Technology Education

Key Learning Area Curriculum Guide
(Primary 1 – Secondary 3)

Prepared by
The Curriculum Development Council

Recommended for use in schools by
The Education Department
HKSAR
2002

Curriculum Development Documents and Supporting Resources

Learning to Learn –
The Way Forward in Curriculum Development
(2001)

Exemplars of Curriculum Development in Schools

Basic Education Curriculum Guide –
Building on Strengths
(2002)

Key Learning Area Curriculum Guides
(2002)

Chinese Language Education

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Preamble

A series of eight Key Learning Area (KLA) Curriculum Guides (Primary 1 to Secondary 3) and the ***General Studies for Primary Schools Curriculum Guide (Primary 1-6)*** (2002) have been developed by the Curriculum Development Council (CDC) to support the ***Basic Education Curriculum Guide - Building on Strengths*** (2002) and to help realize the recommendations made in the CDC Report on ***Learning to Learn - The Way Forward in Curriculum Development*** (2001) and in the Education Commission's (EC's) education reform final report, ***Learning for Life***, ***Learning through Life*** (2000).

The CDC is an advisory body giving recommendations to the Hong Kong Special Administrative Region Government on all matters relating to curriculum development for the school system from kindergarten to sixth form. Its membership includes heads of schools, teachers, parents, employers, academics from tertiary institutions, professionals from related fields or related bodies and representatives from the Hong Kong Examinations Authority, as well as officers from the Education Department.

The KLA and General Studies (GS) Curriculum Guides are based on the ***Learning to Learn*** consultation documents of the respective KLAs and GS published in November 2000. Relevant KLA committees under the CDC have taken into consideration the concerns, needs and interests of schools, teachers and students as well as societal expectations expressed during the consultation period when developing these Guides.

The KLA and GS Curriculum Guides aim to present curriculum frameworks, which specify the KLAs' or GS's curriculum aims, learning targets and objectives, and provide suggestions regarding curriculum planning, learning and teaching strategies, assessment and resources. In addition, each Curriculum Guide provides exemplars of effective learning, teaching and assessment practices. Schools are encouraged to adopt the recommendations in the Curriculum Guides and to achieve the learning goals of the school curriculum (CDC Report, 2001) and aims of education (EC Report, 2000), taking into consideration their contexts, needs and strengths.

Schools are also encouraged to make cross-reference to the ***Basic Education Curriculum Guide - Building on Strengths*** (2002) and the related subject guides as often as possible. This will ensure that there is a coherent understanding of curriculum planning at school, KLA and subject levels.

As curriculum development is a collaborative and on-going enhancement process,

the KLA and GS Curriculum Guides as well as their related subject guides will be updated and improved from time to time to meet new needs of students and society.

Ideas and suggestions on the development of the Technology Education Curriculum are always welcome and may be sent to:

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Key Messages

Technology Education Key Learning Area (TE KLA)

Technology

- Technology is the purposeful application of knowledge, skills and experiences in using resources to create products or systems to meet human needs.

(Section 1.2.1)

- Technology influences and is influenced by the cultures of people, is part of our daily life and has impact on the individual, family and society.

(Section 1.2.2)

Technology Education

- Technology Education is the entitlement of **EVERY** student. It is the learning of how human beings solve their daily problems and how to replicate and transfer the process to solve new problems that arise from time to time.

(Sections 1.3.1 - 1.3.2)

Existing Subjects under TE KLA

- At the primary level, the content of TE is subsumed in the General Studies curriculum.
- At the junior secondary level, there are a total of 15 subjects which are of diversified orientations to satisfy the different interests and needs of students.

(Sections 1.3.3 - 1.3.5)

Direction for Development

- TE will be moving from a curriculum that provides students with specialized knowledge and skills to one that emphasizes the development of students' understanding of their own aptitudes, interests and abilities for their future studies and work.

(Section 1.4.2)

Aims of TE

TE aims to help students to develop their:

- Technological Capability to identify needs, problems and opportunities;

communicate and evaluate solutions; and make informed decisions

- Technological Understanding to understand the interdisciplinary nature of technological activities; the concepts, knowledge and processes of different technologies
- Technological Awareness to be aware of the cultural and contextual dependence of developing technologies, and their impact on the individual, family, society and environment.

(Section 2.1)

Principles to Guide Actions

- Building on the existing strengths of schools and Hong Kong
- Relating the curriculum to daily life and keeping it abreast of the local economic, industrial and technological changes
- Relating the curriculum to the experiences, interests and inclinations of students
- Providing space for developing students' potentials

(Sections 1.5.1 & 3.2.5)

The Central Curriculum of TE

- The central curriculum helps students develop their *knowledge, generic skills*, and *values and attitudes* through the study of the following three strands:

  Knowledge Contexts in Technology:
  - Information and Communication Technology
  - Materials and Structures
  - Operations and Manufacturing
  - Strategies and Management
  - Systems and Control
  - Technology and Living

  Process in Technology

  Impact of Technology

(Section 2.2.1)

Core and Extensions

- TE is an entitlement of every student as well as a KLA where students can have ample opportunities to develop and excel in areas of their interests and inclinations.

- Core learning elements which every student is expected to study are suggested in the six Knowledge Contexts in Technology .
- For each Knowledge Context, extension learning elements are provided to help students to excel in areas of their own choice.

(Section 2.3)

Emphasis of TE Learning at Different Key Stages

- Key Stages 1 and 2 (P.1 - 6 in General Studies): Awareness and Exploration
- Key Stage 3 (S.1 - 3): Exploration, Experiencing and Familiarization
- Key Stage 4 (S.4 - 5) and beyond: Exploring Orientation for Life-long Learning and Specialization

(Sections 1.4.4 & 2.5)

School-based Curriculum Development

- Considerations
  - Vision and mission of the school as well as those of its sponsoring body
  - Strengths of the school and its teaching force
  - Background and learning needs of students
  - Resources of the school

- Phases of school-based curriculum planning
  - Subject-based learning
  - Aligning existing subjects
  - Collaborative teaching of subjects
  - Theme-based learning
  - Life experiences of students

(Sections 3.2.5-3.2.10)

Learning and Teaching

- The learning and teaching of TE should:
  - be purposeful
  - be progressive and iterative in nature
  - involve the coordination of the mind (problem-solving) and hands (hands-on experiences)
  - integrate the different knowledge contexts in TE
  - nurture in students the basic knowledge, skills and attitudes for life-long

learning

- enable the pursuit of excellence in specialized fields for students with interest or talent in TE

(Section 4.1.1)

Short Term Targets

- Enhancing student learning: from skill-based or content-based teaching towards learning and teaching for a balanced development of technological capability, understanding and awareness
- Broadening TE learning through life-wide and life-long learning

(Section 1.5.2)

(Refer to ***Basic Education Curriculum Guide - Building on Strengths*** (2002) for more information on various curriculum matters.)

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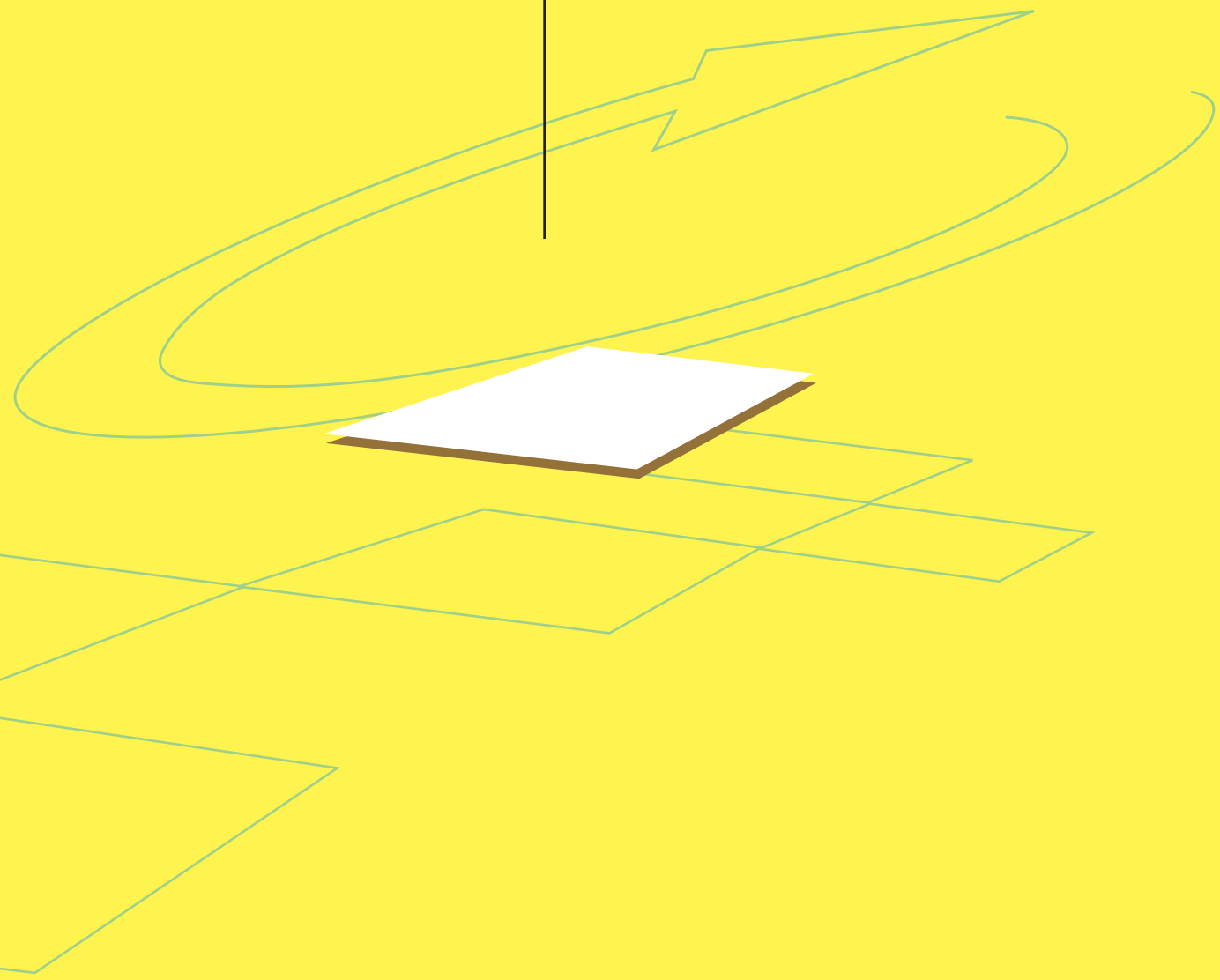
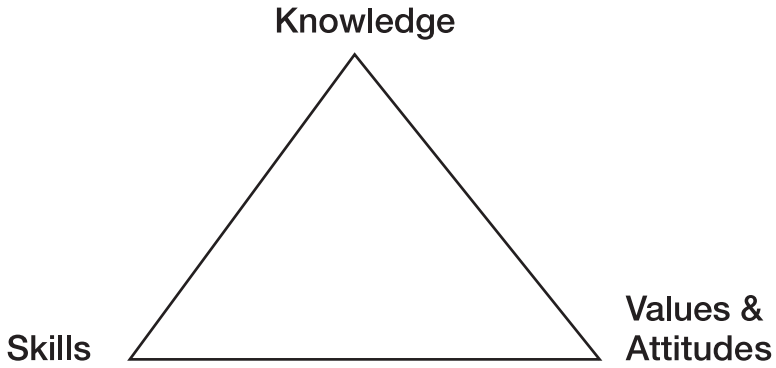


Chapter 1 Introduction

This ***Technology Education Key Learning Area Curriculum Guide (Primary 1 - Secondary 3)*** (2002) is to be used in conjunction with the ***Basic Education Curriculum Guide - Building on Strengths*** (2002), the existing 15 Technology Education (TE) subject syllabuses (Secondary 1-3) and the ***General Studies for Primary Schools Curriculum Guide (Primary 1-6)*** (2002). This Guide helps schools to move from the existing subject orientation towards a balanced TE curriculum framework and its associated curriculum planning.

1.1 What is a Key Learning Area (KLA)?

A Key Learning Area is an important part of the school curriculum. It is founded on fundamental and connected concepts within major fields of knowledge which should be acquired by all students. A KLA provides a knowledge context for the development and application of both generic skills (e.g. creativity, skills of communication, critical thinking and collaboration) and subject-specific skills, positive values and attitudes through appropriate use of learning and teaching activities and strategies. It serves as a context for the construction of new knowledge and the development of understanding. The studies offered in each KLA may have an academic, social or practical orientation or a combination of these, depending on their purpose(s). They can be organized into subjects, modules, units, tasks or other modes of learning. The interrelationships among Knowledge, Skills, and Values and Attitudes are depicted below:



1.2 Overview of Technology

1.2.1 In the context of this Guide, technology is defined as the purposeful application of knowledge, skills and experiences in using resources to create products or systems to meet human needs. Technologies have been employed and constantly improved over time to satisfy basic human needs in various aspects of daily life:

In clothing:

Using natural materials such as animal skin
↓
Weaving with silk and cotton
↓
Production of synthetic fabrics such as nylon and polyester

In food:

Primitive hunting and fishing
↓
Organic farming
↓
Production of genetically modified food

In shelter:

Living in caves and igloos
↓
Using wooden pillars and beams in traditional Chinese architecture and marble in ancient Greek architecture
↓
Using pre-fabricated building parts in intelligent buildings

In transportation:

Carriages drawn by horses
↓
Trains powered by steam engines
↓
Magnetic floating trains

1.2.2 Technology influences and is influenced by the cultures of people, and is part of our daily life. It has different impact on the individual, family and society. The inventions and innovations of technology influence the development of human civilizations, affecting and changing interactions among people, organizations, artefacts, etc.

1.2.3 Technology also constitutes an influential factor in the social and economic development of our society. The milestones in technological development often bring about a rearrangement of values and beliefs as well as a change in the social, economic and political structures of our society.

