching

2.2.1 Organization

Theme: Understanding of Green design, enterprise and technology

No. of periods: 12 periods

Duration of each period: 35 mins

Assignments:

- **Research: Worksheets:**
- Tasks:
  1. Interview record
  2. Propose a sustainable Green Policy
  3. List Green design features
  4. Poster design
- **Group Presentations: PowerPoint**
- **Implementation of the proposed sustainable Green policy plan for the school**

2.2.2 Schedule of Work

Period	Teaching / Learning Activities
01	**Understanding the case and tasks** • Briefly explain the case topic; • Explain the tasks and activities; • Explain the assessment criteria; • Brainstorming a MP3 product; • Complete Class Activity One; • Complete evaluation sheet before the lesson ends.
02-03	**Forming groups and Studying the case** • Form groups of 3 to 4 students per team; • Introduce the story of the case study; • Information search about RoHS, WEEE, CFLs and T5; • Guide students to complete Class Activity Two to Four through small group and class discussion; • Complete evaluation sheet before the lesson ends.
04-05	**Research and data collection** • Encourage small group discussion to understand the case content; • Conduct an interview to collect primary information; • Use Interview Record Sheet; • Prepare for a 10 minutes presentation; • Teacher provides guidance to each group but not the answer.

Period	Teaching / Learning Activities
06-08	**Prepare a School Plan / Product Design** **Task 1** • Guide students to apply the knowledge acquired to propose a sustainable Green policy for their school; • Guide students to prepare an implementation plan; • Guide students to prepare an evaluation or criteria to assess the implementation of the project; • Guide students to propose a project schedule. **Task 2** • Design a conceptual design of a Green electronic gadget based on the agreed criteria; • Present design ideas in a poster; • Propose marketing strategy.
09-10	**Presentation** • Students deliver a 10 minutes presentation of their proposal on a proposal Green policy or a Green product design; • Teacher and peer assessment; • Students will vote which plan/product will be selected for implementation or which one is the best environmental-friendly design.
11-12	**Implementation of school Plan** • Students use their time after school to organize this activities; • Teachers provides resources and guidance to the students.

3. Activities and suggested answers

A. Class Activity One

1. You are a group of product designers. Use a Concept Map to present the ideas of Green MP3.
2. You have only 5 minutes to complete your tasks and share your ideas afterward.

Tips to students:

A Green MP3 may comprise the following environmental parameters

- *A compact size smaller than the regular ones, use less materials*
- *Use recyclable materials*
- *Use less packaging materials*
- *Low energy consumption with energy saving mode;*
- *Green policy to promote recycle practice of customers;*
- *Longer life span*
- *Compliance with RoHS regulations.*

Remarks:

- *Students need to substantiate their ideas with specific elaborations.*
- *Teacher may invite those groups with great ideas to share in the lesson. Teacher may also facilitate small group discussion by sitting in the groups.*

B. Class Activity Two

Conduct an Information search to answer the following questions.

Suggested website for reference:

http://en.wikipedia.org/wiki/Restriction_of_Hazardous_Substances_Directive

1. What is the coverage of RoHS and WEEE on electrical and electronic products?

Categories of Electrical and Electronic equipment affected by RoHS and WEEE are small and large household appliances, IT & telecommunication equipment, consumable equipment (such as electrical toothbrushes and printers), lighting equipment, electrical & electronic tools, toys, leisure & sports equipment and automatic dispensers.

Coverage of WEEE extends to medical devices, monitoring and control instrument.

2. What are the six harmful substances banned by RoHS?

Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated biphenyis (PBB) and Polybrominated diphenyl ethers (PBDE)

Remarks: Teacher can ask students to conduct information search about the full name and functions of PBB and PBDE in electronic and electrical appliances as a further activity.

C. Class Activity Three

1. What is BFR? Why it is used in the printed circuit board?

BFR stands for Brominated flame retardants which are group of brominated organic substances that have an inhibitory effect on the ignition of combustible organic materials.

The electronics industry accounts for the greatest consumption of BFRs. In computers, BFRs are used in printed circuit boards and components, such as connectors, *plastic covers and* cables.

BFRs are exceptionally effective in fire prevention. They reduce the probability that an item will ignite. Brominated flame retardants hinder the spread of the fire and thus provide valuable extra time for evacuation in the early stages of a fire. That is critical to the life saving.

