Learning To Learn

Key Learning Area

TECHNOLOGY EDUCATION

Consultation Document

Hong Kong Special Administrative Region of
The People's Republic of China
Curriculum Development Council
November 2000

CONTENTS

1 INTRODUCTION

This document on the key learning area of Technology Education is written in support of the consultation document ***Learning to Learn*** prepared by the Curriculum Development Council (CDC) (November 2000) and should be read together with it. The ***Learning to Learn*** document is the outcome of the Holistic Review of the School Curriculum conducted by CDC beginning in 1999, which is done in parallel with the Education Commission's Education System Review.

2 BACKGROUND

The Chief Executive of the HKSAR in one of his policy addresses cited that *innovation and technology* are the major driving forces of economic growth while *sustainable development* is a basic principle for making Hong Kong an ideal home and a world-class city. Technology is widely recognized as one of the major contributing factors to the cultural, social and economic development of a nation, yet its impact on the environment and society should not be overlooked. The CDC considers that it is essential to entitle every student to learning opportunities to acquire know-how and knowledge of technology, as well as to develop the ability to critically appraise the impacts of using technology, technological advancement, and becoming technologically innovative. The Technology Education Key Learning Area (TE KLA) is thus positioned as one of the eight KLAs.

In 1999, within CDC, the CDC Committee on Technology Education, CDCC(TE), was established to foster the development of TE in Hong Kong. This document presents the initial recommendations of the Committee and strategies for their implementation.

Technology and Technology Education

The definition of ***Technology*** may vary in different contexts. In the context of this document, it is defined as the purposeful application of knowledge, skills and experience in using resources to create products or systems to meet human needs. Consequently, ***Technology Education*** is characterized by learning activities which provide students with authentic experiences in various technological areas such as energy, environmental protection, business operation, information and communication technology, etc.

Subjects of Technology Education in the Curriculum

The Committee observed that in the school curriculum in Hong Kong, subjects under the purview of TE KLA can be grouped into Table 1. Most secondary schools offer one or more of these subjects in their curriculum. A large number of these subjects are only offered in schools with curriculum models which have a higher percentage of technological subjects.

Table 1

Subjects under Technology Education Key Learning Area

Groups of Subjects	S1-3		S4-5		S6-7
	Existing Subjects	Existing Subjects Proposed to phase out	Existing Subjects	Existing Subjects Proposed to phase out	Existing Subjects
Business Subjects	Business Fundamentals	Office Practice			
		Book-keeping	Principles of Accounts		Principles of Accounts (AL)
		Typing	Word Processing & Business Communication (English)	Typewriting	
	Retail Merchandising				
			Commerce		
					Business Studies (AL)
Computer Education	Computer Literacy		Computer Studies		Computer Studies (AL) Computer Applications (ASL)
			Information Technology		
Home Economics	Home Economics		Home Economics (Food, Home and Family)		
			Home Economics (Dress and Design)		
Technological Subjects	Catering Services	Accommodation & Catering Services	Accommodation & Catering Services		
	Automobile Technology	Auto Repairs			
	Design & Technology		Design & Technology		Design & Technology (ASL)
	Design & Technology (Alt Syll)		Design & Technology (Alt Syll)		
	Design Fundamentals				
	Desktop Publishing	Printing			
			Engineering Science		Engineering Science (AL)
	Electronics & Electricity	Electrical Studies	Electronics & Electricity		Electronics (ASL)
	Fashion Design	Fashion & Clothing	Fashion & Clothing		
	Technology Fundamentals	Metalwork	Technological Studies	Metalwork	
	Graphical Communication	Technical Drawing	Graphical Communication	Technical Drawing	
	Textiles		Textiles		

Some of the subjects in Table 1 have been vigorously revised in recent years to meet current needs: moving from a craft-oriented curriculum to one emphasizing transferable and generic skills. In particular, the report *Review of Prevocational and Secondary Technical Education*, published in March 1997, recommends a group of subjects, referred to as the New Technical Curriculum (NTC), designed to impart to students generic, fundamental and transferable skills in the application of modern technologies and to replace outdated subjects. We consider that the rationale underpinning the development of these subjects could be part of the basis for the development of the TE curriculum framework. In the light of the TE curriculum, NTC subjects would be further refined and schools could choose to implement any of them depending on their missions, curriculum focuses, students' needs and so on.

3 RATIONALE FOR DEVELOPMENT

The Issues

In the deliberations of CDCC(TE), we observe that TE should be an entitlement of every student at all levels. Hence, we need to address the following long-lasting issues in the existing TE curriculum:

- new subjects to be introduced due to the speedy emergence of new technologies and social expectations, which far outnumber outdated subjects to be phased out, resulting in an overlapping and overcrowded secondary TE curriculum
- the lack of common focus and lateral coherence among existing TE subjects as they are introduced at different points of time with different emphases (e.g. to entitle students with the learning of psychomotor skills; to cater for pre-vocational training; to prepare students with some vocational knowledge and skills, etc.)
- the lack of coherence and focus of TE elements in the primary curriculum as they are scattered across different topics in the General Studies curriculum

The Proposed Development

In view of the issues, we propose to put in place a comprehensive framework for TE so as to:

- entitle every student at both the primary and secondary levels to learning opportunities in TE so as to prepare them for technological challenges;
- refocus the role of TE within the school curriculum so as to provide broad and balanced learning experiences for students, to prepare them for a life-long and life-wide education to meet the challenge of emerging technologies;
- provide a flexible framework to accommodate emerging new TE learning elements and to phase out obsolete ones; and
- ensure a greater coherence among TE subjects in accordance with the learning experiences of students, aims of education, and technological capabilities, understanding and awareness.

4 PHASES OF DEVELOPMENT

In our deliberations, we understand that proposals could never be delivered without a realistic implementation plan. In this section, we set out as a basis for consultation the short-, medium- and long-term implementation proposals.

4.1 Short-term (2000-2005)

Many schools are already practising what we are advocating in our proposals, e.g. integrating the learning of different subjects, refocusing the aims of the curriculum for students to understand the context that enables the development of technologies, the impact of technologies on our daily living, etc. We propose that in the short term, the existing subjects should continue to be taught in schools whilst good practices can be further strengthened and disseminated. To this end, we suggest that schools can strengthen the learning of existing TE subjects through:

- refocusing from skill-based or content-based teaching to teaching and learning for a balanced development of capability, understanding and awareness;
- putting more emphasis on the development of interest and the cultivation of creativity by challenging students with problems appropriate to their levels;
- putting more emphasis on the socio-humanistic aspects of TE, like encouraging reading about inventors and inventions, discussions and debates of the impacts of technological advancement, etc; and
- broadening students' exposure to TE through educational visits, inter-school competitions, etc.

Sample Case 1

A Balanced Development of
Capability, Understanding and Awareness

A class of S.1 students is scheduled to learn basic processing skills with thin aluminium sheet like filing and shaping. The teacher intends to shift the learning from a skill-focused approach to the cultivation of creativity and an understanding of the culture of the local community. He asks the students to work on a project titled "A Sculpture to be Erected in the Town Park". Students have to work with aluminium to make a model sculpture which should reflect either a virtue treasured or a wrongdoing disliked by local residents. After the brief, students go home and interview their family members, neighbours and even community leaders to collect opinions. They also go to the Town Park to gather information about location and measurements so that they can build a model park for presenting their sculpture. The students come up with many different ideas for the sculpture: one student makes a big litter bin to remind people to keep the place clean, another one makes an ox to symbolize that diligence is a virtue. After the presentation, the teacher guides the students to evaluate the effects and impact of erecting the sculpture in the Town Park. With students' ideas for the sculpture, the teacher also guides the students to reflect upon the values and culture of the local community.

Some schools may wish to initiate school-based curriculum development in TE through:

- organizing teaching and learning of TE topics in the form of technology learning activities (TLAs);
- conducting integration of learning across TE subjects or across subjects in different key learning areas (KLAs); and
- adapting choices of subjects and/or combinations of learning elements to be in line with the mission of the schools and the needs of students.

Sample Case 2

Adapting Home Economics and Design & Technology

In order to provide equal learning opportunities to students of both sexes, a selection of core elements identified from Home Economics and Design & Technology could be taught to all students in S.1 to give them adequate exposure to the two subjects. For instance, an analysis of household appliances could be done from an ergonomic point of view or from a safe use and care point of view, and Design-Make-Evaluate processes are applicable in different design projects, including Fashion or Product Design. Through an exercise on project work, students could then select different areas of study in the two subjects, e.g. home management, fashion design, product design, etc. according to their interests and competence, and pursue an in-depth study.

Sample Case 3

Creating Space for Learning

In a secondary school, the majority of the students come from low-income families and do not have computers at home. They have the general characteristics of lacking confidence, being unmotivated, having insufficient vocabulary for discussion and with a tendency to learn only practical skills.

A group of teachers decided to integrate the learning of three subjects, Design Fundamentals, Graphical Communication and Desktop Publishing, to facilitate a lateral coherence in the learning of information technology and design, and to reduce content overlapping so as to provide time to accommodate differences in student learning paces. The aims of their curriculum design are for students to understand and master the concept of design and the design process, using information technology as the tool and project learning as the learning process. Students will also be given more opportunities to use the computers in schools.

In S.1, "Theme Park" is chosen as the theme of the year, through which students learn the concepts and techniques of logo design, as well as the impact of logos in the commercial world and on daily lives. In S.2, "Surfing the Web" is chosen as the theme of the year, through which students learn the concepts and skills (including IT skills) of two-dimensional (2D) design, the creating and processing of 2D images as well as messages conveyed by 2D images. In S.3, "Ideal Campus" is chosen as the theme of the year and students learn about three-dimensional (3D) design. The curriculum design

is mainly based on project learning where teachers provide students with the necessary knowledge and skills on a need-to-know basis. In the process, students learn to be more self-initiated and the presentation at the end of each project also helps students to improve their communication skills and to build up self-confidence.

To be in concert with schools' endeavor, the Government will:

- regularly update the contents of the syllabuses;
- coordinate the organization of inter-school projects, visits and other programmes for promoting interest and encouraging innovation;
- work in partnership with the schools to try out new ideas and to identify good practices;
- disseminate the good practices for a wider application; and
- recommend phasing out of outdated subjects and/or learning elements.

The Government, in parallel, will provide teacher development programmes to strengthen teachers' understanding of the curriculum framework, help them acquire the skills to formulate TLAs effectively, and develop teaching and learning resources, in both primary and secondary schools.

4.2 Medium-term (2005-2010)

In the medium-term, schools will be encouraged to diversify and specialize at the senior secondary level, in fields that students and teachers of a school excel, while maintaining a broad and balanced TE curriculum in the junior forms. The Government will help schools transcend successful school-based curriculum development and promulgate good practices for implementation in other schools. Given the fact that new technologies will have arisen and there will be new social expectations, there will also be updating of learning elements, phasing in of new subjects and phasing out of obsolete learning elements or subjects to fulfil the continuous renewal function of the TE curriculum framework.

4.3 Long-term (2010+)

Technology Education will prepare students for life in the ever-advancing technological world by imparting them technological capability, understanding and awareness to help them apply and appraise technology advancement and to make innovations. Technology Education should be an entitlement for all students. Students with talents in different areas would be provided with the opportunities to develop their potentials to the fullest to lead a quality life.

5 THE FRAMEWORK

5.1 Overall Aim

The TE curriculum framework will provide a blueprint to:

- develop technological literacy in students for them to deal with the challenges of the future;
- align the focuses of TE at different levels of schooling and the lateral coherence of existing TE subjects; and
- extend the learning experiences of TE to all students as an entitlement.

5.2 Learning Targets

TE aims to develop *technological literacy* in students through the cultivation of *technological capability*, *technological understanding* and *technological awareness* which can be expressed as the following sets of interrelated learning targets:

(A) Technological Capability
- Identify needs, problems and opportunities, their respective constraints, and preferences
- Develop, communicate, implement and evaluate solutions creatively
- Make informed decisions in creating, using and modifying artefacts, systems and environments

(B) Technological Understanding
- Understand the interdisciplinary nature of technological activities
- Understand the underlying concepts and principles of technological artefacts, systems and environments
- Understand and apply the knowledge of processes and resources used in designing, making and evaluating products, systems and solutions

(C) Technological Awareness

- Be aware of the cultural and contextual dependence of technological developments
- Respect cultural differences and the rights of others as well as develop a sense of social responsibility in performing technological activities
- Be aware that the well-being of oneself, one's family, the society and the natural environment depends upon decisions on how to use technological artefacts and systems appropriately
- Appraise the impact of technology on society and the environment

5.3 Components of the Framework

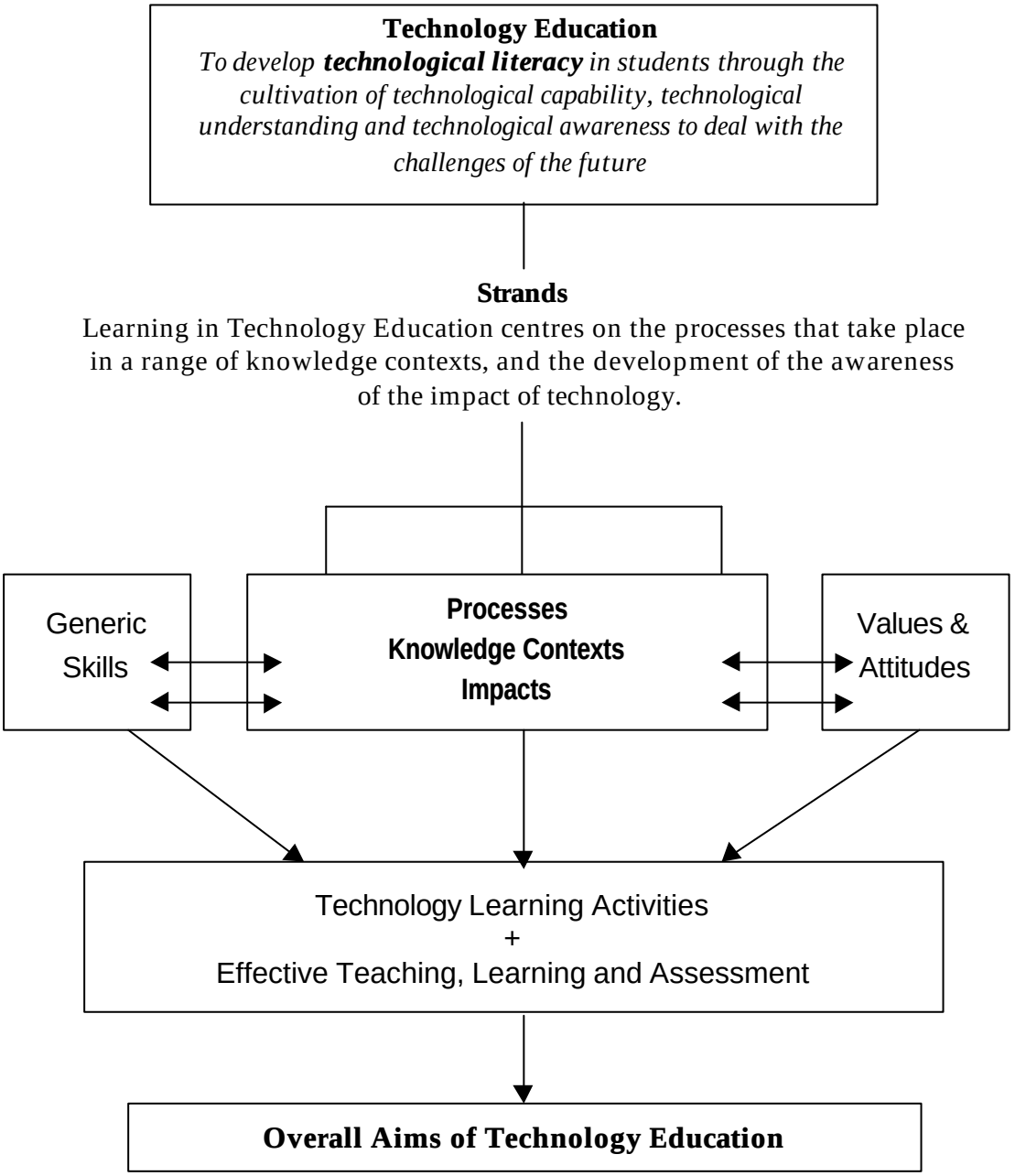

Figure 1: Technology Education Curriculum Framework

5.3.1 Strands

The core elements to be included in TE are grouped into strands: namely *Processes, Knowledge Contexts* and *Impacts*. These strands are selected to spell out the components to be included in TE curriculum planning. They stress the importance of:

- learning a balanced TE curriculum, including mastering the processes, the concepts and appraising the impacts;
- learning TE through creative and hands-on activities;
- learning TE through a wide range of situations; and
- learning the socio-humanistic aspects of TE.