- **Paper making** and **printing** facilitate the keeping of records, the passing on of knowledge and the process of communication.
- The **compass** makes exploration of the world more feasible, resulting in a greater mobility.
- Development in **information technology**, for example, from the abacus to the computer, has resulted in great leaps forward in the processing of data and information.

1.3 Position of the Technology Education Key Learning Area in the School Curriculum

1.3.1 TE is one of the eight KLAs that each student is entitled to study. It provides students with the essential knowledge contexts that are related to the improvement of everyday living, and the social and economic development. TE helps to keep Hong Kong abreast of technological advancement in the world. The contexts within which technology operates include areas like home, design, food, business and finance, information and communication, etc. which should be updated whenever required.

1.3.2 TE learning experiences focus on how human beings solve their daily problems and how the process could be replicated and transferred to solve new problems that arise from time to time. Hence TE is also an effective platform for nurturing the problem-solving skills, creativity and critical thinking skills of students. TE helps students to develop the knowledge and skills for further studies, for work, or both, as well as cultivate their attitude as life-long learners for the betterment of their adult life.

1.3.3 The existing school subjects under the TE KLA listed in Figure 1 are of diversified orientations, such as academic, practical and vocational. They provide the strengths, experiences and basis for Hong Kong schools to move gradually towards a balanced study of knowledge, key concepts, skills, values and attitudes promulgated in the TE KLA to satisfy the diverse interests and needs of students. Some subjects will be phased out and new ones phased in, to be in line with the changes in the school curriculum and structure.

Figure 1 Subjects under Technology Education Key Learning Area

	S.1-3		S.4-5		S.6-7
Groups of Subjects	**Existing Subjects**	**Existing Subjects Proposed to be Phased out/be Replaced**	**Existing Subjects**	**Existing Subjects Proposed to be Phased out/be Replaced**	**Existing Subjects**
Business Subjects	Business Fundamentals		Principles of Accounts		Principles of Accounts (AL)
			Word Processing & Business Communication (English)		
	Retail Merchandising				
			Commerce		
					Business Studies (AL)
Computer Education	Computer Literacy		Computer Studies	To be replaced by Computer and Information Technology	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 (Alternative Syllabus)		Design & Technology (Alternative Syllabus)		
	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		

1.3.4 At the primary level, the content of TE is subsumed in the General Studies (GS) curriculum together with the related contents of the Personal, Social and Humanities Education (PSHE) and Science KLAs. The total suggested **time allocation for GS is 12% - 15%.**

1.3.5 At the junior secondary level, the existing TE curriculum is subject-based and has a suggested **time allocation of 8% - 15%**. The government has provided additional resources to a number of schools where technology subjects are better vehicles for the development of students' generic skills and of values and attitudes, and suit their specific interests and aptitudes. In these schools, the **time allocation for TE is 25% - 35%** and the lesson time, in terms of percentages allocated to other KLAs, could be adjusted accordingly.

1.4 Rationale and Direction for Development

1.4.1 Rationale for development in TE

- There is an urgent need to prepare students to meet the challenges of a rapidly changing world and to maintain Hong Kong's competitive edge in the Asia-Pacific Region and in the world.
- TE subjects are introduced at different points in time with different emphases to meet the social needs of that particular time. The timely updating and reorganizing of the TE curriculum would keep TE learning in pace with the technological and social development and thus helps to prepare students for their adult life.
- The provision of various TE learning experiences to students in different schools gives them the opportunities to develop their potentials to the fullest.
- Recently students have been given many opportunities to develop basic skills in information technology. More space might now be given for students to acquire and construct knowledge in other areas of TE.
- The existing TE subjects such as Home Economics, the subjects of the New Technical Curriculum and school-based curriculum innovations which have emerged recently have provided a good basis to develop the technological literacy[1] in students.

[1] Technological literacy is the cultivation of technological capability, technological understanding and technological awareness to deal with the challenges of the future. This is further elaborated in Chapter 2 in Section 2.1.1.

1.4.2 Direction for development in TE

- From acquisition of easily outdated discipline-based knowledge and skills to understanding of broader technological contexts to keep abreast of changes in the world.
- From a choice between academic or vocational studies to a judicious balance of academic and practical studies for solving daily life problems, for life-long learning and for work.
- From acquisition of trade-specific skills to application of generic skills in new situations to develop creativity, critical thinking and problem-solving skills.
- From a subject-based curriculum to diversified modes of curriculum planning based on the strengths of schools, and the needs and interests of students.

1.4.3 The aims and design of the TE curriculum, from primary to junior secondary and then to senior secondary level, should be coherent, continuous and progressive, in accordance with the social and cognitive development of students.

1.4.4 The emphasis of TE at different Key Stages (KSs) is:

At the primary level, KS1 & KS2:

- *"Awareness and Exploration"*.

Example 1 Emphasis on Awareness and Exploration

In playing with battery-powered cars or lightweight model planes powered by elastic rubber bands, students learn about sources of energy and their characteristics. They can explore the amount of energy provided by a different number of batteries, by the number of turns given to the elastic rubber band, or by rubber bands with different elasticity. They can experience how technology works and how cars or planes are designed so that the amount of energy provided is not wasted. Through these activities, students develop their interest and curiosity in technology, and their ability to appraise technological products critically.

At the junior secondary level, KS3:

- *"Exploration, Experiencing and Familiarization".*

Example 2 Emphasis on Exploration, Experiencing and Familiarization

In TE classes at the junior secondary level, students learn about the characteristics of energy supplied through the mains (the gas and the electricity). Through hands-on activities, they learn about the convenience of having these energy supplies, how gas and electricity are used to power our household appliances to improve our quality of life, and the potential hazards and related safety issues associated with their use. Students will learn to act sensibly, and know what to do and what not to do when there is a gas leak. The activities may be modified to cater for the different needs of students.

On progressing into senior secondary, KS4:

- *"Exploring Orientation for Life-long Learning and Specialization".*

Example 3 Emphasis on Exploring Orientation for Life-long Learning and Specialization

In their further studies on energy sources, students acquire knowledge about how the power generated by the different energy sources can be controlled, how the efficiency can be maximized, and how the design and control concepts can be integrated to develop systems or products to satisfy identified needs. Students learn to see the global nature of different sources of energy as they explore them. They acquire concepts pertaining to sustainable development as they examine the world energy consumption and the current energy crisis. They develop their communication and information processing skills as they explore and disseminate information pertaining to these issues. Through the process of learning TE, students are better equipped for future study and work.

1.5 Strategies for Development

1.5.1 In adopting strategies for the development of a TE curriculum, schools need to ensure that:

- The development is gradual, starting small, based on the strengths of existing subjects such as Design and Technology, Computer Literacy, Home Economics and the New Technical Curriculum subjects, and linking up common learning elements among them.

- Generic skills are infused into the learning and teaching of TE.
- Life-wide learning opportunities are provided to bring about exposure to a wide variety of technologies and to ensure that the learning is up to date.
- The key tasks such as project learning, reading to learn and information technology for interactive learning are used to promote technological awareness, understanding and capability.
- Schools could build on their strengths and use different modes of curriculum planning to provide a more balanced TE curriculum, shifting the emphasis from rigid subject-based contents and trade-specific skills towards a more open, flexible and updateable curriculum.
- Schools should choose the contexts, contents, and learning and teaching strategies, and activities most suited to the needs and interests of students.

1.5.2 In the **short term (2001-02 to 2005-06)**, students and teachers are expected to:

Our Students	Our Teachers
Primary 1 - Primary 3	
Please refer to ***General Studies for Primary Schools Curriculum Guide (Primary 1-6)*** (2002)	Please refer to ***General Studies for Primary Schools Curriculum Guide (Primary 1-6)***(2002)
Primary 4 - Primary 6	
Please refer to ***General Studies for Primary Schools Curriculum Guide (Primary 1-6)*** (2002)	Please refer to ***General Studies for Primary Schools Curriculum Guide (Primary 1-6)***(2002)
Secondary 1 - Secondary 3	
• Engage in authentic, hands-on problem-solving learning activities using easily available materials and equipment • Develop their knowledge and skills to cope with rapidly emerging technologies • Develop their willingness to update their knowledge and skills in technology from time to time • Appraise the impact of technology and develop critical thinking ability	• Move away from subject-based teaching and specific skills training to hands-on problem-solving teaching • Integrate student learning within TE KLA and with other KLAs through different subjects • Provide life-wide learning experiences to students • Encourage students to appraise their solutions • Use a variety of methods to assess students' learning processes and outcomes

1.5.3 In the **medium term (2006-07 to 2010-11)**, at the junior secondary level, schools are expected to offer a broad and balanced TE curriculum which nurtures generic and transferable skills and provides a strong foundation in TE for students to continue their studies in TE or other KLAs at the senior secondary level. At the senior secondary level, schools are expected to specialize in areas in which their students and teachers do well.

1.5.4 In the **long term (beyond 2011)**, TE prepares students for life in the ever-changing world by developing their technological capability, understanding and awareness so that they are enabled to apply and appraise technological innovations and create them themselves.

1.6 Structure of the Guide

Chapter 1 sets out an overview of Technology and Technology Education (TE), and the direction and strategies for development in TE.

Chapter 2 defines a TE curriculum framework.

Chapter 3 provides suggestions on the planning and organization of a TE curriculum at the primary and junior secondary levels and the principles and strategies for planning a school-based TE policy.

Chapter 4 focuses on the principles and strategies of organizing learning and teaching in TE.

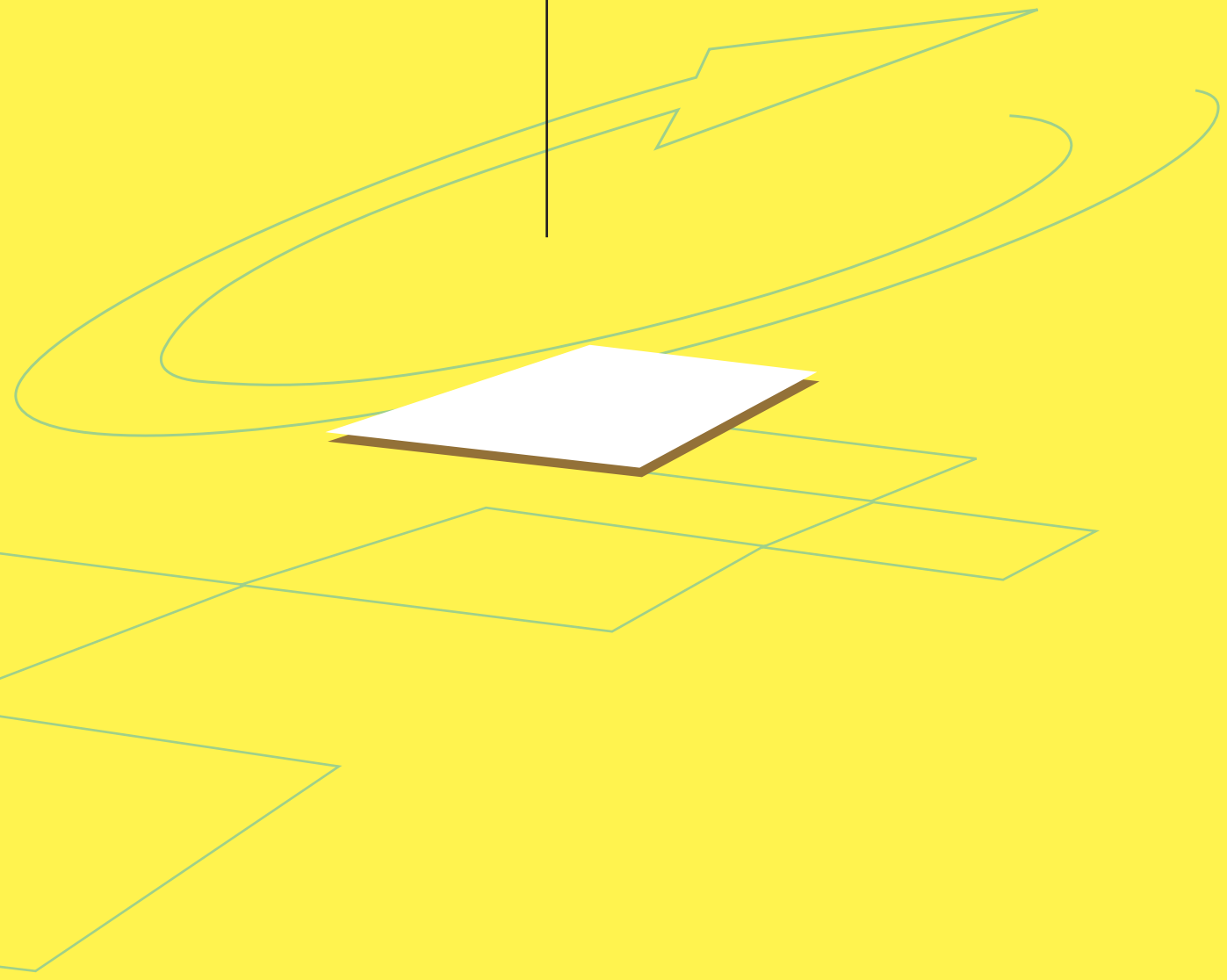
Chapter 5 focuses on the guiding principles and strategies for assessment in TE.

Chapter 6 provides information on the learning and teaching resources for TE.

The exemplars and appendices illustrate the points made in the guide, wherever appropriate, for the reference of readers.

Chapter 2

Curriculum Framework



The Hong Kong School Curriculum

Chapter 2 Curriculum Framework

Booklet 1, ***Basic Education Curriculum Guide - Building on Strengths*** (2002) provides relevant information on the curriculum framework.