2. Why the recycling rate is so low? What hinder the enterprise to recycle the used products?

It is all about the cost. The cost includes high labour cost in classifying the types of recyclable wastes and transportation cost. The profit made from the reused materials usually cannot cover the cost spent in recycling the materials.

Most enterprises suggest that government should subsidise this recycling scheme by providing land to establish recycling spot so as to reduce the transportation cost. The used products should be designed to be easily classified and dismantled for reuse and recycle.

Remarks; Students are expected to have their own ideas when answering these open-ended questions. The suggested answers provided are for reference only and teachers should have their professional judgment and knowledge to give appropriate feedbacks to the students. Teacher should also concern about the participation and involvement of students in their learning process rather than the answer itself.

D. Example 1 - Energy Saving Lightings

Do you know what parts are inside the Compact fluorescent light bulbs?

There are two main parts in a CFL: the gas-filled tube (also called bulb or burner) and the electronic ballast.

An electrical current from the ballast flows through the gas, causing it to emit ultraviolet light. The ultraviolet light then excites a phosphor coating on the inside of the tube. This coating emits visible light.

The basic construction of typical electronic ballast involves a low-pass filter, rectifier, buffer capacitor and a high frequency oscillator. The basic operation is that after passing a low-pass filter, the mains voltage at 50Hz power frequency is rectified by an AC/DC converter. This converter also contains the buffer capacitor, which is charged with a DC voltage. In the high frequency oscillator this DC voltage is transformed into a high frequency voltage which provides the power for the lamp.

E. Example 2 - Fluorescent Light

What is the mercury content in traditional florescent lamp?

CFLs contain a very small amount of mercury sealed within the glass tubing – an average of 4 milligrams. By comparison, older thermometers contain about 500 milligrams of mercury – an amount equal to the mercury in 125 CFLs.

Thanks to technology advances and a commitment from members of the American National Electrical Manufacturers Association, the average mercury content in CFLs has dropped at least 20 percent of 4 milligrams in the past year. Some manufacturers have even made further reductions, dropping mercury content to 1.4 – 2.5 milligrams per light bulb.

F. Class Activity Four

1. Now we all know CFLs can greatly reduce the electricity bill but not at the expenses of the amount of light output. Do you know what materials are inside the Compact fluorescent light bulbs? Why most of the CFLs are in the shape of spiral tube?

There are two main parts inside a CFL, the gas-filled tube (also called bulb or burner) and the magnetic or electronic ballast. Electrical energy, in the form of an electrical current, from the ballast flows through the gas, causing it to emit ultraviolet *light. The ultraviolet light then excites a white* phosphor *coating inside of the tube. This coating emits visible light. CFLs that flicker if they use a magnetic ballasts; CFLs with electronic ballasts are now much more common.*

Spiral tube type can increase the surface area of florescent materials and concentrate the light intensity and density at a minimal volume.

2. As explained above, the T5 has more benefits to the environment than T8 and T12, however, why not so many people are going to replace their fluorescent lamps at home?

T5 is more expensive than T8 and T12. T5 has higher capital cost but it will be justified in the long run by its energy saved (consumes 36% energy less compared with T8 and T12). However, users need to replace the base and the ballast which is quite expensive. Users usually do not see the urgent need to replace the whole set of fluorescent lamp, they will keep the old base and ballast and just replace the tube at much lower cost.

Extended Learning: "What is Ballast?" can be a further activity for the students.

Brief comparison between Electromagnetic Ballast and Electronic Ballast:

- *Compared to electromagnetic ballast, energy losses in electronic ballast are reduced as the solid state circuit contains no conventional copper windings. The energy saved by electronic ballast can be up to 28% as recommended by EMSD.*
- *Benefits of electronic ballast over electromagnetic ballast:*
  - *Rapid or instant starting of lamp without flickering.*
  - *One ballast can be designed to drive more than one lamp, whereas one electromagnetic ballast can only drive one lamp.*
  - *Increased lifetime due to lower operating current.*
  - *Quiet operation.*
  - *Dimmable version is also available.*
  - *No visible flicker during operation.*
  - *No stroboscopic effect by high frequency operation.*
  - *Low operating temperature and reduce blackening in the vicinity.*
  - *Much lighter in weight.*

Teacher's Guide

4. Tasks

Teacher can duplicate and customize the form for their use.