The *Knowledge Contexts* strand includes broad areas of knowledge elements in technology. Presently, six knowledge contexts are identified, namely, *Information & Communication Technology*, *Materials & Structures*, *Operations & Manufacturing*, *Strategies & Management*, *Systems & Control* and *Technology & Living*. A list of possible contents for the knowledge contexts and their related subject areas is at Appendix 1. TE teachers may wish to draw upon concepts from one or more knowledge contexts in planning their teaching and learning activities. Integration of learning across different knowledge contexts is essential for students to appreciate the interdependency of the knowledge contexts.

The *Processes* strand includes the capability to solve technological problems, viz., from identifying needs, through developing and evaluating solutions, to making informed decisions. The totality of these processes is generally termed the *design cycle.*

The *Impacts* strand highlights an awareness of the development and consequences of technological advancement and applications. Students will learn about the impact of technology on human, society and the environment, and also how social values and culture influence technological development.

It must be emphasized that for meaningful learning to take place, learning of TE must make reference to authentic situations which also serve to provide students with the necessary platforms to appraise the impacts of technological developments and applications. A variety of contexts is suggested, including personal, home, school, community, national, international, recreational, business, industrial, environmental,

normal, adverse, etc., in order to achieve a broad exposure for students.

Sample Case 4

Applying the Framework in Home Economics

After learning about design processes and some knowledge of fabrics materials, a class of S.2 students are required to design a present for their parents on Father's / Mother's Day. The present should be a useful item for the home, made with recycled materials, and cost less than $10.

Through group discussion, students have to identify the requirements and constraints of the design task, and suggest a list of presents. They have to apply what they have learnt in the *Materials and Structure* and the *Technology and Living* knowledge contexts to decide on the materials, form and construction method. After completion, students have to present their products to the class. The products will be evaluated for their originality, aesthetic quality, workmanship, and the appropriateness of materials and construction methods. The recyclable value of the materials used will also be discussed.

Sample Case 5

Applying the Framework in Business Education

In a Commerce class, students are asked to divide into small groups to decide on the most effective method of launching an advertising campaign for a new product. In the process, they have to identify the needs and preferences of their target customers, the problems, impact and opportunities of the method chosen, legal and ethical considerations as well as to apply what they have learnt in the *Strategies and Management* and the *Technology and Living* knowledge contexts.

5.3.2 Generic Skills

Generic skills are transferable skills to help students learn in different subjects / key learning areas / contexts. Nine generic skills are regarded as essential. An analysis of the generic skills is discussed in the ***Learning to Learn*** document and possible learning activities in TE that would help students develop these skills at the various levels of schooling are given in Appendix 2.

5.3.3 Values and Attitudes

In TE, we plan to develop students' values that will become their principles for conduct and decisions, and to develop attitudes for their personal dispositions to perform tasks well. A review of how TE contributes to the development of values and attitudes is given in Appendix 3.

Sample Case 6

Openness and Collaboration in Group Project

Values like openness and interdependence, and a participatory and co-operative attitude are needed for students to take part in a group project on "Solar Cooker and Solar Cooking". Students have to work in collaboration to collect information, identify needs and constraints, design and make the model, and present the findings and outcome of the project. The project also provides ample opportunities for students to develop generic skills such as problem solving, creative thinking, collaboration and communication.
(A detailed description of the case is at Appendix 6.)

5.4 Modes of Curriculum Planning

Students move through different stages of cognitive development in their school years. In this respect, we propose that the focus of TE for different levels of schooling should be different. The focuses could be:

(A) At the primary school level
- To arouse students' interest
- Through experiencing and exploration
- Using contexts most familiar to the students, like personal, home and school
- Being aware of the impacts

(B) At the junior secondary school level
- To let students know and become familiar
- Through experiencing the different stages of a design cycle
- From personal to social contexts
- Being aware of the impacts and the underlying principles

(C) At the senior secondary school level

- To know and to explore orientation for specialization
- Through critically reviewed and self-initiated design cycles
- From personal to social and local to international contexts
- Being aware of the impacts, respecting others' choices and relating decisions made to other non-technological factors

The aforementioned focuses are only general guidelines. Schools may wish to take into account their background, students and other factors in setting their school-based focuses in TE.

At the primary level, TE is currently delivered through *General Studies* and schools can make reference to strands promulgated in the General Studies Curriculum Framework for promoting TE. An extract of the General Studies Curriculum Framework is given in Appendix 4.

It is generally recognized that scientific discoveries and technological developments are inseparable processes. A new subject, Integrated Science & Technology, is being proposed for broadening the learning experiences of non-science students. Outlines of the new curriculum are given in Appendix 5. Schools may wish to take these into account in planning their TE curriculum.

5.5 Teaching, Learning and Assessment

5.5.1 Technology Learning Activities

To meet the stated aims of TE, apart from the usual mode of learning factual knowledge, basic operational and analytical skills, we propose to organize student learning through authentic learning activities, which we refer to as technology learning activities (TLAs). In TLAs, students are charged with a challenge or problem. They manipulate materials, resources and equipment available to meet perceived needs. TLAs help:

- to promote learner-focused TE;
- to extend students' capability through their experience of manipulating equipment and resources;
- students to construct knowledge relevant to problems concerned;
- students to appraise the pros and cons of technological solutions,

and the impact of real-life technological developments; and

- to develop students' creativity and to promote interest.

5.5.2 Teaching and Learning through Technology Learning Activities

In formulating TLAs, teachers could take into account parameters such as anticipated learning targets, the strands of TE and the selected knowledge contexts, the relevant situations, lateral coherence with other KLAs, teachers' specialties, etc., to formulate activities to address the learning needs of students. A graphical representation of the formulation is shown in Figure 2 below:

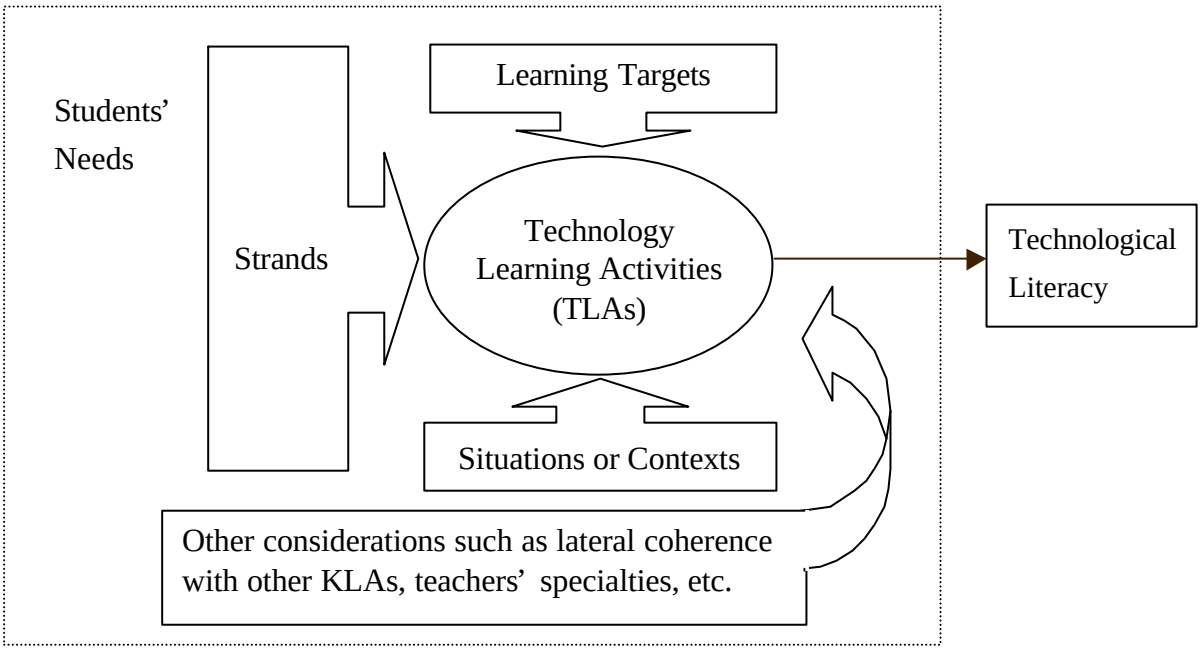

Figure 2: Schema for Formulating TLAs

As TLAs are authentic learning activities, they should be conducted on appropriate platforms, e.g. through themes from current issues or from elements of a knowledge context addressing personal, social, academic, practical, technical and even business problems. Draft exemplars for TLAs are included in Appendix 6 for illustrative purposes.

In a TLA, students will adopt a "design cycle" that normally comprises the following activities:

- Identification of needs and problems;
- Collection, selection and organization of relevant information, employing this and other knowledge already acquired to make

informed decisions;

- Development of a solution through an interaction between the initial plan and the perceived reality;
- Planning, organizing and managing the realization of the solution;
- Communicating the solution to others; and
- Evaluating the solution in the light of the initial requirements identified, and the effect on others and the natural environment.

In an actual technological problem situation, it is neither necessary to go through all the activities nor to go through them in any particular order. Therefore students are not required to carry out all the activities in the design cycle in every TLA.

It should be realized that in many cases there is no standard solution to a technological problem. Students will be encouraged to generate alternatives or multiple solutions to nurture creativity, and compare them critically to further enhance their critical thinking skills.

5.5.3 Assessment

No teaching and learning can be truly accomplished without suitable assessment. Assessment in the current framework is perceived as a means for both the teachers and students to assess the effectiveness of teaching and learning, i.e. whether the teaching and learning process has achieved the learning targets (an elaboration of the learning targets to indicate the learning focuses at different levels of schooling is given in Appendix 7). As such, it is essential for teachers, possibly with students, to decide on the criteria of attainment, i.e. the quality criteria, as the agreed goal in the teaching and learning process. It is also important that teachers and students should understand how to use the results of the assessment to improve teaching and learning. To this end schools should

- avoid breaking down students' performance into atomized units of skills and tasks;
- assess students' capability in response to perceived needs and their ability to identify the purposes, requirements, factors and constraints;
- use a variety of assessment methods including self-appraisal, peer group assessment, teachers' observation, etc.; and

- assess the process of solving the problem as well as the solution itself.

5.6 School-based Curriculum Development

As mentioned earlier, schools may wish to take into account all related factors in setting their school-based focuses in TE. They may adopt a 5-year strategy of transition or an on-going improvement plan.

For schools offering a range of TE subjects, it is suggested that they should minimize overlap by integration and modularization. Schools are encouraged to move towards diversification, with different orientations at the senior secondary level, to develop their own uniqueness and supremacy in TE, so that students can be better motivated and the society as a whole better equipped. The diversification of schools and specialization in orientation help students develop their own areas of interest and sustain their life-long learning in TE. For schools offering a limited number of TE subjects, there should be enhancement to ensure students' entitlement in TE.

5.7 Life-wide Learning

Learning outside School Walls

Student learning can be tremendously enhanced when the students are provided with opportunities to witness the application of technologies to their daily lives, e.g. bridges and tunnels to improve traffic conditions, power stations to generate electricity, telecommunication for mobile phones and for transmitting TV programmes, technologies used in the production of food, etc. After considering students' readiness in knowledge, skills and physical development, it is proposed that at different levels of schooling, such experiences can be

- at primary level, visits to organizations and institutions;
- at junior secondary level, visits to organizations and institutions and hands-on experiences at some industrial standards training centres, such as training centres of the Vocational Training Council; and
- at senior secondary level, hands-on experiences at industrial standards training centres and for some students, attachment to

industrial and business sectors.

Project Learning and the Contribution of Community Resources to Student Learning

In order to provide opportunities for students to learn subject specific skills and knowledge in contexts, project learning is an alternative way to organize students' learning experiences. Through projects, students can:

- enhance their knowledge and understanding of particular learning areas;
- develop their abilities to apply knowledge and skills in practical investigations; and
- develop their abilities to communicate subject specific information systematically and clearly.

Furthermore, related professionals from the industrial and business sectors can be invited to participate in supervising relevant projects of students, which could serve the purposes of familiarizing students with the latest developments in technology and enlightening students' perspective from a professional point of view.

Sample Case 7

Contributions of Community Resources to Student Learning

A competition on business proposals by secondary school students is sponsored by QEF and co-organized by schools, professional bodies and tertiary institutions. A series of lectures, visits and workshops is arranged for teachers and students. Members of the professional bodies and university students are assigned as mentors. In concluding the programme, student presentations and experience sharing sessions will be arranged. It is intended that through the competition and the series of activities, students would broaden their knowledge about the development of e-business in Hong Kong, develop creativity, enterprising, collaborative, leadership and self-management skills, and become active and independent learners.

5.8 Connections with Other Key Learning Areas

TLAs provide students with authentic learning experiences that are interdisciplinary in nature and we envision that TE KLA will require support from other KLAs as well as contribute to other KLAs. For example, a TLA on "Studying the influence of Chinese culture and history on antique furniture design" will couple with learning in Chinese culture; a TLA on "Designing a mechanised toy" will need the input of scientific principles such as "mechanics" and "energy"; a TLA on "Studying and re-designing the town-planning of a local community" will be most effectively studied with the elements on "understanding different dimensions of the development of human society" in the Personal, Social and Humanities Education KLA; and so forth. In order not to compartmentalize student learning but to provide a learning situation closer to the real world situation, teachers are encouraged to explore the possibility of designing TLAs which link with more KLAs.

6 CONCLUSION

We are in an era where technological innovation and advancement is the predominant factor affecting our life. To prepare our children to cope with future challenges, it is necessary to provide TE to all of them, regardless of their sex and ability, in order to develop their technological capability, understanding and awareness. They should be able to understand and take advantage of technological advances to extend their capability. More importantly, they should be aware of the impact of technology and be able to choose to use technology sensibly for a quality life for themselves and for future generations.

Your support and participation are crucial for the success of the TE curriculum review and your opinions and comments will enable the proposed TE curriculum to meet the needs and expectations of society.