2.1 Curriculum Aim of Technology Education

2.1.1 Technology Education (TE) aims to develop technological literacy in students through the cultivation of *technological capability*, *technological understanding* and *technological awareness*. TE provides students with the opportunities to acquire the essential knowledge and concepts, learn the process and skills, and be aware of the impact of technologies in improving everyday living, enhancing social and economic development, and keeping Hong Kong abreast of the technological advancement. Through TE, students are enabled to:

Technological Capability

- develop their abilities in identifying needs, problems and opportunities, their respective constraints and preferences
- develop, communicate, implement and evaluate solutions creatively
- develop their abilities in making informed decisions in creating, using and modifying artefacts, systems and environments

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 process and resources used in designing, making and evaluating products, systems and solutions

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, 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

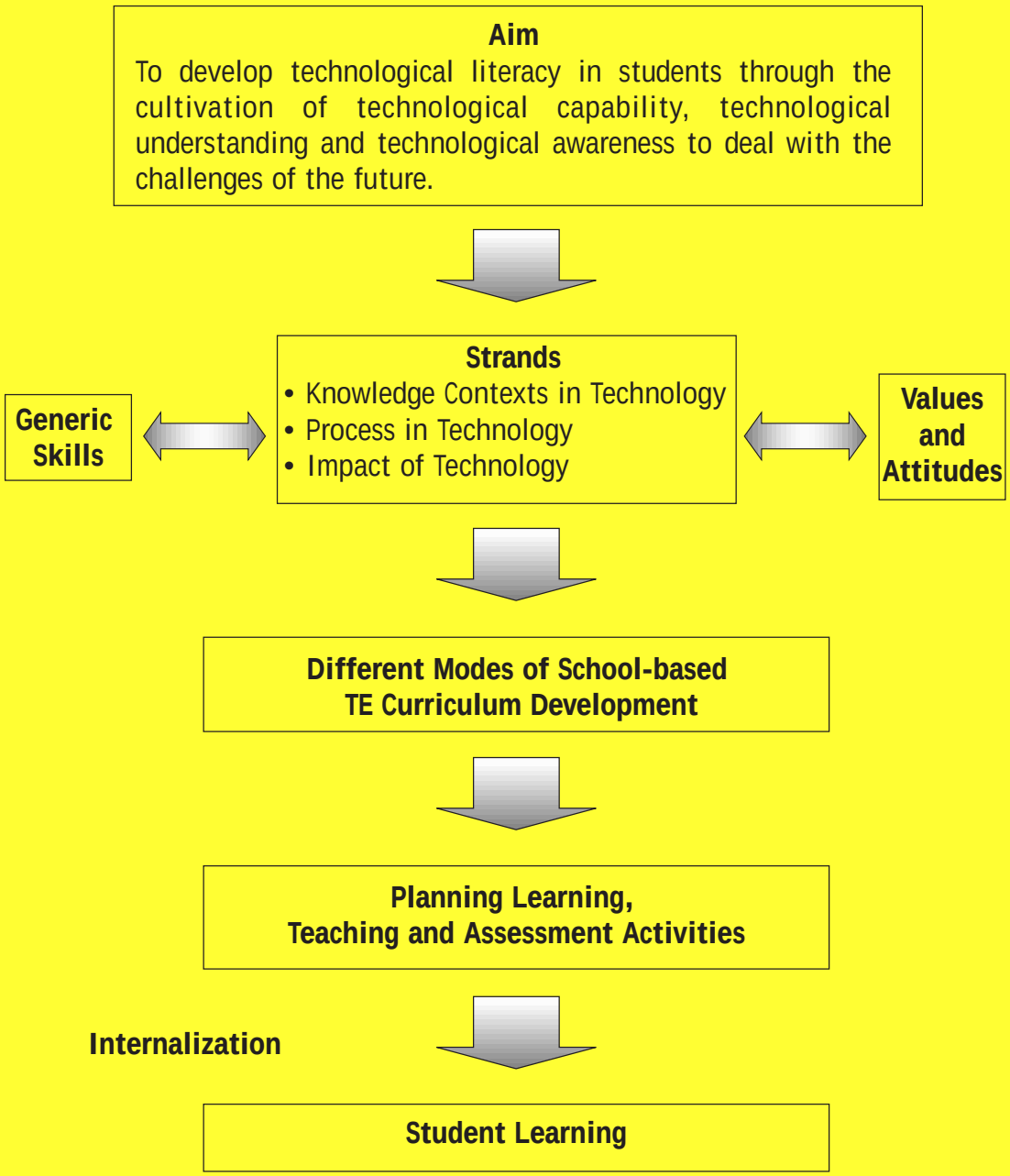
2.2 The Curriculum Framework

The curriculum framework for TE is the overall structure for organizing learning and teaching for the subjects of TE. The framework, shown in Figure 2, comprises a set of interlocking components including:

- subject knowledge and skills, which are expressed in the form of learning targets under the Strands of Knowledge Contexts in Technology, Process in Technology and Impact of Technology, as well as learning objectives;
- generic skills; and
- positive values and attitudes.

The framework sets out what students should know, value and be able to do at various stages of schooling. It gives schools and teachers flexibility and ownership to plan and develop different curriculum modes according to the strengths of the schools and the learning needs of their students.

Figure 2 **Technology Education Curriculum Framework**



2.2.1 Strands, Learning Targets and Learning Objectives

Strands

Strands refer to the categories of **Knowledge and Concepts** that should be acquired by students in a Key Learning Area (KLA).

In TE, students achieve the aims of TE learning, develop their generic skills and nurture their values and attitudes through the study of the following three strands:

(A) Knowledge Contexts in Technology
(B) Process in Technology
(C) Impact of Technology

(A) Knowledge Contexts in Technology

Knowledge Contexts refer to a broad base of learning elements in TE which could be updated as necessary to keep students abreast of the rapidly emerging changes in technology. They provide the contexts for the development of technological capability, understanding and awareness in students. These contexts should preferably be:

- related to local business, industries or daily life,
- updated and in line with current scientific and technological development,
- related to the experiences and interests of students, etc.

In the current Hong Kong context, the following six knowledge contexts are considered essential for TE:

(i) Information and Communication Technology (ICT):
ICT has become the prime tool for learning and is now part of our daily life.

(ii) Materials and Structures:
Whether as a consumer or technologist, an understanding of materials and resources is essential and constitutes an important first step in the design process.

(iii) Operations and Manufacturing:
It is important that students acquire the necessary skills to manage the resources and processes required to realize their design solutions.

(iv) Strategies and Management:

As Hong Kong is an important international centre of trade and finance and a logistic hub of the region, it is essential that our students be equipped with the concepts of business and management.

(v) Systems and Control:

Systems, both at the micro and macro levels, are all around us - in the home, in education, at work, etc. Our students need to have a good understanding of the concepts, applications and implications of systems.

(vi) Technology and Living:

Technology affects our lives and enhances the nurturing of quality people and quality homes.

The six knowledge contexts of TE learning provide the platforms for the organization of student learning. In Basic Education, Primary 1 to Secondary 3 (P.1-S.3), after taking the TE learning targets and the curriculum of existing subjects into consideration, a list of learning elements under the six knowledge contexts are developed for schools' reference. Of these learning elements, five, i.e. "Technology and Society", "Safety and Health", "Information Processing and Presentation", "Design and Applications" and "Consumer Education" are considered common to the six knowledge contexts. Details are depicted in Figure 3.

Knowledge contexts are vehicles for student learning. Through study in various knowledge contexts and through engaging in a range of learning activities, students will acquire technological concepts and knowledge and develop an understanding of the process of technological development and an awareness of the impact of technology on individuals, family, society and the environment.

Figure 3 **Learning Elements under Knowledge Contexts in Technology Education**

Information & Communication Technology	Materials & Structures	Operations & Manufacturing	Strategies & Management	Systems & Control	Technology & Living

Technology & Society

- Legal issues
- Ethical issues
- Environmental issues
- Health issues
- Changes in lifestyle

Safety & Health

- Protective clothing
- Choice, use and care of tools, equipment and chemicals
- Working attitude
- Good housekeeping of work area

Information Processing & Presentation

- Computer and computer operation
- Application of information technology (IT)
- Information processing and information processing tools
- Issues related to the use of IT

Design & Applications

- Basic elements of design
- Design process
- Design consideration
- Fashion design
- Product design
- Cost-benefit analysis

Consumer Education

- Consumers' rights and consumers' choices
- Consequences of consumers' actions

Information & Communication Technology	Materials & Structures	Operations & Manufacturing	Strategies & Management	Systems & Control	Technology & Living
Computer Systems • Hardware and software • Properties and functions of usual components **Computer Networks** • Usual components of a computer network • Use of computer networks • Internet activities **Programming Concepts** • Problem-solving procedures and techniques • Ideas of a stored programme • Data manipulation	**Materials & Resources** • Types and nature of common materials • Material properties and testing • Appropriate application of resources for design work • Reuse and recycle of resources **Material Processing** • Processing of materials - removal, forming, joining and finishing • Appropriate choice and use of material process **Structures & Mechanisms** • Simple properties of structure and movement • Different structural design for various needs • Use of mechanisms for transmission and control of movements	**Tools & Equipment** • Safe use of tools and equipment • Appropriate choice and use of tools, equipment and machines for realization of design solutions **Production Process** • Production process in various fields • Factors and constraints in choosing production process • Skills, procedures and resources for production process **Project Management** • Planning and organizing work in steps or procedures • Cooperation and coordination with individuals in projects: decision-making, planning, organization, control and evaluation procedures	**Business Environments, Operations & Organizations** • Business environments-economic, technological, cultural & physical, social-political-legal • Different types of business organizations • Decision making, planning, organization, control, evaluation, and quality assurance in business operations and projects **Resources Management** • Financial budgeting (personal & company) and reporting • Scheduling of resources • Human resources **Marketing** • Market research • Promotion campaigns • Customer services • Quality assurance	**Concepts of System** • Input, process and output • Open loop and closed control system • System components **Application of Systems** • Mechanical, electrical, electronic and pneumatic control systems • Model control systems **System Integration** • Interconnection of systems and sub-systems **Control & Automation** • Contemporary products • Control for automation • Computer-aided manufacturing (CAM)	**Food & Nutrition** • Food groups • Dietary goals & eating habits • Meal planning **Food Preparation & Processing** • Hygiene & safety • Principles of food preparation & processing • Skills in food preparation & processing **Fabric & Clothing Construction** • Choice of fabric in relation to the design & construction • Pattern and garment construction **Fashion & Dress Sense** • Fashion trend & development • Choice of clothing for different considerations **Family Living** • Family relationship **Home Management & Technology** • Management of family resources & budgeting • Food technology • Energy saving devices

(B) Process in Technology

The ***Process in Technology*** enables students to gain experiences in developing, evaluating, and refining ideas to solve technological problems. It also encourages the creation of innovative designs and the realization of these designs to meet human needs.

Technological development always starts with a purpose in mind: to create a hunting tool, a shelter to keep away from bad weather, a system to store a large amount of information which can be retrieved easily, etc.; followed by the design of artefacts and systems; the search for appropriate materials and the trying out of the design to see whether it fulfills the intended purpose. In most cases, more than one solution will emerge and we have to assess the effectiveness of each so as to make the best choice.

This ***"Process in Technology"*** is at the heart of TE, enabling students to acquire generic and transferable skills to develop further innovative technologies.

(C) Impact of Technology

Studying the ***Impact of Technology*** develops an awareness of the consequences of technological development and their applications. Students come to see how the beliefs, social values and ethics of individuals and groups influence and are influenced by such development.

Students should not be blind followers of new technologies. They should be provided with opportunities to assess the ***"Impact of Technology"*** on themselves, their families, society and mankind; and to cultivate a global outlook towards innovative technological development.

The Learning Targets

Through various stages of schooling, students will develop their technological literacy by studying the three strands of TE learning and using the six knowledge contexts as the platform for their learning. It is anticipated that:

- On completion of the ***primary level*** (i.e. Key Stages 1 & 2), students will have:
  - developed an interest and curiosity in exploring everyday needs and in thinking of ways to respond to these;
  - understood the importance of good eating habits, personal hygiene and safety and found ways of maintaining these;
  - understood the concepts and processes involved in the design cycle and applied

them to solve simple problems
- developed an awareness of how the business world operates and of consumer rights and responsibilities

- On completion of the ***junior secondary level*** (i.e. Key Stage 3), students will have:
  - mastered basic skills in the use of their minds and hands to solve everyday problems and developed an understanding of how to use technologies appropriately
  - adopted a healthy lifestyle and maintained good family relationships
  - developed a basic understanding of the business world and of how to manage their personal finances
  - become socially aware decision-makers who care about public morality and the environment

- Students who have a ***special interest*** in technology and a talent for it will have:
  - developed a more in-depth understanding in particular areas of technology, such as control and automation, project management, computer networks, etc.
  - integrated various TE learning elements within their knowledge framework and understood their inter-relationships
  - mastered the knowledge and concepts underpinning some applications of technology

The Learning Objectives

The six knowledge contexts are the platforms to organize student learning aiming at developing students' concept and knowledge of technologies, process in technology, impact of technology, generic skills, values and attitudes. The proposed learning objectives categorized under the six knowledge contexts at Key Stages 1 - 3 (KS1 - KS3) are outlined in Figure 4.

As a short-term development, these proposed learning objectives would be tried out and further modified in schools through various school-based projects. Good practices would be disseminated to schools from time to time. For KS1 and KS2, references can be made to the ***General Studies for Primary Schools Curriculum Guide (Primary 1-6)*** (2002).