Interview Record Form

For individual/group use

Worksheet Code :	D&T/CS-3G-WS01	**Date:** _____ /_____/_____
Group/Name :		**Class:** _____
Task:	**Interview the school stakeholders to collect information about the way of promoting sustainable Green policy in school**	

Suggested Answers:

Name of Interviewee: _____

The interviewees may be the Principal, teachers, fellow students and clerical staff.

Suggested Interview Questions:

1. *Do you think our school is Green enough?*

   Usually the school cannot be regarded as a perfect Green school as there must be room for improvement and more environmental friendly.

2. *What measures can be taken to cut down the electricity bill?*

   Control the use of lightings, air conditioners, electrical appliances and computers in terms of time and good practices, such as turning off the computers immediately after using.

3. *Should we replace all the lights by the energy saving ones?*

   Replace the traditional light bulbs with CFLs and T5 Fluorescent lighting. Calculate the capital investment and the energy saved during the expected life span when using the CFLs and T5 fluorescent lighting..

4. *Can we control the use of paper?*

   Limited use of paper, quota control, use printed-paper or recycled paper, print both sides.

5. *Can we breakeven the cost invested to improve the energy efficiency?*

   Check against the energy saving labels of the electrical appliances so as to calculate the energy saved during a certain period of time. To find out the time the devices need to be used to cover the extra money spent in new installation.

Teacher Remarks:

Worksheet: Propose a plan on sustainable Green policy

For group use

Teacher's Guide

Worksheet Code :	D&T/CS-3G-WS02	**Date :** ____ /_____/_____
Group:		**Class :** _____
Task:	**Propose a plan on sustainable Green policy for a school**	

Objectives:

e.g. : To reduce the expenditure in electricity bill by 8%

Existing Situation/Problem:

e.g.: Lightings used in the classroom and corridors are all T12 fluorescent lights. The expenditure in lightings may now occupy high percentage of total energy consumption.

Action Plan:

e.g. Calculate the total number of lightings to be replaced. The capital cost involved such as the cost of materials and the installation fee.

Justifications:

e.g. Calculate the money saved during the servicing life of CFLs and fluorescent lights. Forecast the time for breakeven to balance the energy saved during the service life and the capital cost.

Resources:

e.g. The energy saving label for the calculation of energy expenditure.

Budget Planning:

e.g. The unit price of CFLs and T5 fluorescent lighting plus the installation fee.

Schedule:

e.g. To find out the schedule that minimize the impact on normal operation of classroom teaching and safety.

Manpower/organization:

e.g. Contract out the installation work, assign menial tasks such as cleaning to minor staff of the school or commission to social enterprise.

Teacher Remarks:

Teacher's Guide

Worksheet: List Green design features

For individual/group use

Worksheet Code :	D&T/CS-3G-WS03	**Date:** _____ /_____/_____
Group/Name :		**Class:** _____
Task:	**List the Green design features to be adopted in your new product.**	
Type of Product:		

Green Design Features:

(Hints: Design features need to be quantified, such as the percentage of packaging materials to be saved and the percentage of weight to be reduced.)

Suggested Answers:

- *Calculate the percentage of size reduced;*
- *Suggest environmental friendly materials;*
- *Design a packaging with less materials;*
- *Recycling scheme, such as pre-paid envelope and trade-in used product;*
- *Use less parts, recycle-easy design;*
- *Reliable and use longer.*

Teacher Remarks:

Teacher's Guide

Worksheet: Poster Design

For individual use

Worksheet Code :	D&T/CS-3G-WS04	**Date:** _____ /_____/_____
Name :		**Class:** _____
Task:	**Design a promotion poster for your new product with focus on the Green design features.**	

Hints:

- *Use freehand sketching to present your ideas;*
- *Colour pencils for rendering is recommended;*
- *Highlight all Green features in additional to the product specifications;*
- *Communication and aesthetics are the assessment criteria.*

Teacher Remarks:

5. Assessment

Please refer to the Resource Materials.

6. References

- Compact Fluorescent Light Bulbs
  http://www.bellaonline.com/articles/art37906.asp
- Proposal writing
  http://www.nsf.gov/pubs/1998/nsf9891/nsf9891.htm#step1
- Hong Kong Productivity Council
  http://www.hkpc.org/html/eng/common/index.jsp