The Curriculum Development Council Committee on Technology Education will hold a series of consultation seminars. You are welcome to participate in them to discuss our proposals.

You are welcome to send your views to the Curriculum Development Council Secretariat by post, by fax or by e-mail on or before 15 February 2001.

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Appendix 1

Examples of Knowledge Contexts

Appendix 1

Examples of Knowledge Contexts

Knowledge Contexts	Contents	Subject Area*			
		BS	CE	HE	TS
Information and Communication Technology	• Basic computer architecture and computer operation	✓	✓		✓
	• Computers and information systems	✓	✓		✓
	• Areas of computer applications	✓	✓		✓
	• Text processing and graphics handling	✓	✓		✓
	• Calculations and charts	✓	✓		✓
	• Multimedia presentation		✓		✓
	• Computer communications and Internet access	✓	✓	✓	✓
	• Using databases	✓	✓		✓
	• Algorithm and programming		✓		✓
	• …				
Materials and Structures	• Classification of materials			✓	✓
	• Properties of materials			✓	✓
	• Processing of materials			✓	✓
	• Manipulating tools and machinery to process materials			✓	✓
	• Structural loading				✓
	• Structural system (arch, beam, frame, cantilever, etc.)				✓
	• Structural mechanics (stability, equilibrium)				✓
	• Strength and behaviour of materials under stress				✓
	• …				
Operations and Manufacturing	• Logistics management	✓			✓
	• Production management	✓			✓
	• Common industrial production processes				✓
	• Design for Manufacturing				✓
	• Product analysis and product life cycles	✓			✓
	• Safety and health	✓		✓	✓
	• …				
Strategies and Management	• Roles of business in society	✓			
	• Different types of business organizations	✓			
	• Business environments	✓			
	• Human resource management	✓			✓
	• Risk management	✓			
	• Accounting and financial management	✓			
	• Marketing management	✓			
	• Management information system	✓	✓		
	• Strategic management	✓			
	• Missions, decision making, planning and control	✓	✓		✓
	• …				

Appendix 1

Knowledge Contexts	Contents	Subject Area*			
		BS	CE	HE	TS
Systems and Control	• Key concept of control system (input, output, process, feedback)	✓	✓		✓
	• Level of system (system and subsystem)	✓			✓
	• Behaviour of system (open-loop and closed-loop)				✓
	• Component of functioning elements (electronics, mechanism, hydraulic, pneumatics, computers, etc.)				✓
	• Use, design, construction and production of functioning elements		✓		✓
	• Design and determine behaviour of systems				✓
	• Controllers (circuitry, logic, memory, programmes and sequence)		✓		✓
	• Sources and application of energy				✓
	• …				
Technology and Living	• Food and nutrition			✓	✓
	• Food and food technology			✓	✓
	• Food management			✓	✓
	• Food packaging			✓	✓
	• Food safety and hygiene			✓	✓
	• Home and family			✓	
	• Home environment			✓	
	• Fashion and clothing			✓	✓
	• Clothing and textile			✓	✓
	• Fashion design			✓	✓
	• Garment making			✓	✓
	• Consumer education	✓		✓	✓
	• …				

*1. Content elements marked with '✓' are subsumed in existing school subjects of respective subject areas:

BS = Business Subjects
CE = Computer Education
HE = Home Economics
TS = Technological Subjects

2. Some of these knowledge contents are / will be included in General Studies in primary schools.

Appendix 1

Appendix 2

Developing Generic Skills in the Technology Education Key Learning Area

Appendix 2

Developing Generic Skills in the Technology Education Key Learning Area

Collaboration Skills

Problem solving, planning and making decisions in a small group require the necessary collaboration skills, namely the skills of listening, appreciation, communication, negotiation, making compromises, asserting leadership, making judgement, as well as influencing and motivating others. Learners with these skills will be able to effectively engage in tasks and teamwork as well as working with others. Ultimately, learners will be able to form relationships that are mutually beneficial.

(The expected achievements of the learners in this type of generic skills cannot be suitably to be classified according to key learning stages)

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Understanding working relationships Learners will learn to • clarify and accept various roles and responsibilities of individual members in a team and be willing to follow team rules • recognize that individuals as well as the team have to take the consequences for their own actions	Learners 1. identify various roles in team work and obey rules in a team in a technology learning activity (TLA) project work or management game 2. are responsible in the assigned roles in project work and are aware that their individual actions will contribute to the success of the project
Developing attitudes which contribute to good working relationships Learners will learn to • be open and responsive to others' ideas; appreciate, encourage and support the ideas and efforts of others • be active in discussing and posing questions to others, as well as in exchanging, asserting, defending and rethinking ideas • recognize and avoid stereotyping; withhold premature judgement until the facts are known • be willing to adjust their own behaviour to fit the dynamics of various groups and situations	Learners 1. reflect on others' ideas in the TLA, respond objectively with appropriate manners, try out if appropriate, evaluate the outcome, share the success or try out alternatives 2. participate actively and positively in group discussions by contributing individuals' technological expertise and identify opportunities for synergy in designing solutions of TLA problems 3. are open-minded in dealing with emerging new technologies or scenarios calling for new mindsets and avoid stereotypes such as following the traditional social division of labour of males and females and assigning girls to handle 'soft' technological aspects while the boys handle all the hard stuff 4. understand that one's contribution in a TLA project is part of the work and that a technological solution requires contributions from various forms of expertise. Hence, to commit oneself to the goal of the project is to submit one's individuality to the purpose and rationality of the team and one has to behave as part of the team

Appendix 2

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Achieving effective working relationships Learners will learn to • select a strategy and plan cooperatively to complete a task in a team • understand the strengths and weaknesses of members and build on the strengths to maximize the potential of the team • liaise, negotiate and compromise with others • reflect on and evaluate the group work strategy and make necessary adjustments	Learners 1. make feasible estimations in project work of TLA, map out the human resource requirements if objective factors allow, invite peers with different expertise to join the team and set out to achieve the agreed goal. Otherwise, subject to the existing strengths, map out assignments based on members' areas of specialization 2. liaise, negotiate and compromise in task allocation, divide the work into sub-goals and allocate the tasks according to members' abilities 3. review progress and evaluate achievements of the TLA project continuously and make appropriate adjustments, should there be changes of circumstances or should the existing allocation of work for members prove to be sub-optimal

Appendix 2

Communication Skills

Communication is a dynamic and ongoing process in which two or more people interact in order to achieve a desired outcome or goal. In learning to communicate effectively, learners should learn to speak, listen, read and write effectively. They should learn to select the most appropriate means to convey a message in accordance with the purpose and context of the communication. They should use accurate and relevant information and organize it systematically and coherently for their audience. They should also evaluate the effectiveness of their communication and identify areas of improvement for action.

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage One (Junior Primary) Learners will learn to • comprehend and act appropriately on spoken instructions • use clear and appropriate means of communication, both verbal and non-verbal, to express meaning and feelings • read and write simple texts	Learners 1. communicate orally design ideas with classmates with the help of sketches or mock-ups 2. describe orally the modifications of the technology learning activity (TLA) solution to be carried out under the teacher's guidance 3. understand the needs of the end-users and propose possible TLA solutions 4. comment orally with appropriate tone on the classmates' design ideas with intuitive criteria such as like or dislike, lovely or not 5. describe orally with sketches how people's lives are affected by technological artefacts and systems (e.g. the home is on the tenth floor and the lift is out of order) 6. describe technologies used in everyday life using appropriate common terms 7. spell out the reasons for using certain technologies and express ideas and feelings on their imaginative design 8. generate design solutions in role play discussion under the guidance of the teacher 9. read biographies and imaginative writings of scientists, designers, engineers and entrepreneurs

Appendix 2

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage Two (Senior Primary) Learners will learn to • comprehend and respond to different types of texts • use spoken, written, graphic and other non-verbal means of expression to convey information and opinions, and to explain ideas • work and negotiate with others to develop ideas and achieve goals	Learners 1. are able to read signals, graphs and legends commonly used in technological artefacts 2. use diagrams to facilitate the presentation of ideas in a TLA project 3. describe the problem situation or the needs of end-users by means of text / sketches / charts / kits / models 4. use text, simple sketches, mock-ups etc to record the development of design ideas 5. present design ideas to classmates with the help of sketches or mock-ups 6. comment orally on classmates' design ideas with criteria including functions, aesthetic, safety, etc. 7. generate solutions in group discussion on the design of a key-holder 8. describe orally or with simple text / sketches how people's lives are affected by technological artefacts and systems (e.g. we can work late in the night with electric lighting) 9. describe by means of text and/or sketches / mock-ups the modifications of a TLA solution to be carried out under the teacher's guidance 10. present ideas / models and suggest ways to improve the solutions 11. solicit information and/or assistance from the community to facilitate the accomplishment of a design project on sun/rain shelters in parks

Appendix 2

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage Three (Junior Secondary) Learners will learn to • understand, analyze, evaluate and respond to a range of different types of texts • use appropriate language and / or other forms of communication to present information and different points of view, and to express feelings • reflect and improve on the effectiveness of their own communication • work and negotiate with others to solve problems and accomplish tasks	Learners 1. read and comprehend technical instructions / operation manuals for domestic appliances 2. appreciate reporting articles about technology in the media 3. appreciate imaginative texts in science fiction 4. present and convey design ideas, solutions or intended messages to specified recipients in verbal, graphical or written messages in a logical sequence with precision (e.g. as officials of the Students' Union, explain to the school authority in a letter why fewer rubbish bins would be necessary after re-deployment of the existing bins) 5. consider different means, media and protocols to transmit or capture a message (e.g. consider if Siu Ming could read e-mails with graphics while he is on a tour in Guangzhou) 6. communicate with group members of project work by using different media such as briefing notes, over the phone or Internet, etc. 7. perceive communication as a technological system and design a loop feedback so that the effectiveness of communication can be evaluated critically in accordance with the prescribed criteria (e.g. ask the recipients to confirm after they have received the message) 8. evaluate the effectiveness of the sender of the message in terms of achievement in language and other communication skills such as graphical or signals and the effectiveness of the communication system as a technological issue (e.g. Have the instructions via fax for the contractors been drafted with precision and are there any distortions of the image in the message due to the transmission process?)
Key Stage Four (Senior Secondary) Learners will learn to • listen and read critically, and speak and write fluently for a range of purposes and audiences • use appropriate means of communication to inform, persuade, argue and entertain and achieve expected outcomes • critically evaluate the effectiveness of their communication • resolve conflicts and solve problems with others to accomplish tasks	Learners 1. present ideas orally or in writing at the meeting of a TLA project with co-workers, describing how they argue their points, persuade the others (e.g. why environmentally-unfriendly materials should be used) 2. write up • mail requesting product information or making complaints to the Consumer Council, • project reports, • simple instructions / operation manuals for the end products of design projects, • promotion flyers for consumers 3. resolve conflict in a working meeting on a TLA project with properly formulated resolutions to accomplish goals agreed by the majority of players, if unanimity is unreachable (e.g. that commercial sponsorship for a sculpture to be erected on campus cannot be accepted, as the logo of the sponsor on the object would defeat its purposes)

Appendix 2

Creativity

A brief description: Creativity is an important but elusive concept. It has been defined in a variety of ways. Some people define it as an ability to produce original ideas and solve problems, others see it as a process, and yet others take it as certain personal qualities. In fact, creativity is a complex and multifaceted construct. Within the individual, creative behaviour is the result of a complex of cognitive skills / abilities, personality factors, motivation, strategies, and metacognitive skills. Person's creative performance may not correspond to his / her developmental stages.

General Principles: Although the demanding process of teaching for creativity is hard to make routine, some principles apply in general. To develop students' creativity, we ask them to go beyond the given information, allow them time to think, strengthen their creative abilities, reward their creative efforts, value their creative attributes, teach them creative thinking techniques and the Creative Problem Solving model, and create a climate conducive to creativity[1]. These principles can be employed in all key learning areas (KLAs).

(The expected achievements of the learners in this type of generic skills cannot be suitably classified according to key learning stages)

Descriptors of Expected Achievements across the School Curriculum	**Exemplars of Implementation in Technology Education**
Learners will learn to • **strengthen creative abilities**: fluency[2], flexibility[3], originality[4], elaboration[5], sensitivity to problems[6], problem defining[7], visualization[8], imagination, analogical thinking[9], analysis, synthesis, evaluation, transformation[10], intuition, logical thinking, etc. • **develop creative attitudes and attributes**: imagination, curiosity, self-confidence, independent judgement, persistence and commitment, tolerance for ambiguity, openness to new and unusual ideas / methods / approaches, deferment of judgement, adaptability, willingness to take sensible risks, etc. • **use and apply the Creative Problem Solving (CPS) Model and creative thinking techniques**: brainstorming, 6W thinking technique, 6 hats method, attribute listing[11], idea checklists, synectics[12], mind mapping, etc.	Learners 1. develop curiosity about scientific and technological phenomena by exploration 2. maintain a playful and enjoyable mind in exploring and innovating ideas 3. maintain an enjoyable and supportive atmosphere, rapport and playful mind in "synectics group" / group-discussion 4. explore needs and problems through a range of strategies including role-play, fact-finding, interview, simulation or reenactment of a problem situation, etc. 5. re-define the problem from the teacher with loose description allowing room for idea exploration and innovation, e.g. use the phrase " design a sitting device" instead of "design a chair" 6. explore alternative ideas from nature, e.g. a leaf vein as the motif of a jewellery design; bee hives as the idea of a structure design; from deficiencies of existing artefacts and systems, e.g. modify and make the design of students desks and chairs more comfortable for the users; from absurd ideas, e.g. adopt the design of glue-sticks and produce a "butter-stick" that spreads butter on bread more effectively

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
	7. adopt strategies such as "reasoning by analogy", "brainstorming", and "itemized response". In an example of "reasoning by analogy", a student connotes the shoes storage cabinet as a box and then work out details for storage, opening, ventilation, etc. In another, students use the shape of venetian blinds to design a multiple-faced billboard such as a flight schedule display. In synectics group / group discussion, students use "brainstorming" to produce an extensive list of ideas. In so doing, learners will appreciate absurd ideas and uphold a fluent flow of ideas among members. They also provide novel ideas, "re-defined" ideas and "extended" ideas. For example: one member suggests "chair", the next member suggests "sitting block" whilst another member suggests "chair with back rest". With "itemized responses", students endeavor to adopt any emerged ideas to tackle the problem, e.g. solving a cooking problem with a metal bucket at hand if no cooking utensils are available 8. adopt techniques such as "sub-goaling" and "generate and test idea". With "sub-goaling", students break down the problem into sub-problems. For examples: (a) divide the "sitting device" problem into sub-parts of "supporting element", "body-contacting element", "decorative element", etc.; (b) divide a program into sub-routines and deal with them separately; (c) divide a business plan into different time frames such as short, medium and long in order to test its feasibility. On the other hand, students can carry out a "generate and test idea" cycle by proposing and developing a solution, testing it, modifying it and re-testing it, and so forth

Appendix 2

Notes:

1. Climate conducive to creativity: Respecting the novel and unusual, providing challenges, appreciating individuality and openness, encouraging open discussion, absence of conflicts, allowing time for thinking, encouraging confidence and a willingness to take risks, appreciating and supporting new ideas, etc.
2. Fluency: The ability to produce many ideas in response to an open-ended problem, question or task.
3. Flexibility: The ability to take different approaches to a task or problem, to think of ideas in different categories, or to view a situation from several perspectives.
4. Originality: Uniqueness, nonconformity in thought and action.
5. Elaboration: The ability to add details to a given idea, such as to develop, embellish, and implement the idea.
6. Sensitivity to problems: The ability to identify problems, list out difficulties, detect missing information, and ask good questions.
7. Problem defining: The capability to 1) identify the "real" problem, 2) isolate the important aspects of a problem, 3) clarify and simplify a problem, 4) identify subproblems, 5) propose alternative problem definitions, and 6) define a problem broadly.
8. Visualization: The ability to fantasize and imagine, "see" things in the "mind's eye" and mentally manipulate images and ideas.
9. Analogical thinking: The ability to borrow ideas from one context and use them in another; or the ability to borrow the solution to a problem and transfer it to another.
10. Transformation: The ability to adapt something to a new use, to "see" new meanings, implications, and applications, or to change an object or idea into another creatively.
11. Attribute listing: A creative thinking technique that involves listing out all the important characteristics of an item and suggesting possible changes or improvements in the various attributes.
12. Synectics: The joining together of apparently unrelated elements. This technique utilizes analogies and metaphors to help the thinker analyze problems and form different viewpoints.