Figure 4 **Learning Objectives at Different Stages of Learning**

Knowledge Contexts	Learning Elements	KS1 Primary 1-3
Common Topics	Technology & Society	• Be aware that technology is closely connected to activities in daily life • Be aware of the functional and aesthetic aspects of technological products
	Safety & Health	• Know the importance of and the ways of maintaining personal hygiene and safety • Exercise self-discipline in managing one's hygiene and safety in daily life situations • Show concern about the safety issues when using technology
	Information Processing & Presentation	• Know how to operate computers and the related devices • Be aware of the wide applications of IT in our everyday life

	KS2 Primary 4-6	KS3 Secondary 1-3
	• Be aware of and concerned about the beneficial and harmful effects of the use of technology to mankind and the environment • Accept that it is one's responsibility to make sound judgments on the use of technology • Be aware of the latest developments in technology	• Appraise the impact of technology (direct and indirect, short-term and long-term, etc.) on our personal and social lives, the structure and economy of society, the natural and man-made world, etc. • Understand issues related to the use and advancement of technology, including legal, ethical, environmental and health issues, as well as issues related to a change in life style
	• Know the factors affecting one's health and safety, and ways to maintain health and manage risks • Analyse relevant information and make informed decisions on personal health • Understand the importance of community health	• Understand and apply safety precautions and regulations in handling tools, equipment and resources in technological process • Be aware of the need to take into consideration safety precautions in planning the design process • Be aware of current issues on health • Know the responsibilities of a business in providing a safe environment to its employees, customers, and third parties • Know how to release stress and physical fatigue in the office environment
	• Develop skills to access, process and present information, including sending and retrieving e-mail, and accessing information on the Internet • Use IT tools or software packages to support learning • Show concern about issues related to the use of IT	• Understand basic concepts related to the use of information technology and the computer • Develop the capability to process and present information independently or collaboratively with peers • Be aware of the validity and reliability of information, and be able to verify and evaluate the accuracy and reliability of information

Knowledge Contexts	Learning Elements	KS1 Primary 1-3
	Design & Applications	• Design and make artefacts with commonly available resources • Develop interests and curiosity in knowing how things work • Be aware of the functional and aesthetic aspects in a variety of designs and products
	Consumer Education	• Be aware of consumers' rights and responsibilities
Information & Communication Technology	Computer Systems	• Be aware of the different components of a computer and their functions
	Computer Networks	
	Programming Concepts	

	KS2 Primary 4-6	KS3 Secondary 1-3
		• Be aware of intellectual property rights, data privacy issues, etc. and observe the rules and regulations in handling information • Know how to apply good communication and presentation skills to influence and obtain the desired responses from the intended audience
	• Recognize the concepts used in the design cycle and apply them in solving problems • Understand the functional and aesthetic requirements in design and project work • Design and build models by using different materials and test the selected functional characteristics of the models built	• Develop and evaluate a product or a system according to the functional, aesthetic and other standards • Know how to apply cost-benefit principles to technological processes
	• Identify the rights and responsibilities of a consumer • Be aware of the impact of advertising and other forms of promotion	• Recognize the role and functions of the Consumer Council • Make rational consumer decisions
	• Know the meaning of hardware and software and be able to make a distinction between them	• Choose the appropriate hardware and software to perform specific tasks
	• Know the meaning of a computer network • Appreciate the importance and the wide applications of computer networks	• Develop skills to perform a variety of Internet activities
	• Know the meaning of programmes and data and be able to make a distinction between them	• Be aware of the approaches used in solving problems • Develop skills to solve problems systematically • Know how to develop simple programmes to solve problems

Knowledge Contexts	Learning Elements	KS1 Primary 1-3
Materials & Structures	Materials & Resources	• Identify some common materials and know their uses in daily life
	Material Processing	• Design and make artefacts with common materials
	Structures & Mechanisms	• Recognize some characteristics of movement
Operations & Manufacturing	Tools & Equipment	• Be aware of the importance of working with tools safely • Understand how to use small hand tools properly
	Production Process	

	KS2 Primary 4-6	KS3 Secondary 1-3
	• Classify materials by their properties and sources • Explore the physical properties of different materials	• Understand the physical properties of a range of materials • Choose and make use of suitable materials and resources for design and project work • Be concerned about the use and disposal of materials that may affect the natural environment • Understand the importance of reusing and recycling resources for the sustainable development of our society
	• Understand that different materials and resources could be processed to suit various needs	• Choose and use appropriate tools and machinery for material processing • Understand common material processing procedures such as cutting, forming and finishing • Be aware of the need to minimize damage to the environment during processing of materials
	• Be aware that different structures and mechanisms can enhance the functionality of various designs to suit different needs	• Make use of structural and mechanical properties of different materials and devices for design and project work • Understand that different structural designs can lead to different loading capacities • Make use of different mechanisms to enhance the functionality of various designs
	• Choose and use the appropriate tools and equipment for working with common materials and information	• Use tools, machines or equipment to process various materials, energy and information • Apply tools, machines or equipment for the realization of design solutions
	• Be aware of the production process in various fields • Be aware of various factors and constraints in the production process	• Understand the factors in selecting various process for designing and making products • Understand a range of materials in the forming and removal processes

Knowledge Contexts	Learning Elements	KS1 Primary 1-3
	Project Management	• Be aware of the importance of planning and organizing work into steps or procedures for given tasks
Strategies & Management	Business Environments, Operations & Organizations	
	Resources Management	
	Marketing	

	KS2 Primary 4-6	KS3 Secondary 1-3
		• Understand a range of materials in the joining and finishing processes • Manipulate the tools and equipment in various production processes
	• Understand and apply concepts related to planning and organizing the working procedures in formulating solutions	• Cooperate with individuals in projects and in decision-making, planning, organization, control and evaluation
	• Be aware of how innovative ideas could serve others via businesses • Be aware of how innovative ideas could be commercialized and protected by law	• Know the business environments and different types of business organizations • Be aware of how to set up a business after identification of its missions and long-term objectives • Understand the importance and procedures of decision making, planning, organization, control, evaluation, and quality assurance in business operations and projects
	• Be aware of the importance of effective and efficient deployment of resources in achieving the specific goals of a project • Be aware of how innovative ideas could be developed to be commercial products by means of venture capital	• Know how to handle money, e.g. bank notes, electronic money, etc. wisely for self and the accounts of organizations such as class associations • Understand how to prepare and control simple budgets and reports for managing one's own resources and business projects • Be aware of the importance of effectiveness and efficiency in sourcing and deploying resources, including human resources, to pursue business goals
	• Be aware of the difference between technical feasibility and commercial viability of development projects • Be aware of the importance to communicate with end users and business partners	• Understand the basic tools used in market research and know how to find out others' needs • Be aware of how to plan and implement a promotion campaign • Be aware of the importance of always providing quality customer service and obtaining feedback from customers

Knowledge Contexts	Learning Elements	KS1 Primary 1-3
Systems & Control	Concepts of System	
	Application of Systems	
	System Integration	
	Control & Automation	

	KS2 Primary 4-6	KS3 Secondary 1-3
	• Recognize some patterns and phenomena related to light, sound, electricity and movement	• Identify the stages of a control system as input, process and output • Understand the concept of open loop and closed loop control system • Understand the functions of system components
		• Understand the use of mechanical, electrical, electronic and pneumatic tools in control systems • Use construction kits to model control systems • Design systems and sub-systems
		• Explain how different types of systems and sub-systems can be interconnected to achieve a particular function • Identify and illustrate ways for combining interrelated systems (software applications, structures and/or mechanisms) to create a new system which may also be connected with other systems
		• Recognize various applications of control and automation technologies in existing products, e.g. robotics, pollution monitoring systems, automation, remote sensing, etc. • Use electronics, microprocessors and computers to control automation • Appreciate the advantages and limitations of computer-aided manufacturing (CAM)

Knowledge Contexts	Learning Elements	KS1 Primary 1-3
Technology & Living	Food & Nutrition	• Be aware of the importance of food to health
	Food Preparation & Processing	
	Fabric & Clothing Construction	
	Fashion & Dress Sense	
	Family Living	• Treasure harmonious relationships with family members, peers and others
	Home Management & Technology	• Be aware of the use of technology in solving problems at home

	KS2 Primary 4-6	KS3 Secondary 1-3
	• Develop healthy eating habits	• Be aware of the importance of a healthy lifestyle, including nutrition and a balanced diet, to personal development
	• Be aware of the importance of food preparation and processing in daily life	• Understand the principles of food preparation and processing • Apply skills in food preparation and processing
	• Explore the properties of fabric in relation to their suitability for different purposes	• Identify the characteristics, care and suitability of different fabrics • Generate ideas and process materials to make simple products to meet identified needs
		• Appreciate the functional and aesthetic aspects of a design • Know how to equip one's wardrobe for different activities
	• Be aware that one's action may have positive or negative consequences on oneself or others • Enhance relationships with family members and peers while developing assertiveness skills	• Participate actively and responsibly as individuals and family members • Promote and maintain harmonious relationships in the family
	• Show concern and readiness to take care of the home	• Manage time, human and physical resources to make a quality home • Take actions in conserving resources

2.2.2 Development of Generic Skills through Technology Education

Generic skills[2] are transferable skills that can help students in the learning of different subjects or contexts, and more importantly, enable them to develop themselves as efficient life-long learners and workers. It is important to note that students develop their generic skills through learning TE. Generic skills should not be something to be added on to the learning and teaching of TE.

At the present stage, the priority will be on the development of three generic skills, namely *communication skills, creativity* and *critical thinking skills*. As technology itself involves a problem-solving process, TE will be the most appropriate platform to develop *problem-solving skills* as well. Suggestions on how students' generic skills are developed through the learning of TE are given below.

(i) Communication Skills

In TE, students learn the language of technology and how to communicate ideas, possible solutions and reflections of their work in a variety of ways (e.g. verbal explanations and drawings, graphical representation, demonstration models, charts, etc.) to different target groups such as peers, teachers, parents and the public, etc. Through these activities, students develop their communication skills.

Example 4 Developing Communication Skills

In a business project of organizing and running a vending stall selling dry goods on the Open Day of the school, students source and select suitable products for the event. In the process of gathering and disseminating information of the products, students have to negotiate with local suppliers as well as to communicate with other classmates and schoolmates.

Through participating in the activity, students develop better communication skills. They become aware that appropriate protocols, manners and tone have to be used in verbal (e.g. face to face and telephone calls), written (e.g. writing reports and letters) as well as visual communication (e.g. using graphical images and mock-up models). They learn how to phrase their messages so as to obtain the desired responses.

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[2] In the document ***Learning to Learn -The Way Forward in Curriculum Development*** (2001) published by the Curriculum Development Council, nine generic skills, namely Collaboration Skills, Communication Skills, Creativity, Critical Thinking Skills, Information Technology (IT) Skills, Numeracy Skills, Problem-solving Skills, Self-management Skills and Study Skills are identified as fundamental in helping students to learn.

(ii) Creativity

In TE, the cultivation of creativity is reflected in students' learning to generate ideas of their own, make new combinations of old elements, use different strategies to solve a technology problem, work out the different design features of a technology product, etc.

Example 5 Developing Creativity

In a design and application lesson, the teacher gives the class a challenging task of designing and making a concept model of a mobile phone. The model does not have to be a working prototype but should convey the key features of the intended design ideas.

In this activity, students have to use their imagination to create a new look or add new functional features to the mobile phone. They could experiment with different materials, rearrange the control dial, etc. when making the prototype. From conceptualization of initial ideas to realization of the final design, students are encouraged to generate more than one design solutions and then critically appraise the aesthetic value and functional characteristics of each design.

(iii) Critical Thinking Skills

In TE learning, students have to reflect regularly on their ideas, designs, choices of materials and tools in relation to the task. Students develop their critical thinking skills through such processes.

Example 6 Developing Critical Thinking Skills

In Technology Fundamentals lessons, students are asked to design a physical aid for patients who have difficulties in walking up the staircases. In the task, students investigate the needs of the patients and provide solutions that could help the patients to walk up the staircases more easily.

In the process of developing the solutions, students' critical thinking skills would be nurtured through the following activities:

- analyzing the problems and difficulties in walking up the staircases;
- examining the application of technologies in their designs to see if their designs are feasible and effective;
- appraising the various aspects of the solutions against the design specifications;
- evaluating critically the overall process for further improvement; and
- considering the applications and impact of their design on helping people in need and the support that the community should render.

(iv) Collaboration Skills

In TE learning, students are regularly provided with the opportunities to plan, select strategies, make decisions and solve problems cooperatively to complete a task in a small group or a team. Students have the opportunities to liaise, negotiate and compromise with others in the process of attempting the tasks to develop their collaboration skills.

Example 7 Developing Collaboration Skills

In a food technology lesson, students work in groups to investigate the characteristics of different raising agents. They design, conduct experiments, analyse the results and apply the findings in other meal planning activities.

Through the activity, students learn how to develop a good working relationship. They learn to be open and responsive, and appreciate, encourage and support the ideas and efforts of others. They also have to participate actively and coorperatively in discussing as well as in exchanging, asserting, defending and rethinking ideas.

(v) Information Technology (IT) Skills

Information Technology (IT) is both a means and an end in TE learning. Students learn about the tools and systems of IT in TE. They further improve their understanding and competency in IT through applying IT skills in various knowledge contexts in TE.

Example 8 Developing Information Technology Skills

In a control and automation lesson, students could use the robotic construction system to design a positive and a negative feedback system. They design the circuitry, conduct experiments, analyze the results and understand the applications of the feedback systems in real-life situations. They use a variety of IT skills and tools for the investigation.

IT skills help learning in other ways. Students can build up their knowledge through searching for information from different sources at their own pace.

(vi) Numeracy Skills

TE activities often involve calculation and mathematical processing. For example, students calculate the amount and the cost of materials in producing a product, make estimation and predictions in a simulated personal investment, etc. Students develop their numeracy skills through these activities.

Example 9 Developing Numeracy Skills

In a Design and Technology lesson, students are required to shape material (balsa) to a certain form to make a model car for racing. Before proceeding to the actual cutting of the material using different tools and machinery, students have to work out reasonably accurate markings on the balsa.

Interpretation of 3D modelling dimensions as well as calculations of unknown values, according to the production drawing, are always required. This may involve calculating the perimeter, understanding the relationship between radius and diameter, calculating the area, measuring angles, etc. Students have to use numeracy skills in an authentic way when tackling such a project.

(vii) Problem-solving Skills

Technological development is a problem-solving process[3] through which students are provided with a rich context to develop their problem-solving skills.

Example 10 Developing Problem-solving Skills

In a Computer Literacy lesson, students are required to make use of IT skills to present their observations on the Sports Day of the school. Students have to decide on the information they have to collect and on what equipment they have to use during the Sports Day. In order to make the presentation more interesting, students have to employ different methods to produce the desired effects.

In this activity, students develop their problem-solving skills by identifying the problems, designing their own solutions, gathering the necessary information, selecting the best possible solution, and presenting and evaluating their results.

[3] Please refer to the section on "Process in Technology" in Section 2.2.1.

(viii) Self-management Skills

The macroscopic view of technology is to develop a solution to meet a specific need under constraints. It demands the effective management of time and other resources, initiative and perseverance on the part of the students to complete the task, and an ability to handle unexpected problems. Through such activities, students develop their self-management skills.

Example 11 Developing Self-management Skills

In a fabric and clothing construction study, students are formed into groups and are required to design and make a set of cheering team uniforms for their own House. They have limited resources and have to complete the task within a short period of time. They would face peer assessment in the process of designing and development of the uniforms.

Through the study, individual student would set appropriate goals, do research, make plans and initiate actions. They then would liaise with other group members to implement the work. They manage time, money and manpower resources well before the House uniforms can be produced. They have to manage themselves efficiently before managing other resources to complete the task.

(ix) Study Skills

In TE learning activities, students are often engaged in independent study. In the process of gathering, interpreting and using information, students develop their study skills.

Example 12 Developing Study Skills

In a design and applications lesson, junior form students are asked to carry out a re-design process for a yo-yo. Students add various accessories to their yo-yos and test them with the expected outcomes. Through this exercise, students practise modifying a design based on user needs. They need to study relevant information about yo-yo.

To develop students' knowledge of a yo-yo's operation, teachers organize yo-yo practice classes after school in the school hall, with fellow students acting as instructors. The yo-yo practice helps to motivate students to take an interest in the re-design process.

2.2.3 **Developing Positive Values and Attitudes through Technology Education**

The development process in technology involves a great deal of decision making, e.g.:

- choice of design to meet specific purpose;
- choice of materials for a specific design;
- choice of process, tools, equipment, etc. to realize a design.

The decision-making process not only involves the assessment of constraints and cost effectiveness but also of the impact, in particular the impact of sustainable development on the individual, family, society and environment.

When doing this, students learn how to strike a balance between different considerations in evaluating their designs, such as choosing between:

- an environmentally-friendly material versus increased cost;
- highly automated process versus axed jobs;
- globalization versus clustering of local economies, etc.

Through these processes, and with the guidance from teachers, students would be able to nurture their positive values and attitudes and gradually build up their own value system.

2.3 Core and Extensions

2.3.1 TE is the entitlement of every student in Basic Education. It is a Key Learning Area where students can have ample opportunities to develop and excel in areas of their interests and inclinations. The learning targets for every student and those for students with a special interest or aptitude for TE are given in Sections 2.2.1 - 2.2.3.

2.3.2 The knowledge contexts and their learning elements provide the platform for organizing TE learning. Core elements within each of the six knowledge contexts for all students, and extension elements for students with special interests or aptitude, are set out in Figure 5. These should be seen as a rough guide and are not intended to be prescriptive. Extensions in TE learning might cover:

- Designing and constructing different types of robots to extend learning in materials, structure, mechanism, system application and integration, control and automation, etc.
- Designing fashion to extend learning in design and application, fabric and clothing, fashion and dress sense, marketing, etc.
- Designing animation on a chosen theme to extend learning in information processing, programming, design, etc.

- Setting up a virtual business to extend learning in project management, marketing, business organization and operation, control and automation, information processing, etc.

Figure 5 Core and Extensions of Learning Elements under the Six Knowledge Contexts in Technology Education

Core	Extensions
Common Learning Elements: • Technology & Society • Safety & Health • Information Processing & Presentation • Design & Applications • Consumer Education	
Information & Communication Technology: • Computer Systems • Programming Concepts	***Information & Communication Technology:*** • Computer Networks
Materials & Structures: • Materials & Resources • Structures & Mechanisms	***Materials & Structures:*** • Material Processing
Operations & Manufacturing: • Tools & Equipment • Production Process	***Operations & Manufacturing:*** • Project Management
Strategies & Management: • Business Environments, Operations & Organizations	***Strategies & Management:*** • Resources Management • Marketing
Systems & Control: • Concepts of Systems • Application of Systems	***Systems & Control:*** • System Integration • Control & Automation
Technology & Living: • Food and Nutrition • Food Preparation & Processing • Dress Sense & Clothing Construction • Family Living & Home Technology	***Technology & Living:*** • Fabric & Fashion • Home Management

2.4 Curriculum and Subject Organization

2.4.1 The learning of Technology Education at the primary level is subsumed in the General Studies curriculum[4]. The existing subjects in junior and senior secondary schools are given in Figure 1.

2.4.2 At the junior secondary level, the existing TE curriculum is subject-based. Schools could choose to offer different TE subjects based on factors such as the mission and background of the school and the learning needs of students. Schools may also wish to organize their TE in a flexible way as proposed in Section 1.5. Schools may also refer to Sections 3.2.7 to 3.2.9 on how to move from existing subjects towards a more balanced TE curriculum.

2.5 Interface with Secondary 4 and Secondary 5

2.5.1 At the primary level, the emphasis of TE learning is on "*Awareness and Exploration*" and in junior secondary "*Exploration, Experiences and Familiarization*". After completing Basic Education, students should understand technology, its development and its impact on the individual, family and society; have a broad and balanced knowledge of various technologies; and have a platform to consider their interests, inclinations, career orientations etc. to make informed decisions on their choice of subjects in their senior secondary studies.

2.5.2 On progressing to senior secondary, the emphasis is on "*Exploring Orientation for Life-long Learning and Specialization*". The senior secondary TE curriculum provides a variety of subjects to accommodate students with different orientations.

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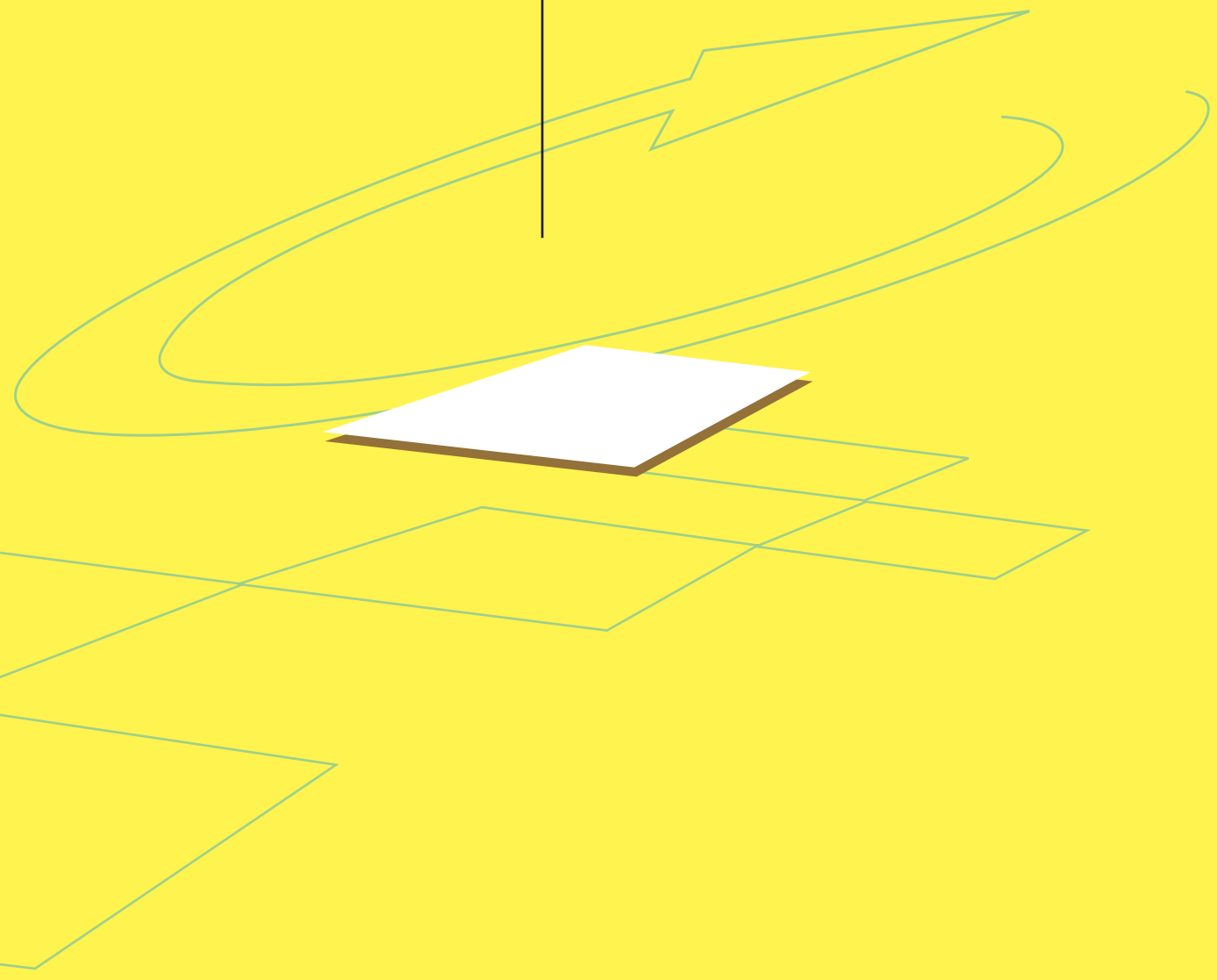
[4] In General Studies, TE learning contents are embedded in six knowledge strands: "Health and Living", "Science and Technology in Everyday Life", "Global Understanding and the Information Era", "People and Environment", "Community and Citizenship" and "National Identity and the Chinese Culture". Details can be found in the ***General Studies for Primary Schools Curriculum Guide (Primary 1-6)*** (2002).

Chapter 3
Curriculum Planning



Chapter 3 Curriculum Planning

In planning the Technology Education (TE) curriculum, schools may make reference to Booklets 2 and 10, ***Basic Education Curriculum Guide - Building on Strengths*** (2002) for more ideas on school-based curriculum development.

3.1 A Balanced Curriculum

3.1.1 At the junior secondary level, a balanced TE curriculum should:

- have a balanced focus on the Knowledge Contexts, Process in and Impact of Technology;
- include a wide spectrum of knowledge contexts in TE so as to give students an exposure to various technologies;
- nurture students' generic skills as well as their values and attitudes, with special emphasis on problem-solving (which is a special feature of TE), creativity, critical thinking skills, and communication skills, the latter three being the short-term targets of the school curriculum reform.

Some suggestions on the choice of learning elements which could widen students' exposure to various technologies are given in Figure 3, Chapter 2.

3.2 Central Curriculum and School-based Curriculum Development

3.2.1 This ***Technology Education Key Learning Area Curriculum Guide (Primary 1-Secondary 3)*** (2002) sets the general direction for the learning and teaching of Technology Education from Primary 1 to Secondary 3 (P.1 - S.3). It outlines a central curriculum in the form of a curriculum framework and sets out what students are expected to achieve, i.e.:

- subject knowledge and skills as embodied in the learning targets under the three strands as well as the learning objectives,
- generic skills and
- positive values and attitudes.

Schools are expected to follow the recommendations of this Guide to ensure a balanced coverage of the learning targets in the three strands of the knowledge contexts, process in and impact of TE.

The TE framework allows schools the space and scope for innovative curriculum practices. Schools are encouraged to capitalize on it and develop their own school-based TE curriculum taking into consideration factors such as:

- The vision and mission of the school as well as those of its sponsoring body
- The strengths of the school and its teaching force
- The background and learning needs of students
- A broad and balanced curriculum for students
- The resources of the school or alternative measures on resource provision that can support learning

3.2.2 Chapter 2 of this Guide lists the TE learning targets as well as the learning objectives of Primary 1 to Secondary 3 (Section 2.2.1). It also states the core learning elements of the curriculum (Section 2.3), which are the entitlement of every student and should be included in the curriculum of every school.

3.2.3 To help students achieve the learning targets and objectives, schools may adapt the central curriculum through selecting and varying the organization of learning elements, learning and teaching strategies, pace of learning and teaching, assignment requirements and modes and criteria of assessment, etc.

3.2.4 Curriculum development is an on-going process. Schools could develop their own school-based curriculum whenever appropriate and feasible. They should also encourage the professional development of teachers and collaboration with other stakeholders to achieve the aims, learning targets and objectives of the TE curriculum.

3.2.5 In developing a school-based TE curriculum, schools may consider the following major aspects:

- **Curriculum aims:** ***What are the vision and mission of the school and how are they related to TE?***

  In some cases, schools may want to strengthen the overall TE education of students, i.e. their technological literacy. In others, they may use TE as a vehicle to nurture generic skills and values and attitudes, such as collaboration skills, self-discipline, etc. of their students. There are also schools which would like to develop their own specialization with a strong inclination towards TE in certain chosen areas, e.g. design, business, etc.

- **Building on the strengths of schools**

  Schools should assess their strengths in providing TE learning and continue to build on them to meet the diverse learning needs of students. The strengths of schools vary and may have:

  - better resources in TE, including more special rooms and workshops, and a team of teachers specialized in a variety of TE disciplines;
  - good connections with the private sector to facilitate arranging life-wide learning activities for their students, such as visits, attachment programmes, etc. ;
  - support from their sponsoring body and a team of teachers with the same mission to provide a balanced TE curriculum for students;
  - a team of TE teachers with different specialisms, to develop a school-based TE curriculum within TE and in collaboration with other Key Learning Areas (KLAs);
  - etc.

  Schools could develop a school-based TE curriculum to excel in the areas of their strengths and to meet the learning needs of their students.