Appendix 2

Critical Thinking Skills

Critical Thinking is drawing out meaning from given data or statements. It is concerned with the accuracy of given statements. It aims at generating and evaluating arguments. Critical thinking is the questioning and inquiry we engage in to judge what to and what not to believe.

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage One (Junior Primary) Learners will learn to • extract, classify and organize information from a source • identify and express main ideas, problems or central issues • understand straightforward cause-and-effect relationships • distinguish between obvious fact and opinion • recognize obvious stereotypes, assumptions, inconsistencies and contradictions • formulate questions, make predictions / estimations and hypotheses • draw simple but logical conclusions not contradictory to given evidence and data	Learners 1. understand, with the help of the teacher's guiding questions, the main points of a typical report issued by the Consumer Council on a commonly used product for infants which may cause danger for the end-users 2. summarize factors attracting the customers to buy the product as described by the above-mentioned report 3. state the findings of the above-mentioned report on how the product may cause danger to infants 4. understand the representations of the investigators in the above-mentioned report and distinguish them from obvious facts or facts supported by findings and their personal opinions 5. understand, from the above-mentioned report, the discrepancy between the advertised performance and the actual performance of the product 6. re-design the product by making references to the findings in the above-mentioned report, ask how the product would be much safer with a different construction, and spell out explicit assumptions and hypotheses of the proposed design 7. collect data relevant to the aforesaid proposed design and draw logical conclusions on the plausibility of the design

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage Two (Senior Primary) Learners will learn to • understand and make deductions / inferences from sources • cross reference other sources to determine the reliability of a source • understand the concepts of relevance and irrelevance • distinguish fact and opinion as well as source and evidence • question obvious bias, propaganda, omissions, and the obvious fallacies • formulate appropriate questions, make reasonable predictions and hypotheses • draw logical conclusions based on adequate data and evidence, and make predictions about consequences	Learners 1. understand the images and texts of an advertisement for a health food in the press, determine if it contains fallacious inferences such as making reference to the characteristics of the populace of the place of production as evidence for the effectiveness of the product, infer whether the advertised product would be useful for the customers it addresses 2. find out the status of the medical agency cited by the above-mentioned advertisement, established from the agency if the representation in the ad is indeed the position of the agency, consult a dietitian on whether the findings are plausible 3. interpret the images of the above-mentioned advertisement and judge if the images are indeed relevant to the information required by customers to make an informed purchase decision 4. state which part of the contents of the above-mentioned advertisement should be taken as descriptive information and which part should be regarded as propaganda, ask if there is information that the customers would like to know but is missing in the advertisement 5. assume that the needs of the end-users as identified by the above-mentioned health food manufacturer are concrete, ask how the needs could be properly addressed without reliance on the health food, and propose a design solution with explicit hypotheses, rationale of design, means of realization and evaluation specifications 6. ask some of the potential end-users if the needs are genuine, whether they like the proposed solution and if they would buy the proposed solution at a suggested price, confirm the findings with a survey of a reasonable scale suggested by common sense
Key Stage Three (Junior Secondary) Learners will learn to • compare different sources, note contrasts and similarities, and determine their reliability • distinguish fact, opinion and reasoned judgment • be aware that value orientations and ideologies would affect the perspective of a source • recognize and challenge stereotypes, inconsistencies, emotional factors, and propaganda • draw and test conclusions as well as hypotheses, identify reasonable alternatives and predict probable consequences	Learners 1. compare information collected from various sources on a social issue such as the causes leading to the installation of a power plant with excessive capacity in Tuen Mun. The sources can be web sites, press reports, government announcements, papers presented by pressure groups, etc. 2. discern whether the information collected is facts, opinions, or reasoned judgment supported by evidence. 3. are cautious of the standpoints of various players that may affect the quality of the information provided. For example, the information provided by the power supplier may justify their actions and the statements put forward by pressure groups may aim at rallying public support through emotional arguments and propaganda. 4. assume that the plant is of excessive capacity and predict the impact on society and the environment due to the excessive capacity. Test and examine the assumption against the information collected and refine the assumption when new information emerges.

Appendix 2

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage Four (Senior Secondary) Learners will learn to • distinguish real and stated issues, false and accurate images, and relevant and irrelevant evidence • recognize and challenge subtle consistencies and inconsistencies, unstated fundamental assumptions, permeating value orientations and ideologies • distinguish among sophisticated fact, opinion and reasoned judgment • be aware that the selection and deployment of information / facts is affected by personal perspective • draw warranted conclusions, predict and assess probable consequences and make reasoned judgment in reading, writing, and speech	Learners 1. study press articles on a social issue such as the benefits for Hong Kong to hold the Asian Games, compare the information reported in different newspapers and seek to find out if there are inherent factors for a newspaper to report the issue from a special perspective, such as commercial interests or ideological bias 2. classify the aforesaid information into facts, opinions and reasoned judgement and evaluate its quality accordingly 3. identify the various arguments bearing in mind that there might be subtle discrepancies and inconsistencies among arguments in the same group or within the argument itself 4. identify from the arguments if there are any statements due to parochialism and question whether a decision involving such a huge investment should be made merely on emotional terms 5. gather the data for existing facilities such as sports, accommodation, transport, amenities, etc., analyze and conclude if the existing facilities plus the proposed new facilities could reasonably support the needs of the Games 6. propose viable alternatives to achieve the ultimate goals of the proposed Games, such as organizing an international grand prix on Lantau Island or revitalizing the local light industries with high-tech initiatives, by spelling out explicitly the current state of technology and possible global trends in the near future

Appendix 2

Information Technology Skills

IT skills are the ability to use IT to seek, absorb, analyze, manage and present information critically and intelligently. In addition, IT will motivate and empower our learners to learn at their own pace and help them develop habits of self-learning, which will benefit them for life.

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage One (Junior Primary) Learners will learn to • operate computers in schools • input Chinese characters with a handwriting recognition device • use multimedia resources to support learning with the help of teachers • communicate and handle information with IT tools in learning activities	Learners 1. operate computers in schools and search for knowledge and information pertaining to design problems on CD-ROM / CAL software 2. acquire the basic concept of a system by means of computer-controlled construction kits under the teacher's guidance 3. via a computer tablet, write up in Chinese the title and a brief description of a design project 4. suggest, with the help of the teacher's guiding questions, at least two sources such as CD-ROM and Internet for retrieving relevant information to facilitate the development of solutions 5. use drawings / graphics or presentation applications to communicate design ideas with classmates
Key Stage Two (Senior Primary) Learners will learn to • use a number of software packages for different purposes • input Chinese characters with devices and the aid of an input method • access information via computer networks and other media • process information using IT tools	Learners 1. use a drawing software to visualize the initial idea and a 2D CAD software to develop and present the design idea in a more precise form to peers under the teacher's guidance 2. via a computer tablet and keyboard, write up in Chinese the work flow of a design project 3. search for information on CD-ROM or the school Intranet / Internet as specified by the teacher to solve a technological problem 4. tabulate data collected in a design project and present them to peers with a presentation software

Appendix 2

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage Three (Junior Secondary) Learners will learn to • use appropriate IT tools to facilitate learning • use IT tools and strategies for processing and presenting information • communicate with others via e-mails • verify and evaluate the accuracy and reliability of information	Learners 1. identify, select, and justify sources of data, information, IT equipment and presentation styles in a design brief 2. write up the project portfolio with the help of IT tools 3. process and analyze collected ergonomic or sales data, present the information to peers, and justify the proposed solution for the design problem 4. use computer simulations to explore various situations and predict the outcomes of different decisions 5. search and gather relevant information on the Internet and request technical information from public institutes or business firms via e-mail 6. verify technical data or information collected from the website of an overseas university with a third source such as a local professional body 7. try out the data collected with a simulation model and establish their worthiness
Key Stage Four (Senior Secondary) Learners will learn to • improve self productivity • use and analyze information • produce multimedia presentations • integrate the uses of a wide range of IT tools to fulfill specific purposes • select and apply appropriate IT tools in different aspects of study, like research, etc	Learners 1. use IT tools and equipment in project work and activities with computer control elements 2. communicate with others by means of electronic data communication 3. create and express design ideas with graphics and image processing software 4. analyze experimental data and findings with the help of IT tools 5. make choices in designing, implementing and testing a system model, and justify the methods 6. explore the effects of changing variables in a design project with computer simulations 7. propose a solution after taking into consideration the resources available and the know-how and present the interpreted findings to others with IT tools 8. perform or produce the proposed solution with various tools, IT tools being one of the options 9. develop the ability to tackle research, design or business problems with the appropriate resources available, including IT tools

Appendix 2

Numeracy Skills

Numeracy skills include the ability to perform basic computations, to use basic mathematical concepts in practical situations, to make reasonable estimates, to understand graphs, charts and numerical concepts in languages, to manage data, to handle money and do stock inventories.

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage One (Junior Primary) Learners will learn to • perform basic computations • recognize and describe shape, position and direction • develop an intuitive knowledge of measurement and measuring units, and use appropriate tools for measurements e.g. ruler, thermometer • formulate and solve simple problems arising from collected data and constructed graphs • read and use simple quantitative information	Learners 1. use appropriate tools for measuring length, weight and temperature in design and realize the solution under the teacher's guidance 2. calculate the overall size / weight of a design solution under the teacher's guidance 3. understand the requirements of the design solution and / or communicate the ideas with co-workers and end-users in terms of quantitative information such as length, weight, temperature, etc. under the teacher's guidance 4. describe, with the help of the teacher's guiding questions, the shape and form of the realized artefact by means of geometrical concepts such as circles, squares
Key Stage Two (Senior Primary) Learners will learn to • perform numerical computations, calculate mentally and provide quick estimates of the accuracy of a calculation • understand intuitively the properties of shape, position and direction • extend measurement skills to concept areas such as volume • collect, process, present and evaluate quantitative information • use mathematical concepts to solve simple real-life problems	Learners 1. estimate the size of the parts that will combine to form the final solution under the teacher's guidance 2. determine the volume of the realized artefact and compare it with the given specifications 3. use geometrical concepts regarding shapes and forms to develop a solution and present the design idea to end-users

Appendix 2

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage Three (Junior Secondary) Learners will learn to • perform numerical manipulations and quick estimates of the accuracy of a calculation • understand properties of shape, position, direction and movement • apply formulae or choose the appropriate tools and strategies to find measures and note the approximate nature of measurement • use appropriate tools and strategies for collecting, processing and presenting quantitative information • estimate risks and chances through the use of elementary probability • solve real-life experiences utilizing quantitative information	Learners 1. estimate risks and chances with elementary probability reasoning and statistical methods such as the failure rate of components in design projects 2. prepare simple project management plans using numerical data and instructions 3. interpret design drawings using numerical data 4. realize design ideas using spatial concepts 5. use a spreadsheet model to answer "what if" questions simply by altering one or more of the variables and take note of the effects resulting from the change 6. use a graphic package to explore ideas in colour, shape and presentation 7. conduct a survey and present the data by means of charts or graphs 8. analyze the research data and explore the implications 9. observe the importance of balance through the calculation of intake and expenditure
Key Stage Four (Senior Secondary) Learners will learn to • solve problems involving numbers and symbols by using quantitative evidence and appropriate devices • evaluate the appropriateness of tools and strategies for collecting, processing and presenting quantitative information • adapt to new mathematical demands in various circumstances as needed • use quantitative information for personal organization and planning, and for understanding social problems	Learners 1. perform problem solving activities in the design and realization process using statistical data 2. perform simple mathematical analysis in the design and realization process (e.g. the search for the internal rate of return of the project by way of iterations) 3. use spreadsheets to represent relationships such as quantity and costs 4. use quantitative information wisely with practical activities in design projects 5. observe and record observations carefully and systematically 6. compare the efficiency of different technological appliances 7. recognize the importance of wise shopping and budgeting 8. understand the use of proportion in various design activities and space utilization

Appendix 2

Problem Solving Skills

Problem solving involves using thinking skills to resolve a difficulty. It assembles facts about the problem and determines the best course of action.