- **Contents of learning: *What is worth learning to achieve the aims?***

  Schools may consider the learning elements and objectives outlined in Chapter 2 and the subject syllabuses in TE, when choosing the contents of learning in accordance with the curriculum aims to meet the learning needs of their students.

- **Timetable organization**

  Schools could employ different ways to set their school timetable flexibly to create more space for student learning. Examples of flexible timetable arrangement are given in "More Effective Use of Learning Time" in Booklet 2, ***Basic Education Curriculum Guide - Building on Strengths*** (2002).

An example of TE timetable arrangement:

S.1	Home Economics and Design & Technology	Design & Technology and Computer Literacy
S.2	Home Economics and Computer Literacy	Design & Technology and Home Economics
S.3	Home Economics, Design & Technology and Business Fundamentals	Design & Technology, Home Economics and Computer Literacy

- **Strategies in planning students' learning experiences**
  A variety of learning experiences that are congruent with the learning targets and conducive to the chosen TE learning should be selected. The learning experiences (details to be dealt with in Chapter 4) could include activities such as:
  - Classroom teaching
  - Workshop/Laboratory sessions
  - Exploratory learning
  - Reading to learn (one of the four key tasks recommended by the curriculum reform)
  - Case studies
  - Project learning (one of the four key tasks recommended by the curriculum reform)
  - Job attachment, etc.

- **School-based assessment policy: *What constitutes the evidence of learning?***
  Assessment is an integral part of student learning. It is the process of identifying, gathering and interpreting information about student progress. Effective assessment practice should have appropriate answers to the following questions:
  - What is the purpose of assessment?
  - How to collect information? (i.e. the modes of assessment)
  - By whom? (by teachers, students, parents, etc.)
  - How to communicate the results of assessment to the relevant stakeholders so as to inform the planning of subsequent learning?
  - etc.

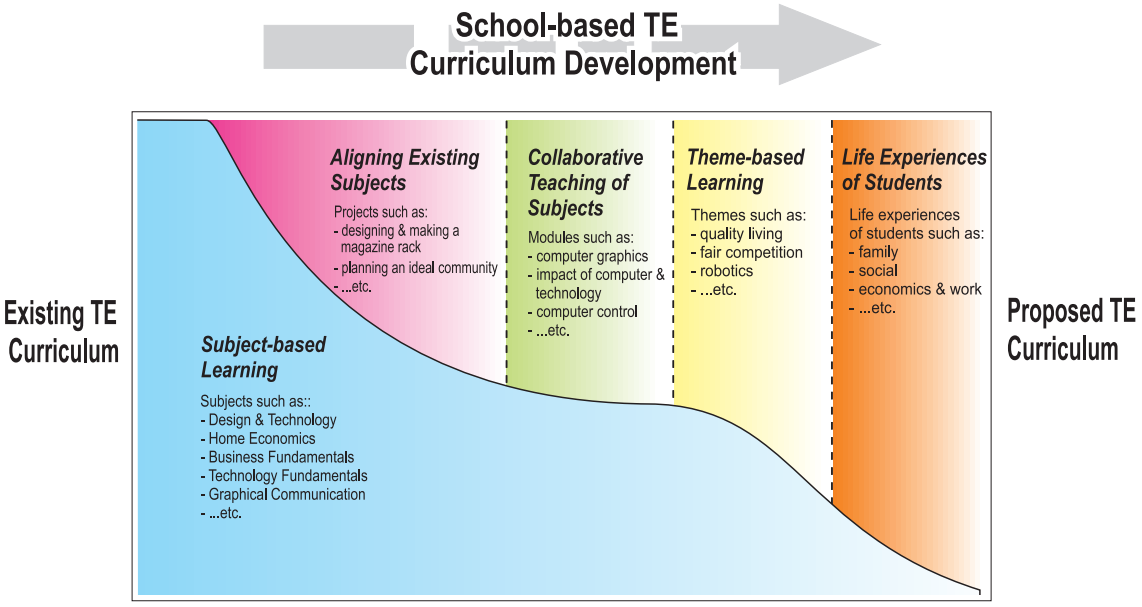
Illustrations of TE assessment are given in Exemplars 4 to 9 and the details are dealt with in Chapter 5.

3.2.6 Phases of Development

The existing modes of TE curriculum development in schools constitute a wide spectrum: ranging from subject-based learning to a curriculum on life experiences of students. The phases of development are depicted in Figure 6.

3.2.7 There are different phases at which schools implement their technology curriculum using different modes of curriculum planning to meet the learning needs of their students. Figure 6 represents a general direction **from** a subject-based curriculum where the existing subjects could be used as the organizers of student learning **to** a curriculum on life experiences of students where suitable organizers are drawn from daily life to organize student learning.

Figure 6 **Phases of Development: From a Subject-based Curriculum to a Curriculum on Life Experiences**



3.2.8 The characteristics and facilitating conditions for the different modes of school-based TE curriculum development are given in Figure 7. Schools may move from existing subject learning towards aligning related learning elements of different subjects taught by different subject teachers as in phase 2. For example, Home Economics and Information Technology teachers could rearrange the learning elements to establish links between the two subjects. As teachers acquire more experience of collaboration, they could attempt teaching a common element, connecting knowledge and skills of different subjects together as in phase 3. For example, teachers of Computer Literacy and Design and Technology could teach as a team to create more space for student learning. Schools may also organize the TE curriculum around some essential themes drawing upon the knowledge of different TE subjects as in phase 4. Teachers could also use experiences relevant to students' daily life as the focus of learning in technology education as in phase 5. It is important to note that the phases do not constitute a fixed sequence.

3.2.9 The various modes of curriculum development that are being used and recommended for schools are elaborated in Section 3.2.10.

Figure 7 Modes of School-based Technology Education Curriculum Development

Phase	Modes of Curriculum Development	Characteristics and Facilitating Conditions	Exemplars or Examples
1	Subject-based learning, e.g. • Design & Technology • Home Economics • Business Fundamentals, etc.	Existing subjects used as organizers of student learning	
2	Aligning subjects, e.g. • Home Economics, Design & Technology, Information Technology • Home Economics, Technology Fundamentals	Learning elements of subjects rearranged to establish links Projects or coursework Cross-KLA studies	Exemplar 1: TE Curriculum in ABC Secondary School Exemplar 2: TE Curriculum in LCM Secondary School Exemplar 3: TE Curriculum in DEF Primary School Example 13: Establishing Links between Subjects - Home Economics and Design & Technology
3	Collaborative teaching of subjects	Team teaching to create more space for student learning Learning elements of different subjects clustered to form modules Cross-KLA studies	Exemplar 2: TE Curriculum in LCM Secondary School Exemplar 1: TE Curriculum in ABC Secondary School Exemplar 3: TE Curriculum in DEF Primary School

Phase	Modes of Curriculum Development	Characteristics and Facilitating Conditions	Exemplars or Examples
			Example 13: Establishing Links between Subjects - Home Economics and Design & Technology
4	Theme-based Learning	Themes used as platforms for organizing learning experiences Cross-KLA studies Life-wide learning Projects or coursework	Example 14: Theme-based Learning - Quality Living Exemplar 3: TE Curriculum in DEF Primary School Example 13: Establishing Links between Subjects - Home Economics and Design & Technology Example 19: TE Life-wide Learning - Technology Competition
5	Life experiences of students	Learning elements organized by life experiences Cross-KLA studies Life-wide learning Projects or coursework	Example 1: Emphasis on Awareness and Exploration Example 2: Emphasis on Exploration, Experiencing & Familiarization Example 3: Emphasis on Exploring Orientation for Life-long Learning and Specialization Exemplar 8: A Balanced Diet Exercise

Orientations[5]	Characteristics and Facilitating Conditions	Exemplars or Examples
Hands-on studies	Aptitude of students	Exemplar 7: Building a Tower Example 17: Learning TE through Project Learning at the Primary Level
Community needs	Mission of schools, connection with community leaders	Exemplar 4: A Presentation to Promote the Image of Hong Kong
Vocational needs	Mission of sponsoring body Networking with other organizations	Example 20: TE Life-wide Learning - Job Attachment Programme
Academic needs	Mission and tradition of schools Ability and aptitude of students	Exemplar 1: TE Curriculum in ABC Secondary School

3.2.10 **Selected Modes of School-based TE Curriculum Development**

Descriptions of selected modes of school-based TE curriculum development (Figure 7) are given below:

- **Aligning Existing Subjects**

Teachers of different TE subjects are encouraged to rearrange the learning elements of their respective subjects to establish links among the subjects. Teachers plan and schedule the contents of different subjects in such a way that common learning objectives for students could be achieved and assessed.

[5] Schools, regardless of which mode of curriculum planning they adopt, may consider different orientations to build on their strengths and resources as well as the need and interests of their students.

Example 13 **Establishing Links between Subjects - Home Economics and Design & Technology**

S.1 students are asked to design and make a magazine rack as part of the TE course requirement. They learn to construct the wooden frame for the rack in Design & Technology lesson and prepare the fabric part for the rack in Home Economics lesson. The parts will then be put together to form the final product. Students utilize the knowledge gained in the two subjects and apply it in their design.

Project or coursework, which requires contribution from both subjects, enables students to understand the connection between the subjects (Figure 8).

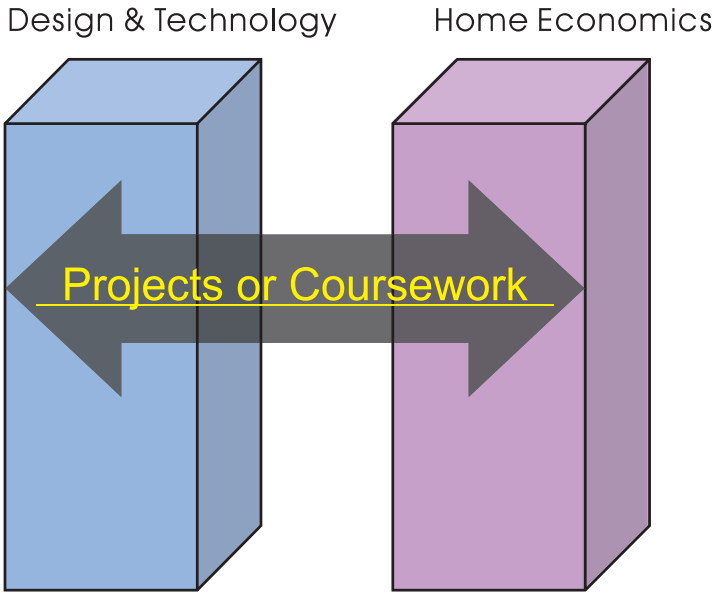


Figure 8 **Establishing Links between Home Economics and Design & Technology**

- **Collaborative Teaching of Subjects**

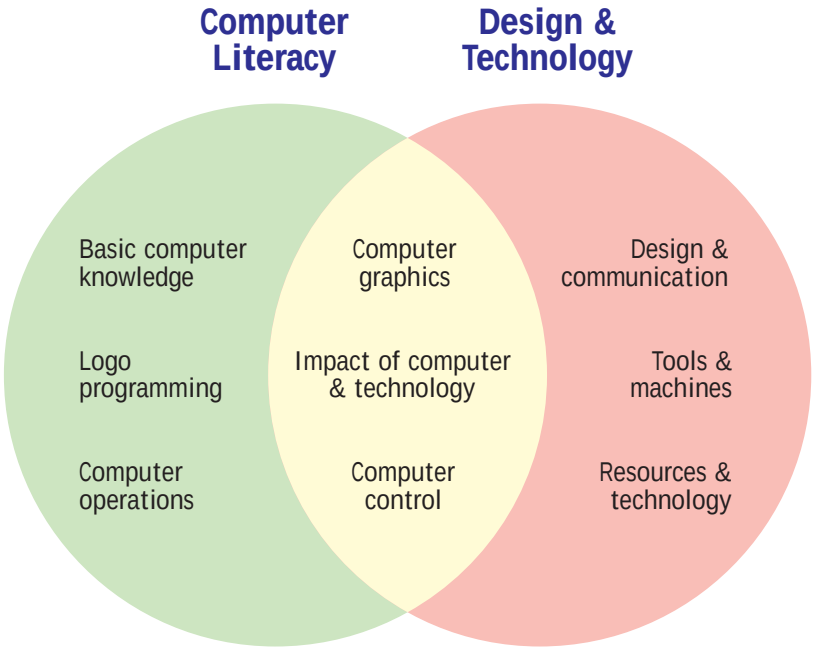
Teachers of two or more subjects can teach as a team. Some learning elements could be integrated to create more space for student learning.

Alternatively, clusters of learning elements in different subjects could be taken as a basis for forming modules to be used as building blocks for the curriculum at different levels. This approach facilitates the flexible sequencing of learning experiences.

Through the collaborative effort of subject teachers in designing the modules, students learn some common elements of the subjects more effectively. An example is illustrated in Figure 9.

Figure 9 **Integrated Learning Elements in Technology Education Subjects**

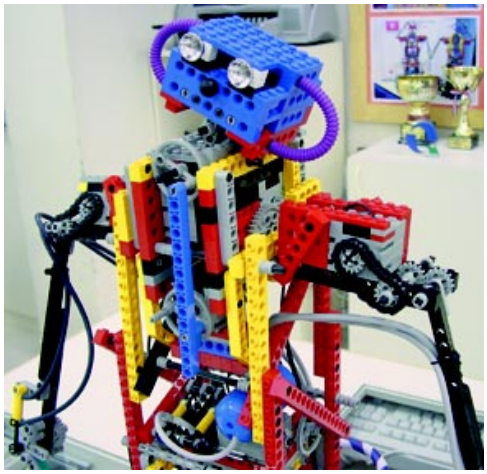
The organization of the curriculum of Secondary 3 Computer Literacy and Design & Technology could be represented by the following diagram:



- **Theme-based Learning**

In this mode, a selected theme, which covers the learning elements from various TE subjects, is used as the platform for organizing learning experiences related to daily life. Examples of themes are:

Themes	Subjects
Quality Living	Home Economics, Computer Literacy, Business Fundamentals
Smart Living in the 21st Century	Home Economics, Design & Technology, Computer Literacy
Do I Need Brand Name Products?	Business Fundamentals, Home Economics, Computer Literacy, Design Fundamentals
Fair Competition	Business Fundamentals, Computer Literacy
Robotics	Design & Technology, Electronics & Electricity, Computer Literacy
Chocolate Egg Packaging Design	Design & Technology, Computer Literacy, Home Economics, Business Fundamentals
Poster Design	Design Fundamentals, Graphical Communication, Computer Literacy
Fashion Design and Fashion Show	Home Economics, Design Fundamentals, Design & Technology, Business Fundamentals, Computer Literacy



In the process of learning, students are provided with a project brief, which outlines the purpose of the project and common enabling skills such as survey design, interviewing skills, etc. Students then form project groups and choose themes of their own interests to develop their technological literacy as well as nurture their values and attitudes. Sharing sessions such as presentations and exhibitions could be planned for students to learn from the experiences of other groups.

Example 14 **Theme-based Learning - Quality Living**

Theme: Quality Living
Level: Secondary 3

The chosen theme aims to cover some major knowledge and concepts in Home Economics, Computer Literacy and Business Fundamentals, such as Food & Nutrition, Family Living, Information Processing & Presentations, Consumer Education, Resources Management, etc.

The theme aims to motivate students to commit themselves to active self-learning and to cultivate an independent thinking culture in the school. A briefing on possible programmes for a more in-depth study and research method could also be given.

Students are engaged in a brainstorming session in which they might come up with topics such as the following:

- Living Environment
- Law and Protection
- Planning and Management of Life
- Education
- Health
- Technology
- Social Welfare
- Culture

A concept map showing the inter-relationship between "Quality Living" and the topics could be developed for a closer analysis of the whole issue.

Students are asked to focus on one area and come up with a detailed report on a selected TE topic. In the process, students are highly motivated since the topics are closely related to their everyday life. Group and individual work are involved. Frequent feedback is provided so that in-depth learning could also be achieved.

To conclude the event, an exhibition is held at the school campus to give students the opportunity to share their learning experiences.

A strategy for the gradual implementation of TE by phases in theme-based learning is illustrated in the following extract from Exemplar 2: "Technology Education Curriculum in LCM Secondary School".

Programme

- The learning of existing TE subjects would be refocused from skill-based or content-based teaching to learning and teaching for a balanced development of technological capability, understanding and awareness.
- The programme would be implemented in three phases, starting with S.1 in September of Year 1, S.1-S.2 in September of Year 2 and S.1-S.3 in September of Year 3, so that the change will occur gradually and smoothly. The programme will be reviewed once every three months or whenever desirable to ensure that it is providing what students need in their learning.
- Commencing in S.1, the students will experience about 4 themes every year. The learning experiences involved in each theme include activities such as classroom teaching, workshop sessions, small group activities, reading assignments and projects, and last for about two months. The themes have the following characteristics:
  - progressive in nature
  - integrating the different knowledge contexts of TE
  - nurturing the basic skills, attitudes and the ability for life-long learning of students
  - ensuring basic competence for core elements and encouraging the pursuit of excellence in specialized fields.

(An extract from Exemplar 2)

- **Life Experiences of Students**

Schools may wish to consider organizing TE learning elements according to the life experiences of students as below:

Family	Social	Economics & Work
• Food & Nutrition • Food Preparation & Processing • Fabric & Clothing Construction • Family Living • Home Management & Technology	• Fashion & Dress Sense • Consumer Education • Technology and Society	• Safety & Health • Design & Applications • Business Environments, Operations & Organizations • Resources Management • Marketing • Concepts of System • Application of Systems • System Integration • Control and Automation • Materials & Resources • Material Processing • Structures & Mechanisms • Tools and Equipment • Production Process • Project Management • Information Processing & Presentation • Computer Systems • Computer Networks • Programming Concepts

Schools can choose to implement only one life experience at each level, or alternatively different life experiences at the same level. For example, a school can choose to organize the learning experience of TE around "Family" in S.1, "Social" in S.2 and "Economics and Work" in S.3. Alternatively, a school can choose to organize TE learning around "Family" and the theme will run for 20 weeks, "Social" and "Economics and Work" for 10 weeks each in S.1, while the duration of the three life experiences in S.2 and S.3 can be varied according to the students' learning needs.

3.3 Cross Key Learning Area Links

3.3.1 Technology Education can contribute to, and gain from the learning of other KLAs as student learning is not compartmentalized. It is envisaged that learning activities may provide opportunities for students to demonstrate their learning in more than one KLA, which are generally complementary in nature. Some examples of how TE learning is linked to other KLAs are given below:

3.3.2 **With Chinese Language and English Language Education**

Students communicate ideas and present solutions (orally and in writing) appropriately and accurately.

3.3.3 **With Mathematics**

Students have many opportunities in applying mathematical concepts in TE activities, such as estimating, measuring and calculating the quantity of materials used in making products.

3.3.4 **With Personal, Social and Humanities Education**

Students need to understand how different aspects of human behaviour and its social and cultural background influence technologies used in daily life. Students would then have a deeper understanding of the impact of technology on the individual, family and society.

3.3.5 **With Science Education**

Students investigate the products and process systematically, take records during observations, and test hypotheses when implementing solutions. Sometimes students need an understanding of science to improve their designs and proposals.

3.3.6 **With Arts Education**

The aesthetic sense developed in Arts Education helps students to improve their visual presentations, select the appropriate media to present their ideas and evaluate the aesthetic

value of new technology designs.

3.3.7 With Physical Education

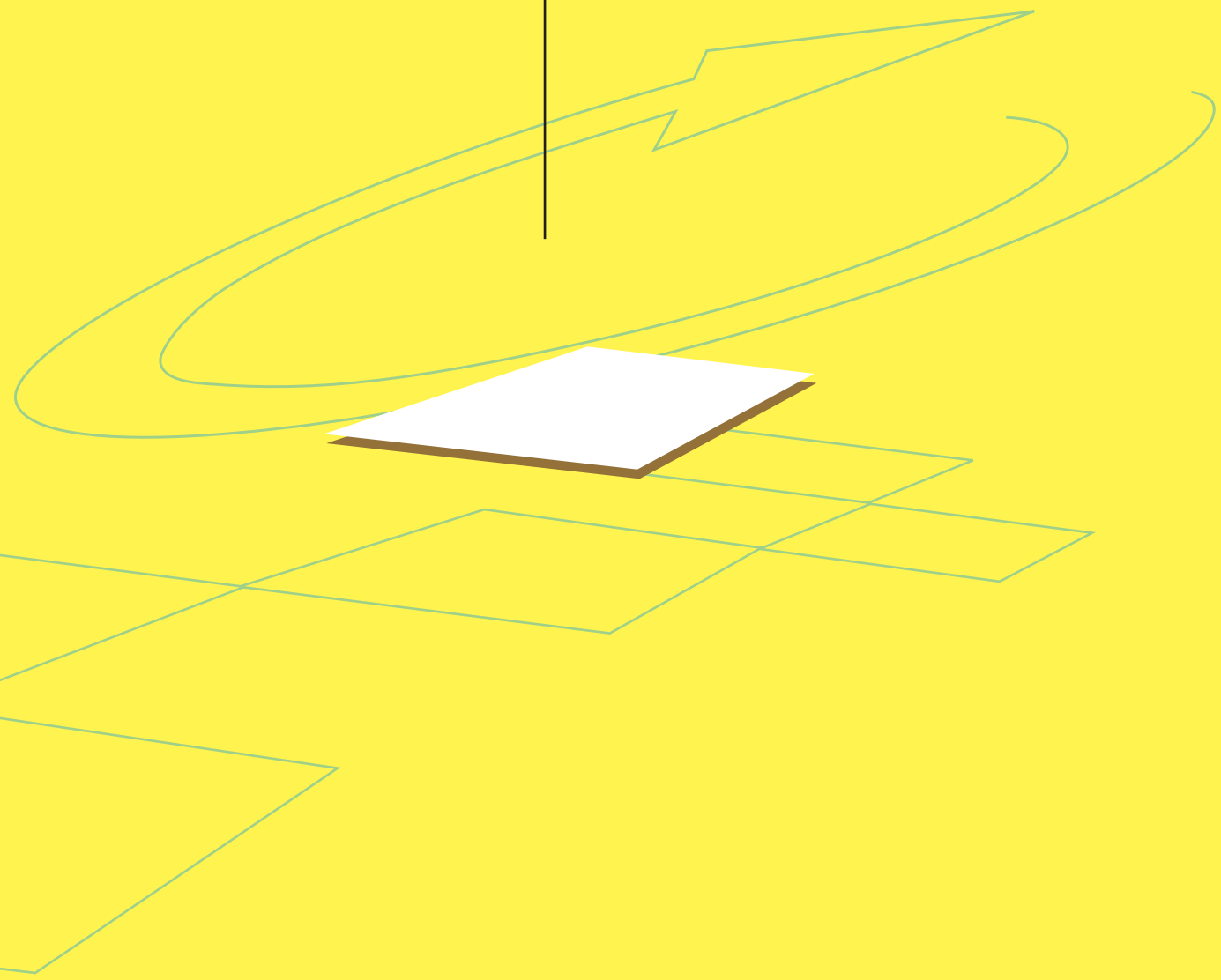
TE and Physical Education share the similar goals of promoting students' concern about safety in the learning process, encouraging a healthy lifestyle, and experiencing success that contributes to students' self-esteem.

3.4 Time Allocation

3.4.1 Schools are advised to follow the suggested allocation of lesson time given in Booklet 2 of the ***Basic Education Curriculum Guide - Building on Strengths*** (2002). The suggested time allocation for TE at the junior secondary level is **8% to 15%** of total curriculum time, i.e., **220 - 413 hours**. However for some schools where technology subjects are better vehicles for developing students' generic skills, the time allocation for TE could be **25% to 35%**, i.e., **689 - 964 hours**.

3.4.2 The proposed flexible TE curriculum framework and the rapidly emerging new technologies provide an effective platform for planning student learning in TE. Schools may wish to consider expanding TE as an effective vehicle through which to enhance students' knowledge and to develop their generic and transferable skills.

Chapter 4
Learning and Teaching



Chapter 4 Learning and Teaching

Key considerations for effective learning and teaching can be found in Booklet 4, ***Basic Education Curriculum Guide - Building on Strengths*** (2002).

4.1 Principles to Guide Actions

4.1.1 Technology Education (TE) at the Basic Education level provides opportunities for students to acquire a comprehensive range of learning experiences, which could be organized according to the following principles. They should:

- be purposeful
- be progressive and iterative in nature: allowing students to progress at their own pace and to make improvement
- involve the coordination of the mind and the hands
- integrate the different knowledge contexts in TE
- nurture in students the basic knowledge, skills and attitudes for life-long learning
- enable the pursuit of excellence in specialized fields for those with interest or talent in TE

These principles aim to promote a balanced TE curriculum and to allow in-depth studies in chosen areas.

4.2 Approaches to Learning and Teaching

4.2.1 TE learning is always purposeful: with a problem as the context of study. TE learning always has a deliverable - either an artefact or a system. It involves the use of both the hands and the mind. It consists of a variety of learning activities, such as classroom teaching, reading and information collection, designing and processing, out-of-school activities, etc. The series of learning activities achieving a common purpose is generally referred to as a learning task.

4.2.2 In considering the organization of a learning task, it is important to make reference to a number of essential factors. Some suggestions are given in the following framework as a reference for planning. The factors are grouped under six headings.

Essential Factors to Consider in Organizing Learning Tasks	Elaboration of the Factors
Key Features:	
• What is the focus of this task?	Learning a specific skill/concept/ principle; or developing generic skills, etc.
• What is/are the learning target(s)? • What is/are the best context(s) to be chosen as the platform of learning?	
Task Definition:	
• What is the nature of learning?	A case study, project work, debate and discussion, learning game, small group activity or individual task, etc.
• What is the resource implication for this task?	Task(s) to be conducted in a classroom, special room, outside school, or a combination of these venues
• What is/are the final deliverable(s) of this task?	
Integrated Dimensions of Technology:	
• Which TE learning element(s) is/are associated with this task? • How many dimensions of TE learning will be involved in this task? • How can students nurture their generic skills and values and attitudes through this task?	Emphasis on knowledge, process and impact
Intended Learning Objectives:	
• What is the evidence of student learning? • Do these learning objectives reflect the learning target(s)?	Classifying the learning objectives into knowledge, process and impact

Essential Factors to Consider in Organizing Learning Tasks	Elaboration of the Factors
Activity Sequence:	
• How can the task be structured into a series of activities to provide a logical sequence of learning as well as to overcome various constraints, such as timetabling, availability of resources, etc.?	
Evaluation:	
• How can evaluation be included to provide timely and constructive feedback to facilitate student learning?	
• Is it necessary to construct evaluation instruments for these events?	Observation checklists, student worksheets, etc.

Illustrations of the organization of TE learning tasks are given in Exemplars 4 to 8.

4.2.3 A useful learning sequence in TE, which is referred to as Technology Learning Activities (TLAs) was proposed in the consultation document ***Learning to Learn - Key Learning Area Technology Education*** (2000). TLAs help students to understand the process of developing technologies, to construct knowledge and to nurture their creativity. A brief description of TLAs is at Appendix A.

4.2.4 **The Four Key Tasks**

The ***Learning to Learn - The Way Forward in Curriculum Development*** (2001) recommends Four Key Tasks i.e. *Moral and Civic Education, Reading to Learn*, *Project Learning* and *Information Technology for Interactive Learning*, to help students develop independent learning capabilities through TE and across Key Learning Areas (KLAs). The Four Key Tasks can be flexibly embedded into different learning activities as stated in Booklets 3A to 3D, ***Basic Education Curriculum Guide - Building on Strengths*** (2002). Illustrations on how to incorporate the four key tasks in TE learning activities are given below.