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage One (Junior Primary) Learners will learn to • develop ideas about the problem and identify sources of information and help • identify, under guidance, different ways of tackling the problem • choose and implement a solution plan, using support and advice given • follow the given step-by-step methods to check and describe the outcomes	Learners 1. recognize and state, with the help of the teacher, the needs and requirements of the end-users and the limitations of a technology learning activity (TLA) problem 2. apply knowledge and know-how provided by the teacher in developing and realizing the solutions of TLA problems, e.g. use the "repeat" function of a computer graphic package under the guidance of the teacher to draw identical shapes 3. develop a solution through interaction between the "mind" and the "hand" with the help of sketches, mock-ups and the guidance of the teacher 4. plan the stages in realizing the solution with the help of the teacher 5. compare the realized solution of the TLA project with the specified requirements, under the guidance of the teacher e.g. compare the carrying bag realized / produced with the specified requirements
Key Stage Two (Senior Primary) Learners will learn to • identify the problem and describe its main features • propose alternative courses of action for solving it • plan and try out the selected option, obtain support and make changes when needed • develop an appropriate method to measure the outcomes and examine the approach chosen	Learners 1. define the needs and requirements of the end-users with the help of the teacher's guiding questions in a TLA project 2. apply the knowledge and understanding, provided by the teacher and self-acquired under the teacher's guidance, in developing and realizing a TLA solution, e.g., study in depth the possible motions produced by certain mechanisms with initial information about motions of mechanism provided by the teacher as the basis and apply them in developing a TLA solution 3. make choices in developing a solution supported by relevant information with the help of the teacher, e.g. decide on the choice of material to produce a carrying bag according to the properties of the material, such as toughness and colour 4. develop a TLA solution among alternatives through interaction among the "mind", the "hand" and the "eye", e.g. test the stability of the various designs of the structure of folding chairs through experiments 5. plan the stages and sequences in realizing a TLA solution with the help of the teacher's guiding questions, e.g. plan the production of the component parts of the solution and the procedures for assembling them 6. evaluate the realized solution with the specified requirements and provide suggestions for improvement with the help of the teacher, e.g. state the parts that could be modified in order to serve the requirements better

Appendix 2

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage Three (Junior Secondary) Learners will learn to • explore the problem and identify the issue(s) at stake • suggest and compare the possible outcomes of each alternative course of action and justify the option selected • execute the planned strategy, monitor progress and revise the approach when necessary • evaluate against established criteria the quality of outcomes, and review the effectiveness of the solution process	Learners 1. identify possible sources of information related to the needs of the end-users and the problems with the help of the teacher's guiding questions, e.g. identify housewives / domestic helpers as sources of information about housework 2. identify possible and relevant sources of knowledge and information, study and apply them in developing and realizing the TLA solution with the help of the teacher's guiding questions, e.g. recognize the knowledge provided by various teachers, such as chemistry, geography and the like, acquire and select the relevant information to solve a pollution problem 3. make informed decisions in developing the TLA solution with the help of the teacher, e.g. choose certain kinds of structures for the "folding-chair" design according to its properties such as stiffness, rigidity, weight etc. 4. identify the nature of the problem (such as algorithmic problem or ill-defined problem) and decide the appropriate approach to tackle the problem with the help of the teacher's guiding questions, e.g. • solve a set of pre-defined programming problems with a "pseudo-code" strategy • design an artefact for aesthetic appreciation by starting with the exploration of the possible forms and then the preferences of the end-user 5. plan, with the help of the teacher's guiding questions, the stages and time-schedule in realizing a TLA solution according to budgets of time, equipment, expertise, finance, etc., such as • plan the order of the production of parts in light of the availability of machines under the supervision of the teacher • arrange the production of identical / similar tasks at the same time 6. evaluate the TLA solution realized vis-à-vis the specified requirements and specifications and provide suggestions for improvement with the help of the teacher's guiding questions, such as • state the parts that could be improved to enhance the performance of the artefact • evaluate the realized artefact in terms of the functions it can perform compared with its expected functions and specifications

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage Four (Senior Secondary) Learners will learn to • recognize the complexity of the problem and search for appropriate information required to solve it • formulate feasible strategies to achieve optimal results, considering both long term as well as short term objectives • monitor and critically reflect on the progress in solving the problem • evaluate the overall strategy and anticipate possible future problems related to the solution	Learners 1. realize that a real world problem is interdisciplinary in nature and identify possible sources of information according to the needs of the end-users and the problem itself, e.g. realize that in designing an "industrial-robot", a multitude of factors (such as safety and efficiency) and resources will be involved and recognize that the manager and operators can be sources of information 2. identify the possible and relevant sources of knowledge and information, study and apply them in developing and realizing a solution 3. make informed decisions in determining why, when and how to use certain resources / materials / strategies in developing and realizing the solution, e.g. choose plastic rather than wood in making outdoor furniture in light of its durability and environmental conditions 4. identify the nature of a problem (such as algorithmic problem, ill-defined problem) and decide the appropriate approach to tackle the problem in light of the repertoire of strategies acquired as well as the complexity of the problem, e.g. • solve a set of pre-defined programming problems with the aid of block diagram tools • employ "criterion-check" technique and a range of requirements specified to determine the most appropriate solution to the problem 5. organize and plan the realization / production of the solution in light of the time limit, cost-estimation and budget control, quality expected and so forth 6. set priorities in realizing and producing the solution and modify design in accordance with the time and cost limit, equipment available and so forth 7. evaluate the realized solution with the specified requirements / specifications and provide suggestions for improving the solution and the problem solving process, e.g. • evaluate the "housework-robot" realized / produced in terms of the functions it can perform compared with its expected functions and specifications; • evaluate the advantages and drawbacks of dealing first with the functions of the "housework-robot" rather than its appearance and vice versa

Appendix 2

Self Management Skills

Self-management skills are essential for the building up of self-esteem and the accomplishment of goals. Learners who have mastered self-management skills understand their own feelings and preserve emotional stability. They are positive and proactive towards work. They set appropriate goals, make plans and initiate actions to achieve them. They manage time, money and other resources well. They are able to handle stress and tolerate ambiguities.

Learners will learn to

1. evaluate their own feelings, strengths, weaknesses, progress and objectives (self-assessment)
2. consider aspects of their performance, attitudes and behaviour in order to change or enhance future outcomes (self-reflection)
3. be confident in their own judgements, performance and capabilities (self-confidence)
4. make informed decisions and safe choices in reaching goals and carrying tasks, develop good habits and maintain a healthy life style (self-discipline)
5. work under unfamiliar, stressful or adverse conditions, accept changes and new ideas and be able to handle diversity and tolerate ambiguity (adaptability)
6. make decisions and initiate actions on their own and draw satisfaction from their own effort (self-motivation)
7. keep promises and fulfill obligations (sense of responsibility)
8. control their own emotions and impulses and maintain emotional balance (emotional stability)

(The expected achievements of the learners in this type of generic skills cannot be suitably classified according to key learning stages)

Descriptors of Expected Achievements Across the School Curriculum	**Exemplars of Implementation in Technology Education**
• Self assessment • Self reflection • Self confidence • Self discipline • Adaptability / Ability to Work with Diversity • Self motivation • Sense of Responsibility • Emotional Stability	Learners 1. develop the motivation and vigilance to identify and grasp opportunities to advance the well-being of an individual or a group of the community by putting forth technological artefacts, systems, or environments to satisfy their material or emotional needs which are immediate or emerging 2. identify their own needs or needs of other end-users in a technology learning activity (TLA) on a team basis with peers, specify a problem , propose a solution and the means of achieving it 3. understand that development work in a TLA is an adventure, particularly those with many alternative solutions, that requires good adaptability and endurance 4. proceed with realizing the TLA solution confidently, evaluate achievement in each stage, assess the effectiveness of penetrating and solving the problems of the stage, reflect on ways of improving effectiveness 5. consider their own ability and identify responsibility worth taking up (such as producing a component part for friends), stand ready to accept the responsibility, execute the responsibility, hold their own self accountable for failure, and accept earned success with modesty 6. realize that TLA problems require concentration, precision and endurance, perform TLA tasks with good discipline over behaviour, and restrain emotional upsurge or depression that would reduce the chance of success in achieving work targets

Appendix 2

Study Skills

Study skills are the basic techniques that help to improve the effectiveness and efficiency of learning. They are crucial to the development of the basic learning habits, abilities and attitudes of the learners that form the essential foundation for lifelong learning.

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage One (Junior Primary) Learners will learn to • identify the main points and ideas in different types of straightforward reading materials • use different forms of writing to present main ideas clearly • collect information from given sources, organize them into predetermined categories and analyze them according to preset guidelines • understand the need to set up a study plan and follow a given plan to meet short-term targets	Learners 1. gather and select information from readings related to the technology learning activities (TLAs) under the teacher's guidance 2. write up briefly the nature of the problem in the TLAs, propose a solution, and solicit comments from peers 3. work through the artefact or system being developed, study its behaviour and effectiveness, record the data, organize the findings systematically, analyze the findings vis-a-vis the desired outcomes and appraise critically the success of the project 4. plan the feasibility study of the project, the achievement target, realization stages and evaluation criteria with the help of the teacher
Key Stage Two (Senior Primary) Learners will learn to • identify main lines of reasoning, skim materials to gain general ideas of content and scan text to obtain main points • use different forms and styles of writing for different purposes and present main ideas coherently in a given form and style of writing • locate required information from a variety of sources, organize them into self-defined categories and assess them for completeness, accuracy and relevance • develop short-term and intermediate study plans to meet targets and purposes of study identified by oneself	Learners 1. gather and select information from more diversified readings related to the problem of the TLAs under the teacher's guidance 2. present the idea to peers with a written design proposal that contains texts, graphics, tables of data, etc. 3. write a promotion flyer for the realized product to be launched at the annual school fun fair 4. identify possible sources of information relevant to the TLA project, collect findings, verify their worthiness, organize them in accordance with a schema of categories, and establish an information bank for the project 5. plan the stages in realizing the solution with an alternative path of development for the TLAs under the guidance of the teacher 6. record problem requirements, information gathered, the development of a solution and evaluation of the solution with text, sketches, charts and drawings

Descriptors of Expected Achievements across the School Curriculum	Exemplars of Implementation in Technology Education
Key Stage Three (Junior Secondary) Learners will learn to • identify accurately complex lines of reasoning and hidden ideas and distinguish facts from opinions • select an appropriate form and style of writing for a specific purpose and develop a writing strategy for organizing ideas and information clearly and coherently • define purposes of collecting information, critically investigate sources to distil relevant information and evaluate the quality and validity of information • review and revise study plans developed for short-term, intermediate and long-term targets to meet new demands and to improve study performance	Learners 1. use templates to outline ideas and identify possible factors in real life affecting the realization of design ideas 2. use templates to facilitate the organization and presentation of ideas of the design project 3. collect information relevant to the TLAs, establish the worthiness of the information and utilize the information in the development 4. divide the work into small, short-range sub-goals and set up procedures systematically and structurally to meet new demands and to improve study performance
Key Stage Four (Senior Secondary) Learners will learn to • evaluate key ideas, opinions and arguments identified from reading materials and synthesize them to construct and develop their own interpretation and reflections • assess their own writing strategies to ensure relevant information, ideas and arguments are structured and presented in a logical sequence and the writing is in an appropriate form and style • explore alternative lines of inquiry, refine and integrate information into specific formats and evaluate an overall strategy for refinement and new requirements • evaluate an overall strategy for effectiveness and quality and adapt the strategy and seek alternatives as necessary, based on reflections and feedback	Learners 1. collect relevant materials, read and interpret the materials critically, synthesize others' ideas with their own imagination, construct new knowledge and reflect upon the new constructs in relation to the TLA objectives 2. represent ideas graphically by the use of pictorial or diagrammatic forms in the TLA projects 3. select and use appropriate tools to facilitate writing 4. explore appropriate tools to organize ideas in tackling the problems encountered in the TLA project 5. review the final product of the TLA project and suggest ways to improve the design and the process in production 6. plan and manage learning activities efficiently and evaluate the effectiveness of the outcomes in terms of a pre-determined goal

Appendix 2

Appendix 3

Contributions of Technology Education to the Development of Values and Attitudes by Key Stages

Appendix 3

Contributions of Technology Education to the Development of Values and Attitudes by Key Stages

Values and attitude			Technology Education KLA
			Key Stage One (P.1 - P.3)
Core Values: Personal - sanctity of life - truth - aesthetics - honesty - human dignity - rationality - creativity - courage - liberty - affectivity - individuality	**Sustaining Values: Personal** - self-esteem - self-reflection - self-discipline - self-cultivation - principled morality - self-determination - openness - independence - enterprise - integrity - simplicity - sensitivity - modesty	**Attitudes** - optimistic - participatory - critical - creative - appreciative - empathetic - caring and concerned - positive - confident - cooperative - responsible - adaptable to changes - open-minded - with a respect for ・self ・life ・quality and excellence ・evidence ・fair play ・rule of law ・different ways of life, beliefs and opinions ・the environment - with a desire to learn - diligent - committed to core and sustaining values	1. Recognize and state, with the help of the teacher, the needs of a specific group of users with due attention given to the special needs of individual differences 2. Respect the rights of others in performing technological activities 3. Make choices in technological decisions after considering a range of factors such as functional needs and aesthetic quality 4. Recognize that real world problems cannot be solved with one type of knowledge alone and to keep an open mind in discussions, respect others' opinions, obey and act positively with the team's decisions 5. Be aware of the changing nature of technology and develop adaptability to changes 6. Understand the need to pursue better outcomes and strive to pursue quality in technological activities 7. Realize that different people will expect different solutions to the same problem according to their social / cultural background and the needs to appreciate their own culture and heritage and respect cultural differences 8. Recognize that technological activities can bring about both good and bad effects on people and that responsible technological decisions are commitments to other members of the society 9. Develop qualities of civic-mindedness and caring for the well-being of others 10. Recognize and state the impact of technology on society and the environment
Core Values: Social - equality - kindness - benevolence - love - freedom - common good - mutuality - justice - trust - interdependence - sustainability - betterment of human kind	**Sustaining Values: Social** - plurality - due process of law - democracy - freedom and liberty - common will - patriotism - tolerance - equal opportunities - culture and civilization heritage - human rights and responsibilities - rationality - sense of belonging - solidarity		

<table>
<tr><th colspan="3" rowspan="2">Values and attitude</th><th>Technology Education KLA</th></tr>
<tr><th>Key Stage Two (P.4 - P.6)</th></tr>
<tr>
<td>Core Values:
Personal
- sanctity of life
- truth
- aesthetics
- honesty
- human dignity
- rationality
- creativity
- courage
- liberty
- affectivity
- individuality

Core Values:
Social

- equality
- kindness
- benevolence
- love
- freedom
- common good
- mutuality
- justice
- trust
- interdependence
- sustainability
- betterment of human kind</td>
<td>Sustaining Values:
Personal
- self-esteem
- self-reflection
- self-discipline
- self-cultivation
- principled morality
- self-determination
- openness
- independence
- enterprise
- integrity
- simplicity
- sensitivity
- modesty

Sustaining Values:
Social

- plurality
- due process of law
- democracy
- freedom and liberty
- common will
- patriotism
- tolerance
- equal opportunities
- culture and civilization heritage
- human rights and responsibilities
- rationality
- sense of belonging
- solidarity</td>
<td>Attitudes
- optimistic
- participatory
- critical
- creative
- appreciative
- empathetic
- caring and concerned
- positive
- confident
- cooperative
- responsible
- adaptable to changes
- open-minded
- with a respect for
・self
・life
・quality and excellence
・evidence
・fair play
・rule of law
・different ways of life, beliefs and opinions
・the environment
- with a desire to learn
- diligent
- committed to core and sustaining values</td>
<td>1. Know how to identify needs and opportunities for a specific group of users with due attention given to the special needs of individual differences
2. Perform technological activities effectively with respect to various user requirements
3. Make informed decisions in creating, using and modifying artefacts and systems with consideration given to the environment
4. Respect the rights of others in performing technological activities
5. Realize that constraints and limitations affect the development of solutions and be able to make compromises after considering a wide range of factors such as functional needs, aesthetic quality, etc.
6. Understand the diversified nature of technological activities, keep an open mind in discussions, respect others' opinions, obey and act positively with the team's decisions
7. Understand the changing nature of technology and develop adaptability to changes
8. Understand the need to pursue better outcomes in technological activities and strive to learn continuously to pursue a quality of excellence
9. Understand that technological development is culturally and contextually dependent, appreciate one's own culture and heritage and respect cultural differences
10. Be aware that technological decisions bear impacts on the well-being of our society and natural environment and that responsible technological decisions are commitments to other members of the society
11. Develop the qualities of civic-mindedness and caring for the well-being of others
12. Appraise the impact of technology on society and the environment</td>
</tr>
</table>

Appendix 3

<table>
<tr><th colspan="3" rowspan="2">Values and attitude</th><th>Technology Education KLA</th></tr>
<tr><th>Key Stage Three (Junior Secondary)</th></tr>
<tr><td>Core Values: Personal
- sanctity of life
- truth
- aesthetics
- honesty
- human dignity
- rationality
- creativity
- courage
- liberty
- affectivity
- individuality</td><td>Sustaining Values: Personal
- self-esteem
- self-reflection
- self-discipline
- self-cultivation
- principled morality
- self-determination
- openness
- independence
- enterprise
- integrity
- simplicity
- sensitivity
- modesty</td><td>Attitudes
- optimistic
- participatory
- critical
- creative
- appreciative
- empathetic
- caring and concerned
- positive
- confident
- cooperative
- responsible
- adaptable to changes
- open-minded
- with a respect for
・self
・life
・quality and excellence
・evidence
・fair play
・rule of law
・different ways of life, beliefs and opinions
・the environment
- with a desire to learn
- diligent
- committed to core and sustaining values</td><td rowspan="2">1. Know how to identify needs and opportunities for a specific group of users with due attention given to the special needs of individual differences
2. Perform technological activities effectively with respect to various user requirements and regulatory frameworks
3. Make informed decisions in creating, using and modifying artefacts, systems and environments with considerations given to sustainable development
4. Respect the rights of others (including civic and statutory) in performing technological activities
5. Make compromises in technological decisions after considering a wide range of factors such as functional needs, aesthetic quality, constraints and limitations
6. Understand the diversified nature of technological activities, keep an open mind in discussions, respect others' opinions, obey and act positively with the team's decisions
7. Understand the changing nature of technology and develop adaptability to changes
8. Understand the need to pursue better outcomes in technological activities and strive to learn continuously to pursue a quality of excellence
9. Understand that technological development is culturally and contextually dependent, appreciate one's own culture and heritage and respect cultural differences
10. Be aware that technological decisions bear impacts on the well-being of our society and natural environment and that responsible technological decisions are commitments to other members of the society
11. Develop qualities of civic-mindedness and caring for the well-being of others
12. Appraise the impact of technology on society and the environment in the past, present and future local settings</td></tr>
<tr><td>Core Values: Social
- equality
- kindness
- benevolence
- love
- freedom
- common good
- mutuality
- justice
- trust
- interdependence
- sustainability
- betterment of human kind</td><td>Sustaining Values: Social
- plurality
- due process of law
- democracy
- freedom and liberty
- common will
- patriotism
- tolerance
- equal opportunities
- culture and civilization heritage
- human rights and responsibilities
- rationality
- sense of belonging
- solidarity</td></tr>
</table>

Appendix 3

Values and attitude			Technology Education KLA
			Key Stages Four (Senior Secondary & Sixth Form)
Core Values: Personal - sanctity of life - truth - aesthetics - honesty - human dignity - rationality - creativity - courage - liberty - affectivity - individuality	**Sustaining Values: Personal** - self-esteem - self-reflection - self-discipline - self-cultivation - principled morality - self-determination - openness - independence - enterprise - integrity - simplicity - sensitivity - modesty	**Attitudes** - optimistic - participatory - critical - creative - appreciative - empathetic - caring and concerned - positive - confident - cooperative - responsible - adaptable to changes - open-minded - with a respect for ・self ・life ・quality and excellence ・evidence ・fair play ・rule of law ・different ways of life, beliefs and opinions ・the environment - with a desire to learn - diligent - committed to core and sustaining values	1. Know how to identify needs and opportunities for the betterment of mankind in general with due attention given to the special needs of the minorities and underprivileged 2. Perform technological activities creatively with respect to various regulatory frameworks and values commonly upheld in society 3. Make informed decisions independently in creating, using and modifying artefacts, systems and environments so that sustainable development can be achieved 4. Respect the rights of others (including civic, statutory and consumers) in performing technological activities 5. Make compromises in technological decisions after considering a wide range of factors, functional needs and aesthetic quality, ethical and legal standards, constraints and limitations 6. Understand the interdisciplinary nature of technological activities, keep a critical and open mind in various discourses, be sensitive to opinion differences, reflect and evaluate one's stance, and respect and act positively with the consensus reached in a democratic process without losing one's individuality 7. Understand the underlying concepts and principles of technological artefacts, systems and environments, be adaptive and act as an active agent of technological diffusion 8. Understand and be committed to the need to pursue better outcomes in technological activities and strive to learn continuously to pursue a quality of excellence 9. Understand that technological development is culturally and contextually dependent, identify with and treasure one's own culture and heritage, respect cultural differences and promote understanding across cultures 10. Understand that technological decisions bear impacts on the well-being of our society and natural environment and that responsible technological decisions are commitments to other members of the society 11. Develop qualities of civic-mindedness and caring for the well-being of others 12. Appraise critically the impact of technology on society and the environment in the past, present and future; and in local, national and international settings
Core Values: Social - equality - kindness - benevolence - love - freedom - common good - mutuality - justice - trust - interdependence - sustainability - betterment of human kind	**Sustaining Values: Social** - plurality - due process of law - democracy - freedom and liberty - common will - patriotism - tolerance - equal opportunities - culture and civilization heritage - human rights and responsibilities - rationality - sense of belonging - solidarity		

*****

Appendix 3

Appendix 4

An Extract of the General Studies Curriculum Framework

Appendix 4

An Extract of the General Studies Curriculum Framework

Children in the 21st century have to face challenges brought about by the rapid developments in science, technology and society. They need to be able to construct knowledge and develop a global perspective, and possess lifelong learning skills so that they can cope with a knowledge-based economy and society.

The General Studies (GS) curriculum aims at guiding children to have a better understanding of themselves and the world around them, as well as the inter-relationship and inter-dependence among people, things and their environment. The contexts are subject to change according to societal, scientific and technological development. It is therefore necessary to introduce an open and flexible framework which can facilitate teachers to enhance the capabilities of their students in meeting the challenges of the new century.

General Studies is a cross-Key Learning Area curriculum, which encompasses learning elements of Technology Education (TE), Science Education (SE), and Personal, Social and Humanities Education (PSHE) KLAs. It is designed in the belief that students' learning experiences are connected and not compartmentalized, such that they can develop a holistic view of themselves as individuals in the community, the natural and the technological world.

The GS curriculum aims at helping students to:

- understand themselves, the society and the world at large
- maintain a healthy personal development and contribute to the well-being of the local community, the nation and the world as confident, informed and responsible persons
- become rational and responsible citizens
- develop curiosity and interest in the natural and technological world, and cultivate a care and concern for environmental conservation
- develop ability to inquire and solve problems, with special reference to those related to the impact of science and technology on society

Six strands are identified:

- Health
- Environment
- Community
- National Identity and the Chinese Culture
- Global Understanding and the Information Era
- Science and Technology in Everyday Life

Schools will construct their own themes based on the above six strands.

To enhance a smooth interface with pre-primary education, the curriculum for Primary 1-2 will emphasize personal and social education. The curriculum for Primary 3-6 will be more focused on TE, SE and PSHE. Elements from other KLAs will also be integrated in General Studies where appropriate.

Students will gain diversified learning experiences through active participation in learning activities such as project learning, service learning, scientific investigation and hands-on activities. Resources from community establishments, such as social service agencies, cultural organizations, museums, community organizations, public and private bodies, will be utilized to promote life-wide learning.

Appendix 4

Proposed Core Elements for General Studies

Strand: Health

Level	Proposed Core Elements
KS1	<u>Growth and Development</u> • basic needs and uniqueness of my body • managing oneself in daily life situations • decision making in simple dilemma situations • similarities and differences between boys and girls • individual differences in growth and development • functions of different parts of the body as a basis for body care <u>Healthy Lifestyle</u> • factors affecting personal health • developing healthy living habits • simple hygiene practices and safety procedures as applied in daily situations
KS2	<u>Growth and Development</u> • personal developmental needs • one's strengths and weaknesses • emotions and ways to cope with and express them • coping with unfamiliar situations and new challenges • minimizing and managing risks in daily life situations • changes during puberty • gender roles, relationships and ways to handle sexual feelings <u>Healthy Lifestyle</u> • the characteristics of a healthy person (including physical, mental and social aspects) • impact of an unhealthy lifestyle • maintaining personal and community health • safety in different daily life situations

Appendix 4

Strand: Environment

Level	Proposed Core Elements
KS1	Natural Environment • the existence of a variety of living things and their observable characteristics • plants and animals in their living environment • weather and seasonal changes and how they affect our daily life People-environment Relationship • characteristics of our immediate living environment • location of the main features in the surrounding environment • how natural and human features in the neighbouring areas affect people's life • care of living things • ways to conserve resources
KS2	Natural Environment • cycles in the living world • the interdependence of living things in the environment • water and air in the environment • energy and the environment • the Earth as a source of resources People-environment Relationship • how human activities are affected by the natural environment • balance of nature being affected by human activities • the physical and human characteristics of Hong Kong and China • the distribution pattern of the major physical and human features in Hong Kong • types of resources available in Hong Kong • pattern of energy use in our living environment and its conservation • some local environmental issues • personal responsibilities in environmental conservation • planning and managing resources in developing solutions in daily life situations

Appendix 4

Strand: Community

Level	Proposed Core Elements
KS1	Human Relationships • different types of relationships in students' experiences • roles and identity of individuals in different social groups (family, friends and schools) • maintaining harmonious relationships in family and peer groups Development of Our Community • important events and different aspects of daily life in familiar settings • traditional practices and cultural activities in the family • different kinds of work in the local community • goods and services to meet our needs • impact of technology on our society Good Citizenship • the importance of respecting the rights of others • the need for rules and laws • identity of an individual as a member of society
KS2	Human Relationships • roles, rights and responsibilities in the family and other social groups • maintaining and enhancing relationships while demonstrating assertiveness in expressing feelings and ideas Development of Our Community • major changes in the development of the local community during the past two centuries • reasons and results of the above major changes on our community • local customs and traditions • major features of the Hong Kong economy • influence of technology on our daily life Good Citizenship • exercising basic rights and observing duties in various settings (home, school, community) • importance of the Basic Law to the life of Hong Kong • importance of observing rules and laws • importance of participation in local and national affairs

Appendix 4

Strand: National Identity and the Chinese Culture

Level	Proposed Core Elements
KS1	• local and national symbols and their meanings • the uniqueness of our culture • celebration of traditional festivals • human relationships in the Chinese culture
KS2	• our identity as Chinese HKSAR residents • major historical periods of China • major events and changes experienced by China in the past two centuries • major physical and human features in China and their distribution patterns • Chinese customs and traditions • reasons and importance of conservation of culture and heritage • factors affecting cultural changes in China • major science and technology development in Chinese history and present day China

Appendix 4

Strand: Global Understanding and the Information Era

Level	Proposed Core Elements
KS1	Global Understanding • cultural differences which affect the lives of different peoples • the ways we perceive other cultural groupings • respecting cultural differences • reasons for people to exchange information, goods and services • ways people interact with other cultural groups • how science and technology are changing people's interactions and relationships throughout the world The Information Era and its Impact on Our Daily Life • IT and its impact on communication among different peoples
KS2	Global Understanding • how Hong Kong and the mainland of China are related to the region around • common elements found in different cultures • influences of the physical environment and social conditions on cultural development in different parts of the world • effects of cultural interaction on cultures and societies • major current international events and their meanings to us • impact of science and technology on different societies The Information Era and its Impact on Our Daily Life • ways the information era is affecting our daily life • concerns in the ITC world (e.g. intellectual property, privacy, piracy)

Appendix 4

Strand: Science and Technology in Everyday Life

Level	Proposed Core Elements
KS1	• observing natural phenomena • the wonder of Nature • everyday materials and their uses • experiencing the man-made world • awareness of how technology contributes to daily life • using science and technology to solve problems at home • famous scientists and inventors and their contributions
KS2	• natural phenomena: investigating • the wonder of the Universe • contributions of space exploration to everyday life • sources of energy and their uses • interaction between energy and materials • exploring the man-made world • solving daily life problems with science and technology • safety and personal responsibilities in using technology • future advancements in science and technology • awareness that the usage of technology might be different in other cultures

Appendix 4

Appendix 5

Proposal on A New Science and Technology Curriculum at Senior Secondary Level

Appendix 5

Proposal on
A New Science and Technology Curriculum at Senior Secondary Level

Background

In the *"Learning for Life, Learning through Life – Reform Proposals for the Education System in Hong Kong"* published by the Education Commission in September 2000, there is the suggestion to introduce a new subject called *Integrated Science and Technology* at the S4-5 level. The subject is among those that aim to provide students a broad and balanced curriculum at the senior secondary level. It is particularly valuable to non-science students in providing them with additional learning experiences in regard to modern scientific and technological developments.

Rationale

The new science and technology curriculum aims at enabling students to:

- have a better understanding of the scientific and technological world;
- develop better capabilities in interpreting, analyzing and evaluating scientific and technological data or information;
- acquire the skills to solve simple scientific and technological problems;
- be aware of the implications of scientific discoveries and technological developments;
- appraise the impact of scientific discoveries and technological developments; and
- develop a positive attitude towards the use and misuse of scientific discoveries and technological developments.

There will be a close integration between the knowledge domains and the daily life examples, as well as between the scientific theories and the technological applications. The integration helps students develop a holistic view about the roles of science and technology in the modern world.

The knowledge and skills acquired through the subject help students develop the capability to cope with the challenges of the changing world, and prepare them for a better adult and working life. Students' awareness of the implications and impact of scientific discoveries and technological developments also helps them make rational judgements and decisions as regard the future shaping of the scientific and technological world.

Curriculum Outline

The requirements of the subject will be as follows:

- a core module on the nature and development of science and technology;
- 2 optional modules selected from a list covering the different strands of

science and technology education; and
- an independent study project.

Each of the optional modules takes 40 hours of study (i.e. 60 forty-minute periods). The core module and the independent study project make up another 40 hours of study, giving a total of 120 hours for the whole course.

A tentative list of the optional modules and their content is as follows:

- *Health Science* - food and health, growth and development, health and diseases, community health
- *Environmental Science* - the changing atmosphere, living things and their environment, energy and resources, quality of the environment, environment and sustainability
- *Telecommunication* - telephone, radio and TV broadcast, mobile phone, communication satellite, communication through computer networks
- *Graphical Communication* - development and application of graphical communication, basic presentation techniques, application of computer graphics, desktop publishing, simple image processing
- *Design and Control* - designing for human needs, appreciation and design considerations, applications of control systems in daily life, control systems and devices, simple control system design and construction

The independent study project can be based upon the core module or the optional modules, or any combination of them. It can take the form of a scientific investigation, a technology learning activity, or a piece of creative writing on a scientific or technological issue.

The teaching and learning of each module will be supported by a variety of learning activities including information search, self-exploratory investigation, experimental investigation, design and making, discussion and debate, role-playing, problem-solving activities, and decision-making exercises.

Further Development

The content of the modules will be revised and updated regularly in the light of new scientific and technological developments. A wider choice of modules will also be offered if students show interest in the subject.

The subject may be developed into a 3-year course for students in the new senior secondary curriculum. In that case, students will be required to study 2 more modules for the additional year. The modules may also be grouped into 2 or 3 categories (*science-based*, *technology-based*, and *neither*) for them to have a specialized study or a balanced curriculum depending on the student's choice.

Appendix 5

Appendix 6

Exemplars

Appendix 6

Exemplar I

(1) Unit: Improving Our Living Environment

(2) Level: Primary Three

(3) Learning Focuses

(i) Technological Capability

- Pupils will be aware of the needs in study areas.
- Pupils will be aware of the limitations in addressing the needs.
- Pupils will share their ideas and feelings with their peers orally, and in the form of drawing.
- Pupils will be aware of their differences with others and show respect for others' choices in the use of technology.

(ii) Technological Understanding

- Pupils will be aware that the real world context is inter-related – the home environment is affected by the environment in the community.

(iii) Technological Awareness

- Pupils will be aware that there are various solutions for one single problem.
- Pupils will be aware of the application of technology in our daily life.
- Pupils will make choices in the use of technology.

(4) Knowledge Contexts

- Technology and living
  - Materials and Structures

(5) Situation / Contexts

- Home
- Study Area

(6) Generic Skills

Numeracy	• Measure size of objects, simple calculations • Use appropriate units in measurements
IT	• Use of simple graphic tools in drawing

Collaboration	• Agree on role and responsibility of members in performing group activities • Clarify and accept various roles and responsibilities of individual members in a team and be willing to follow team rules • Participate actively and positively in group discussions
Problem Solving skills	• Develop ideas about the problem and identify sources of information and help • Propose and develop alternative solutions to environmental problems.
Creativity	• Develop a playful and enjoyable mind in exploring and innovating ideas • Devise ways to conserve the environment • Strengthen creative abilities: originality and imagination
Communication	• Write a simple report on observations • Use clear and appropriate means of communication, both verbal and non-verbal, to express meaning and feelings • Use appropriate names to describe common technology used in everyday life
Self-management	• Be committed to saving resources in everyday life • Take responsibility in maintaining a healthy and safe environment at home
Critical thinking	• Identify and express main ideas, problems and central issues • Understand straightforward cause-and-effect relationships • Summarize factors / observations

(7) Values and Attitudes

- Caring and concerned
- Respect for life
- Respect for the environment
- Sustainability
- Sensitivity
- Self-reflection
- Cooperative
- Common Good
- Self-discipline
- Openness
- Independence
- Trust
- Interdependence
- Betterment of mankind
- Sense of belonging
- Appreciative

(8) Lateral Linkage with Other KLAs

Languages:

- Utilize natural language to reason and appraise technological decisions critically
- Exchange ideas and information to get things done

- Provide or find out, interpret and use information, to explore, express and apply ideas, and to solve problems

Mathematics

- Use concepts such as measuring, calculating and estimating in the preparation of a production plan

Personal, Social & Humanities

- Develop self-management skills and cope with change and adversity
- Develop a healthy lifestyle and an attitude to care for others and the environment in dealing with technological decisions
- Develop flexible and open-minded mentalities in solving design problems which are open-ended in nature

Science

- Provide students with opportunities for meaningful investigation and let them apply and use scientific methods to solve problems

The annotations serve as illustration and by no means indicate an exhaustive list of generic skills or values and attitudes that can be developed within any activity.

(9) Activity One

(i) Pre-requisites:

- Students can measure sizes of tables and chairs, etc.
- Students can use pencils or simple graphic tools to create sketches
- Students have experience in creating simple 3D models

Contribute to development of *Numeracy* Generic skill

Contribute to development of *IT* Generic skill

(ii) Learning Objectives:

- To suggest ways of keeping a safe and healthy environment at home;
- To identify possible problems, constraints and improvements needed for a healthy living environment at home;
- To make choices and show respect for others' choices on the use of technology;
- To be aware of some applications of technology to provide a safe and comfortable study area; and
- To be aware that there exist various alternatives for one single problem.

Contribute to development of *Self-discipline* Attitude

Contribute to development of *Critical Thinking* Generic skill

Contribute to development of *Respect for life & Common good* Value & Attitude

Contribute to development of *Openness* Attitude

Contribute to development of *Sensitivity & Betterment of mankind* Value

(iii) Duration: 2-3 periods

(iv) Brief Description:

(a) Teacher illustrates John's study area by showing a picture / a 3D model or using a classroom corner (Figure A):

John is a primary 3 pupil. This is his study area. He always forgets to turn off his computer when it is not being used. The air-conditioner is always on in summer, no matter if it is windy or not. The windows are always closed as the shelves are placed in front of the windows. The curtains are always pulled down. There is not much space in his room. Things are always stacked here and there on the floor.

(b) Students are divided into groups to find out possible problems / needs with John's study area.

Contribute to development of *Problem-solving, collaboration* Generic skills & *Creativity*

	Possible problems / needs	Possible solutions
e.g.	The desk is too small or the monitor is too large	➢ Use a larger desk ➢ Use an energy-saving LCD monitor which is smaller in size and consumes less energy. The monitor turns off when it is not being used for a long time.
	The air is not fresh The room is dark Waste of electricity	➢ Relocate the bookshelf and open the windows, letting in fresh air and also bringing light into the room during the day to save electricity and money.

Contribute to development of *Self management* Generic skill

(c) Each group makes suggestions on how to improve John's study area. Many possibilities may arise such as re-arrangement of stuff and use of other equipment. Students may also imagine and design new devices for John.

(d) Each group sketches a desirable study area for John.

(e) Students present their sketches to fellow classmates and express their views on the design.

Contribute to development of *Communication* Generic skill and *Appreciative* Attitude

Contribute to development of *Interdependence* Value & *Cooperative* Attitude

(v) Extended Activity *(if any)*:

- Pupils could design and create a model, in the form of a drawing or 3D model, of their own desirable study areas.
- Pupils could design and create their own environmentally friendly dream home.

Contribute to development of *Independence* Attitude

Contribute to development of *Respect the environment* Attitude and Value of *Sustainability*

(vi) Teaching and Learning Resources:

- Pictures for illustration purposes
- Materials and equipment for the construction of 3D models
- Simple graphic tools in drawing

(vii) Assessment for Learning:

- Teachers' observation using a checklist for individuals' performance and group performance. The checklist includes behavioural items of individual pupils and the needs and solutions suggested in paragraph (iv).
- Pupil evaluation could be used as cross-referencing evidence reflecting the contributions of individuals in a group.
- Portfolio assessment could be considered and the progress could be reflected in the diary.

Please kindly help John to re-design his study area so that he can have a better and healthier living environment. You may suggest using more environmentally friendly and safe equipment to improve the living environment.

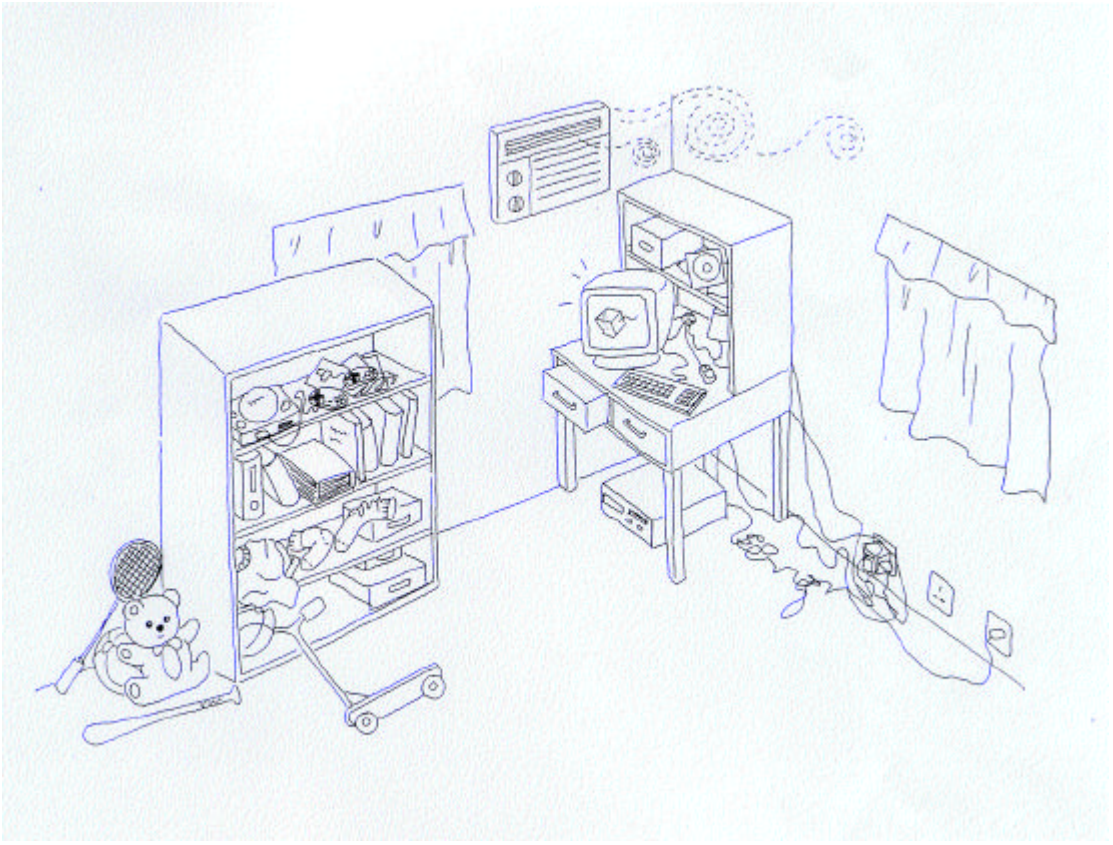

Figure A

Appendix 6

Exemplar II

(1) Unit: Reconstruction of our Neighborhood

(2) Level: Primary Six

(3) Learning Focuses

(i) Technological Capability

- Pupils will be aware of pollution problems in the community.
- Pupils will share their ideas and feelings on the how and why to make the suggestions.
- Pupils will develop 3D models and share their ideas using the models.
- Pupils will make choices on the use of technology to improve the living environment.
- Pupils will plan and manage the resources in developing the models.

(ii) Technological Understanding:

- Pupils will take into account the real world context in the community in tackling pollution problems.
- Pupils will know various ways of tackling pollution problems.

(iii) Technological Awareness:

- Pupils will be aware that there are various solutions to tackle one single pollution problem.
- Pupils will be aware of the impact of technology on our environment, such as severe air pollution due to some motor vehicles.
- Pupils will demonstrate concern for the use of proper technology to address various pollution problems.

(4) Knowledge Contexts

- Technology and Living
- Information and Communication Technology
- Materials and Structure

(5) Situations / Contexts:

- Community
- Environment

(6) Generic Skills:

IT

- Pupils are encouraged to search for relevant information on technology used in environmental protection.
- The report can be generated using word processing and graphical tools.

Communication

- Pupils can share their ideas in group discussions.
- Pupils will discuss pollution problems, suggest solutions and present to their fellow classmates.

Numeracy

- Pupils will measure sizes in creating the 3D models.

Critical Thinking

- Pupils will make reasonable predications on how to reduce air pollution, water pollution and noise pollution, etc.

Problem-solving

- Pupils will recognize various pollution problems.
- Pupils will conduct brief research on how to reduce pollution problems.
- Pupils will make their own suggestions on improving the living conditions in the community.

Creativity

- Pupils will imagine and suggest ways to improve the living conditions in the community.
- Pupils will create their own models to show their ideal community.

Collaboration

- Pupils will participate in various roles in the project.
- Pupils will participate in the discussion and development of a 3D model.

Study

- Pupils will collect and select information on how to tackle pollution problems.
- Pupils will document their progress and possible problems in a diary.

Self-Management

- Pupils will work according to the schedule and may make adjustments to the schedule.

(7) Values and Attitudes:

Values

- Self-reflection
- Self-discipline
- Openness
- Independence
- Betterment of mankind
- Creativity
- Common good

Attitudes

- Participatory
- Critical
- Creative
- Caring and Concerned
- Cooperative
- Sense of belonging
- Responsible
- Human rights and responsibility

(8) Lateral Linkage with Other KLAs:

Languages

- Utilize natural language to reason and appraise technological decisions critically
- Exchange ideas and information to get things done
- Provide or find out, interpret and use information to explore, express and apply ideas and to solve problems

Mathematics

- Use concepts such as measuring, calculating and estimating in the preparation of a production plan

Personal, Social & Humanities

- Understand that some technological decisions for one location may bear impact on another and the environment as a whole
- Develop an attitude to care for others and the environment in dealing with technological decisions
- Develop flexible and open-minded mentalities in solving design problems

which are open-ended in nature

Science

- Use technological understanding to assess the impact of science, e.g. the impact of the discovery of utilizing different energy power on the community
- Provide students with opportunities for meaningful investigation and let them apply and use scientific methods to solve problems

(9) Activity

(i) Pre-requisites:

- Students can search information through the Internet
- Students have experience in creating medium to large scale 3D models in groups

(ii) Learning Objectives:

- To arouse pupils' awareness of various environmental issues in the neighborhood, such as air pollution, water pollution, noise pollution, etc.
- To make suggestions on how to reduce pollution problems.
- To arouse pupils' awareness of various possible alternatives to tackle one single pollution problem.
- To arouse pupils' awareness and interest in the application of technology to improve the quality of living.
- To develop a model to demonstrate an ideal community in the pupils' living environment.

(iii) Duration: 6-8 periods

(iv) Brief Description:

(a) The teacher illustrates possible pollution problems in the community, such as air pollution, water pollution, noise pollution etc. These problems could be shown using pictures / photos of the community.

(b) The pupils are divided into groups to find out possible pollution problems in the vicinity.

Possible problems / needs	Possible solutions
A flyover is nearby. Some areas of the community are very noisy.	Pupils living near the flyover always close their windows to reduce the noise. But to improve ventilation within the apartment, the air-conditioner is always on. This is expensive and consumes energy. In some areas, noise barriers are used to "block" the noise.
The water quality is not good. At times, the water is yellow in color. Sand is mixed with the water.	A water filter could be used to filter the water.
The air is not fresh. The community is near to the factory district.	A dust filter could be used to filter the dust in the air to improve the living conditions within people's home.

(c) Each group observes the facilities in the living environment and searches for relevant technology used in environmental protection. Each group makes suggestions on how to improve the living conditions of the community. Many possibilities may arise such as re-arrangement of facilities in the community or use of various technologies to improve the living conditions. Pupils may also imagine and design new facilities to address the problems.

(d) Pupils could design and create a 3D model showing their desirable environmentally-friendly community. Pupils are required to identify and use proper materials for their models. Each group should make a schedule and divide the task among the group members.

(e) A diary is required to document their working progress. A final report is required to document their ideas behind the models and share their own feelings in the group work.

(f) A brief presentation on the 3D model will be conducted at the end of the project.

(v) Extended Activity *(if any)*:

- Pupils are encouraged to express their views to the neighborhood or to the parties concerned.

(vi) Teaching and Learning Resources:

- Pictures for illustration purpose
- IT equipment and resources for searching the Internet
- Materials and equipment for the construction of 3D models

(vii) Assessment for Learning:

- Teachers' observation using checklists for individual performance and group performance. The checklist includes behavioral items of individual pupils, the quality of their needs analysis and suggested solution in paragraph (iv), etc.
- Pupils' evaluation could be used as cross-referencing evidence reflecting the contributions of individuals in a group.
- Portfolio assessment could be considered and the progress could be reflected in the diary.

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Appendix 6

Exemplar III

(1) Unit: Chocolate Egg Package Design

(2) Level: Secondary 1

(3) Learning Focuses
The following is an extended list of desirable outcomes. In practice, teachers might exercise their judgment to decide which outcomes to focus on.

(i) Technological Capability
Acting as the Chief Designer of the Marketing Department of ABC Chocolate Company, students:

- identify the needs of customers who would buy the chocolate eggs
- design and realize the package design
- with the help of guiding questions, present the design solution through graphical, anecdotal and / or IT means
- with the help of guiding questions, perform an evaluation of the solution realized through design / aesthetic critique, comparison with specified requirements and structural testing (Drop Test)

(ii) Technological Understanding
Acting as the Chief Designer of the Marketing Department of ABC Chocolate Company, students:

- perform the retrieval and organization of information related to packaging to support the decision regarding the package design
- acquire and apply knowledge and understanding of packaging and properties of paper in designing the solution
- acquire information about the nutritional value of chocolate
- define the constraints of the package design with the help of guiding questions

(iii) Technological Awareness
Acting as the Chief Designer of the Marketing Department of ABC Chocolate Company, students:

- will be aware of the impact of promotional activities upon the habits and preferences of consumers and the environment
- will be aware of the nutritional value of chocolate to the health and well-being of consumers

(4) Situations / Contexts of TLA: Business and Industry, Recreation and Leisure

(5) Duration: 3 meetings (2 lessons x 40 minutes each)

(6) Main Contexts of Knowledge

- Consumer Knowledge
- Information & Communication Technology
- Food & Food Technology
- Strategy & Management
- Materials & Structure

(7) Generic Skills

Generic Skills	Activities involved
IT	• Use 2D CAD software to design the development of the package. • Suggest sources for retrieving and criteria for selecting information. • Write up the project folio with IT tools.
Communication	• Present the design solution through graphical, anecdotal and written means. • Compose the printed information on the package.
Numeracy	• Measure size, shape and form, volume.
Critical Thinking	• Realize that the designing of the package is related to a range of factors including marketing, material, production procedures. • Evaluate the solution realized through design / aesthetic critique, comparison with specifications and drop test for the package structure. • Consider and make inquiries related to consumer rights in determining the package and the printed information. • Be aware of the impact of promotional activities upon the habits and preferences of consumers and the environment. • Be aware of the effect of chocolate on the health and well-being of the consumers.
Problem Solving	• Identify the constraints and specifications of the package design. • Design and realize the package design. • Evaluate the solution.
Creative thinking	• Explore ways to protect the chocolate egg from dropping with reference to the material limitation. • Design the package attractive to the clients.
Collaboration	• Consider the clients' needs and consumers' rights in designing. • Be able to develop a caring attitude towards others through the consideration of clients' needs and rights. • Understand that the well-being of our society and natural environment depends on appropriate decisions about the choice of materials, production procedures and promotional strategies.
Self-management	• Show perseverance in realizing the solution. • Be open-minded in accepting the result of the drop test and be

Generic Skills	Activities involved
	willing to improve.
Studying	• Acquire and apply knowledge and understanding about packaging and the properties of paper in designing the solution.

(8) Values And Attitudes

Values
- aesthetics
- rationality
- creativity
- courage
- individuality
- openness
- enterprise
- integrity
- simplicity
- sensitivity
- common good
- sustainability
- tolerance
- culture and civilization heritage

Attitudes
- critical
- creative
- appreciative
- positive
- confident
- adaptive to changes
- with a respect for
  - quality and excellence
  - fair play
- with a desire to learn

(9) Description of Activities

Acting as the Chief Designer of the Marketing Department of ABC Chocolate Company, students will design a promotional package containing ONE chocolate egg for the Easter holiday. Students design and realize the package according to the following requirements:

- Use only one sheet of A3 drawing paper with as little glue as possible in making the package. No adhesive tapes or staples are allowed. (Students need, therefore, to compromise between the stiffness of the structure and the amount of materials used).
- Contain only one egg.
- Be attractive in displaying and showing the egg inside.
- Show the ingredients and nutritional value of the chocolate egg.
- Be able to protect the egg against shock and bumps during transportation.
- The package realized will be tested by dropping it from its corner from the top of the teacher's bench.
- Be easy to open and take out the egg.

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Exemplar IV

(1) Unit: Solar Cooker and Solar Cooking

(2) Level: Secondary 3

(3) Overall Aim: To recognize the use of solar energy and its implications for environmental, social and cultural issues

(4) Learning Focuses:

Through this technology learning activity, students are expected to achieve

(i) Technological Capability

- Use the internet to research on solar collectors and the process of changing light energy into heat energy
- Consider various uses and designs of solar collectors by using the research results
- Develop ideas using drawings, models, discussions, writings, etc.
- Construct the solar cooker using appropriate materials, resources and equipment
- Develop recipes suitable for solar cooking
- Plan and conduct the practical cookery activities
- Use equipment and ingredients in solar cooking safely

(ii) Technological Understanding

- Recognize that different sources of energy would result in different benefits of cost, reliability, performance and environmental effects;
- Identify and appraise the uses of solar energy and solar collectors;
- Understand the differences between conduction, convection and radiation
- Compare solar cooking with conventional cooking methods, e.g. baking, simmering, roasting
- Be able to apply learned knowledge to design recipes for solar cooking, i.e. slow cooking, low temperature cooking / drying
- Realize the importance of safety in constructing the solar cooker and in practical cookery activities

(iii) Technological Awareness

- be aware of the use of solar energy and its implications for the environment
- be aware of the impact of solar energy on individuals and families
- develop a caring attitude to family members by designing healthy, nutritious meals using solar energy for them

(5) Knowledge Contexts:

- Technology and Living
- Information and Communication Technology
- Materials and Structure

(6) Contexts: Home, community and leisure

(7) Generic Skills:

Numeracy

- Perform arithmetic and mathematical operations
- Interpret charts, tables and graphs

IT

- Search for information on the internet
- Select appropriate information relevant to the topic
- Use computers for information processing and data presentation

Collaboration

- Identify various roles in group work and obey rules in a team in project work
- Actively and positively participate in group discussion and activities

Problem Solving

- Develop problem solving strategies
- Carry out simple research

Creative Thinking

- Design and construct a solar cooker
- Plan, create and test recipes for solar cooking

Communication

- Share ideas with classmates and the teacher
- Adapt listening strategies to utilize the verbal and non-verbal content of communication

Critical Thinking

- Interpret and select appropriate information obtained from the Internet
- Make decisions based on conclusions drawn from findings
- Create different new ideas to tackle problems

Study

- Time scheduling and time management, information retrieval and processing, writing, note taking, reading …

Self management

- To develop a sense of responsibility, self-discipline, self-motivation, self-confidence …

(8) Values and Attitudes:

Development of Values

- Open-minded, Self-reflection, Self-discipline, Independence, Creativity

Development of Attitudes

- Participatory, Critical, Creative, Caring and Concerned, Co-operative, Sense of belonging, Responsible

(9) Lateral Linkage with Other KLAs:

Languages:

e.g. demonstrate competence in reading, writing and speaking to provide, distribute or find information

Mathematics:

e.g. handle numerical data and interpret charts, graphs; apply and use illustrations, charts, tables and graphs to complete task

Personal, Social & Humanities:

e.g. show awareness of environmental issues, assess influence on social and cultural aspects

Science:

e.g. identify the different forms of energy, energy transfer, apply and use scientific methods to solve problems

(10) Activity

(i) Learning Objectives:

Students can be expected -

- to search for information using the internet
- to show the appropriate use of solar energy in the home
- to design and construct a solar cooker and develop recipes suitable for solar cooking
- to explain the underlying principles for constructing a solar cooker
- to tell the advantages of using solar energy
- to apply the concepts of recipe development, food handling and work planning in practical activities
- to evaluate and give feedback about their designs for the solar cooker and recipes

(ii) Duration: 10-12 periods

(iii) Brief Description:

- Teacher facilitates students to discuss the use of energy in everyday living
- Teacher discusses the use of solar energy. A number of ways can be used to introduce the concept of collecting solar energy and its uses
- Students are divided into groups to search for information about the solar cooker from the Internet
- Teacher facilitates students to discuss the criteria for the design brief of the solar cooker
- Teacher facilitates students to discuss the criteria for recipe development
- Students are asked to:
  - Search on the internet for information about the history, design and use of solar cooking
  - List the design and construction criteria for the solar cooker. Prepare the working drawing
  - Develop recipes for solar cooking. Prepare a work plan for testing the recipes
  - Record, evaluate and give feedback about the TLA
  - Prepare a presentation to report their work to the class
- Teacher gives feedback to each group and facilitates the students to improve their learning and work throughout the process

(iv) Teaching and Learning Resources:

- IT resources for internet searching and designing
- Materials and equipment for the construction of the solar cooker
- Ingredients and equipment for the development of recipes for solar cooking

(v) Assessment for Learning

Assessment criteria will be set for each case:

- Teacher observes and records the progress of students in this TLA.
- The design and construction of the solar cooker
- The development of recipes for solar cooking
- Testing the recipes using the constructed solar cooker
- A presentation to report the work
- Suggestions for improvement are encouraged

(11) Remarks

This exemplar is modified from a few solar cooker projects successfully implemented in some Hong Kong secondary schools.

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Appendix 6

Appendix 7

Learning Focuses of Technology Education at Different Levels of Schooling

Appendix 7

Learning Focuses of Technology Education at Different Levels of Schooling

Students are encouraged to:

Learning Targets	Primary		Secondary	
	(Focus on Awareness)	(Focus on Exploration & Experiencing)	(Focus on Familiarization)	(Focus on Orientation & Specialization)
I . Technological Capability				
Identify needs, problems and opportunities, their respective constraints and preferences.	• Be aware of their own needs.	• Explore needs in the environment and the possible ways to improve the quality of living.	• Identify needs and / or problems (by means of group discussion, brainstorming, etc.)	• Identify needs and / or problems through empirical studies.
	-	• Be aware of the constraints in addressing the needs.	• Collect relevant information and identify constraints on the problem.	• Collect relevant information, identify constraints and formulate solution(s) to the problem.
	-	• Show concern about the environment in working out the solution(s).	• Reflect concern about the environment and consider the impact in working out the solution(s).	• Identify value stances, aspirations and preferences in working out the solution(s).
Develop, communicate, implement and evaluate solutions creatively.	• Develop ideas and solutions and share them with peers (using drawings, mock-ups, verbal communication, etc.)	• Develop ideas and solutions taking into account factors like the resources available.	• Develop feasible solution(s) taking into account a range of factors including the resources available, the cost and the benefits.	• Model and refine solution(s) taking into account a complex set of specifications.

Learning Targets	Primary		Secondary	
	(Focus on Awareness)	**(Focus on Exploration & Experiencing)**	**(Focus on Familiarization)**	**(Focus on Orientation & Specialization)**
	-	• Plan the steps in working out the solution(s).	• Plan and organize resources in realizing the solution(s).	• Plan, organize and manage the resources in realizing the solution(s).
	-	• Present their ideas and solution(s) with others (in the form of drawings, models, verbal communication, electronic presentations, etc.)	• Communicate ideas and solution(s) with others (in the form of graphics, models, verbal communication, electronic presentations, etc.)	• Organize presentations and communicate ideas/ solution(s) with others effectively.
		• Give suggestions on how to use/improve the solution(s).	• Evaluate the solution(s) from different points of view with reference to the identified requirements.	• Evaluate and justify the solution(s) and predict its impact on others, society and the natural environment.
Make informed decisions in creating, using, and modifying artefacts, systems and environments.	-	• Make choices on the use of technologies.	• Suggest sources for collecting information, setting up criteria, and provide justifications for selection in making decisions.	• Retrieve, select and analyze information to make informed decisions that are ethical and legal.

Learning Targets	Primary		Secondary	
	(Focus on Awareness)	(Focus on Exploration & Experiencing)	(Focus on Familiarization)	(Focus on Orientation & Specialization)
II. Technological Understanding				
Understand the inter-disciplinary nature of technological activities.	-	• Take into account the interrelated nature of real world situations in solving problems.	• Relate knowledge in different areas when carrying out technological activities.	• Relate and apply knowledge in different areas when carrying out technological activities.
Understand the underlying concepts and principles of technological artefacts, systems and environments.	• Develop interest in exploring how technology works.	• Know some concepts and principles of technology.	• Acquire concepts and knowledge through the process of designing/making/evaluating, and apply them in technological activities.	• Acquire concepts and knowledge through the process of designing/making/evaluating, and apply and extend them in technological activities.
Understand and apply the knowledge of processes and resources used in designing, making and evaluating products, systems and solutions.	• Be aware of the functional and aesthetic aspects in designing, making and evaluating.	• Identify the functional and aesthetic requirements in designing, making and evaluating.	• Identify the functions, aesthetic and quality requirements in designing, making and evaluating.	• Develop analytical and critical ability in designing, making and evaluating.
	• Be aware of the availability of suitable and safe technology, materials, tools and processes.	• Identify suitable and safe technology, materials, tools and processes in developing solution(s).	• Apply suitable and safe technology, materials, tools and processes in developing solution(s) and/or marketing product(s).	• Relate knowledge and understanding in developing solution(s) and/or marketing product(s).

Learning Targets	Primary		Secondary	
	(Focus on Awareness)	**(Focus on Exploration & Experiencing)**	**(Focus on Familiarization)**	**(Focus on Orientation & Specialization)**
III. Technological Awareness				
Be aware of the cultural and contextual dependence of technological developments.	• Be aware that there are different solutions for a problem.	• Be aware that the choice of solutions for a problem would vary according to a person's preferences and cultural background.	• Be aware that contexts, preferences and cultural background will affect the choice of solutions in technological activities.	• Observe and make explicit the effects of the problem contexts, people's preferences and cultural background in determining the solution(s) of technological activities.
Respect cultural differences and the rights of others as well as develop a sense of social responsibility in performing technological activities.	-	• Be aware of the cultural differences of others and show respect for their choice of technologies.	• Be aware of the cultural differences and the rights of others, and show respect for their choice of technologies.	• Appreciate the cultural differences and the rights of others, and show respect for their cultures and choice of technologies.
	-	• Be concerned about others when using technology to address needs in everyday life.	• Develop qualities of civic-mindedness and caring for the well-being of others when using appropriate technology to address needs in everyday life.	• Realize and respond to the well-being of others and choose appropriate technology to address needs in everyday life.

Learning Targets	Primary		Secondary	
	(Focus on Awareness)	**(Focus on Exploration & Experiencing)**	**(Focus on Familiarization)**	**(Focus on Orientation & Specialization)**
Be aware that the well-being of oneself, one's family, the society and the natural environment depends upon decisions on how to use technological artefacts and systems appropriately.	• Be aware of the proper ways of using technology.	• State how to use technology properly and safely.	• Comment on the consequences of the use of technology in our lives.	• Justify with reasons why certain products and systems are used in certain situations, and predict the consequences if these products and systems are used in other situations.
Appraise the impact of technology on society and the environment.	• Be aware of the impact of technology on our lives.	• Be aware of the impact of technology on our lives, family, society and the environment.	• Understand the impact of technology on our lives, family, society and the environment.	• Understand and comment critically on the impact of technology on our lives, family, society and the environment.
	• Be aware that technology is changing.	• Be aware that technological advancement builds on existing technology.	• Be aware of the irreversible and accelerating nature of technological advancement.	• Understand that technological development is irreversible and accelerating.
	• Be aware of different choices of technology available.	• Make choice(s) in the use of technology.	• Give justifications for the choice of technology used in daily life and be aware of the need to tradeoff.	• Evaluate the choice of technology used in daily life and understand why some artefacts and systems are promoted while some are constrained in their development.

Appendix 7

Learning Targets	Primary		Secondary	
	(Focus on Awareness)	(Focus on Exploration & Experiencing)	(Focus on Familiarization)	(Focus on Orientation & Specialization)
	-	-	• Understand the historical development of technology, and compare and contrast similar / different technological artefacts and systems.	• Understand and appraise the impact of technology on society and the environment in the past, present and future; and compare and contrast similar / different technological artefacts and systems.