Moral and Civic Education

4.2.5 The learning elements in TE, as stated in Figure 4 in Chapter 2, are related to

local business and industries or daily life, and include elements that are related to the family, society and nation.

4.2.6 Through TE, students are exposed to topics such as environmental protection, media education, ethics and healthy living. More importantly, students would develop a global outlook of the world, a sense of identity associated with their family, society and nation; as well as their personal qualities, responsibilities, and good characters to serve the society.

Example 15 Developing Civic Mindedness through TE Learning Activities

In a TE lesson, which aims to provide opportunities for students to explore the conservation of resources for environmental protection, students select an old garment and identify its characteristics. They then plan and decide what to do with it - repair, restyle or recycle. After designing and making something out of it, students introduce and discuss the "new" and innovative article with their classmates.

Reading to Learn

4.2.7 Reading is an important learning skill in TE. There is a large repertoire of reading materials within the technological context such as:

- The historical development of technology;
- The latest developments in technology and their applications;
- The manipulation of new technologies, etc.

Reading such materials could help students to see how the development of technology is related to geographical locations and natural resources, and it can help them to understand its impact on social and economic development.

Example 16 Developing Reading to Learn Skills in TE

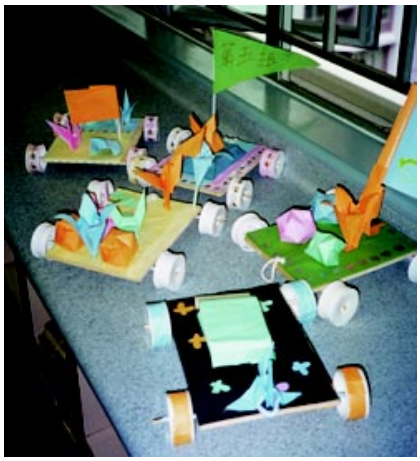
At the beginning of the school term, students select a topic on a new technology in line with their own interests. They then collect reading materials on it from sources such as websites and magazines, and prepare reports in their spare time. Presentation of reports is done in the second term. Teachers may also make arrangements for students to share their readings.

Project Learning

4.2.8 A project is a tool for both learning and assessment in TE. Project learning enables students to construct and connect knowledge, concepts and skills in TE and across different KLAs, and to nurture values and attitudes through a variety of learning activities.

Example 17 Learning TE through Projects at the Primary Level

In a General Studies lesson, students work on a small group project to design, assemble and test different toy models. Students are required to design and develop a toy car which can overcome various artificial hurdles such as ditches, grease, tunnels, etc. Through the project, students develop an understanding of how various energy sources are used in their daily life.



Information Technology for Interactive Learning

4.2.9 Information Technology (IT) can provide students with access to the vast network of information on knowledge, skills and application of technologies and enable them to explore different learning resources. The teacher is no longer the sole provider of knowledge but also the facilitator of learning. IT serves as an effective tool for students to carry out their learning activities, particularly when they have to collect ideas, and communicate them in different media, such as drawing, pictures, videos or a combination of media.

Example 18 IT for Interactive Learning in TE

At the beginning of a product design project, students practise evaluating different product designs by exploring an interesting website *www.baddesigns.com*, which provides many examples of bad designs. Through this mode, students can learn more about design.

Life-wide Learning

Schools may refer to "Issues about Life-wide Learning" in Booklet 6, ***Basic Education Curriculum Guide - Building on Strengths*** (2002) for guidelines on organizing life-wide learning activities for their students.

4.2.10 TE learning should not be confined to the school. Life-wide learning aims to offer opportunities for students to learn:

- in real contexts;
- by doing; and
- through interactions with people from different sectors.

4.2.11 Schools can make arrangements for their students to visit or be attached to different organizations to understand the application of technologies in their daily life and to gain experiences by doing.

4.2.12 Alternatively, professionals and experts from different fields can be invited to give talks and conduct activities in schools. Arrangements can also be made for students to visit these experts in their work places so as to have a wider exposure in different fields related to TE.

4.2.13 In TE, there are many possible life-wide learning activities. The following table highlights some of the activities adopted by different schools.

Life-wide Learning Activity	Objectives
1. Visits to different organizations (e.g. power plants, switch stations, control stations, model homes, model offices, research laboratories, etc.)	1. To expose students to different specialized areas to understand how technologies are actually applied to solve real life problems
2. Talks, seminars and public lectures by practitioners or professionals	2. For students to gain up-to-date and contextual knowledge and experiences about different technologies and to communicate directly with professionals
3. Participation in technology-oriented competitions	3. For students to apply knowledge and skills acquired and to learn through team work and collaboration
4. Work attachment	4. For students to gain first hand knowledge and work experiences and acquire the skills in working with others
5. Mentorship programmes by professionals	5. For students to have a better understanding of a certain TE knowledge area, to work under the guidance of professionals and to be aware of the strong competition in different fields



Example 19 TE Life-wide Learning - Technology Competition

Technology Competition - Smart Home for Today and Tomorrow

The Technology Competition - Smart Home for Today and Tomorrow is designed to promote students' interests in exploring the innovative development of technology and to raise their awareness of the impact of technology on quality of life. To provide student participants with life-wide experiences, the organizing committee arranges:

1) a practising professional engineer as a mentor for each school team, and
2) a series of visits and talks on Smart Home Technologies by professionals in the business and industrial sectors.

The mentor regularly discusses with students about their proposal and progress, giving advice from the perspective of a practitioner. Students benefit from their exposure to the views of frontline practitioners on technology development and applications. The series of visits and talks provide background and stimulation for students to put into practice ideas that they think worth exploring.

Example 20 TE Life-wide Learning - Job Attachment Programme

In the summer of 2000, KYW Secondary School organized a job attachment programme for ten S.3 students to apply their classroom knowledge in an authentic context. The programme placed students in jobs in local organizations, preparing them for future studies and employment. During their job attachments, the ten students served in the following divisions of a charitable organization and an electronics manufacturer.

Organization	Division	No. of Students
Charitable Organization:	Community Services	1
	Medical Services	1
	Auditing	1
	Finance	1
	Administration	1
Electronics Manufacturer:	Store	2
	Human Resources	1
	Engineering	1
	Marketing	1

4.2.14 Life-wide learning activities can be organized according to the specific condition of schools. Some examples of the activities conducted in schools include:

- learning outside school hours
- additional and follow-up work (e.g. out-of-school activities, etc.)
- technology week (e.g. exhibition of students' design work and portfolio, etc.)
- technology club
- workplace experiences (e.g. visits to technology sites and attachments, etc.)
- integrated learning with other KLAs (e.g. the study of technological artefacts in different time periods in China)
- internal and external competitions

4.2.15 **Professional development of TE teachers**

To support TE teachers in planning the learning and teaching of TE, it is essential for schools to promote individual and organizational learning through reflective practice, collaborative lesson preparation, action research, sharing, etc. as suggested in Booklet 10, ***Basic Education Curriculum Guide - Building on Strengths*** (2002). Through these

capacity building processes, TE teachers would be better equipped to design holistic learning experiences for students.

4.3 Catering for Student Diversity

4.3.1 The learning needs of students are different, depending on a number of factors:

- Interests and inclinations
- Family and social backgrounds
- Motivation and self-esteem
- Perceptions and expectations
- Prior knowledge
- Learning styles, etc.

4.3.2 There are many different ways to bring about student learning. The meaning and general strategies on catering for student diversity are set out in Booklet 4, ***Basic Education Guide - Building on Strengths*** (2002). This booklet also provides detailed descriptions on how a flexible school curriculum with appropriate assessment can cater for the diverse needs of students.

4.3.3 As TE provides a wide spectrum of learning elements and flexibility in progression, students at different stages in their learning can identify learning elements that match their learning needs. For example, in designing an alarm system for the main door, some students can use a simple circuit to detect the opening of a door while others can use advanced technology, such as infrared beams, microprocessors, etc. to improve the sensitivity of the system.

4.3.4 In organizing TE learning, subject to the resources available, schools may:

- design learning modules of different levels for the same Knowledge Context, e.g. in Systems and Control, Information and Communication Technology (ICT), etc. so as to let all students acquire the basic knowledge and skills; and students with special talents excel.
- provide a wider variety of technologies in the curriculum to accommodate the interests of different students, e.g. in Technology and Living, Operations and Manufacturing, etc.
- allow different modes of assessment so that students of different learning pace can chart their progress, thus reducing the threat of tests.

- encourage the accumulation of learning evidences and processes such as collecting the different designs of a product, a system, etc., in the form of a TE learning portfolio.
- provide authentic hands-on learning experiences and reinforce the importance of both manipulative and problem-solving skills so that students of different orientations can find their own way to excel.
- encourage group work in TE so that students of different orientations, such as the "thinkers" and "doers", could learn to support each other in completing a task through collaboration.

4.3.5 Schools may also make reference to Section 2.3 "Core and Extensions" in designing activities for students with diverse learning needs.

4.4 Homework

Schools may refer to Booklet 8, ***Basic Education Curriculum Guide - Building on Strengths*** (2002) for the guidelines on setting meaningful homework.

4.4.1 The outcome of TE learning is always associated with artefacts or systems which can be directly applied in students' daily life, e.g. meal planning, poster and fashion design, computer system and applications, etc. Well-planned TE homework would help students to:

- consolidate learning;
- deepen understanding;
- construct knowledge; and
- enhance technological capability, understanding and awareness.

4.4.2 School experiences suggest that traditional homework which aims at drilling the manipulative skills of students, such as knitting a long scarf or filing a key ring, does contribute to improving the manipulative skills of students but fails to encourage students to transfer what they have learnt to new situations and to nurture generic skills, such as problem-solving skill, creativity, etc.

4.4.3 Under the open and flexible TE framework, schools may wish to employ homework to nurture students' transferable and generic skills, such as planning and cooking a nutritious meal after learning about food and nutrition and healthy eating pyramid, helping community centers to set up small-scale computer networks after studying about them in school.

4.4.4 Schools may need to provide TE facilities for students to carry out their homework after lesson time. Schools may also refer to Booklet 8, ***Basic Education Curriculum Guide - Building on Strengths*** (2002) for the guidance on the frequency of homework.

Chapter 5
Assessment

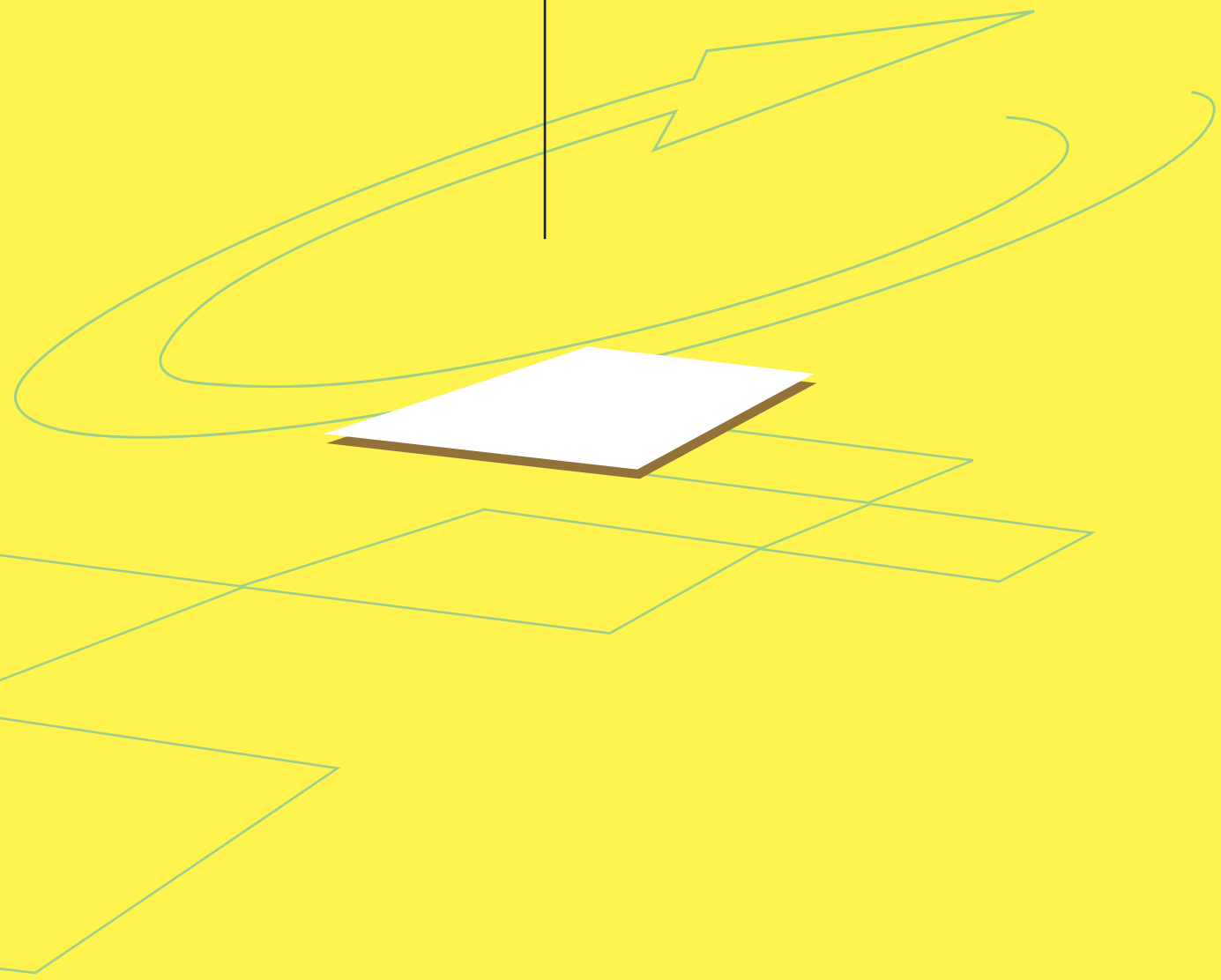
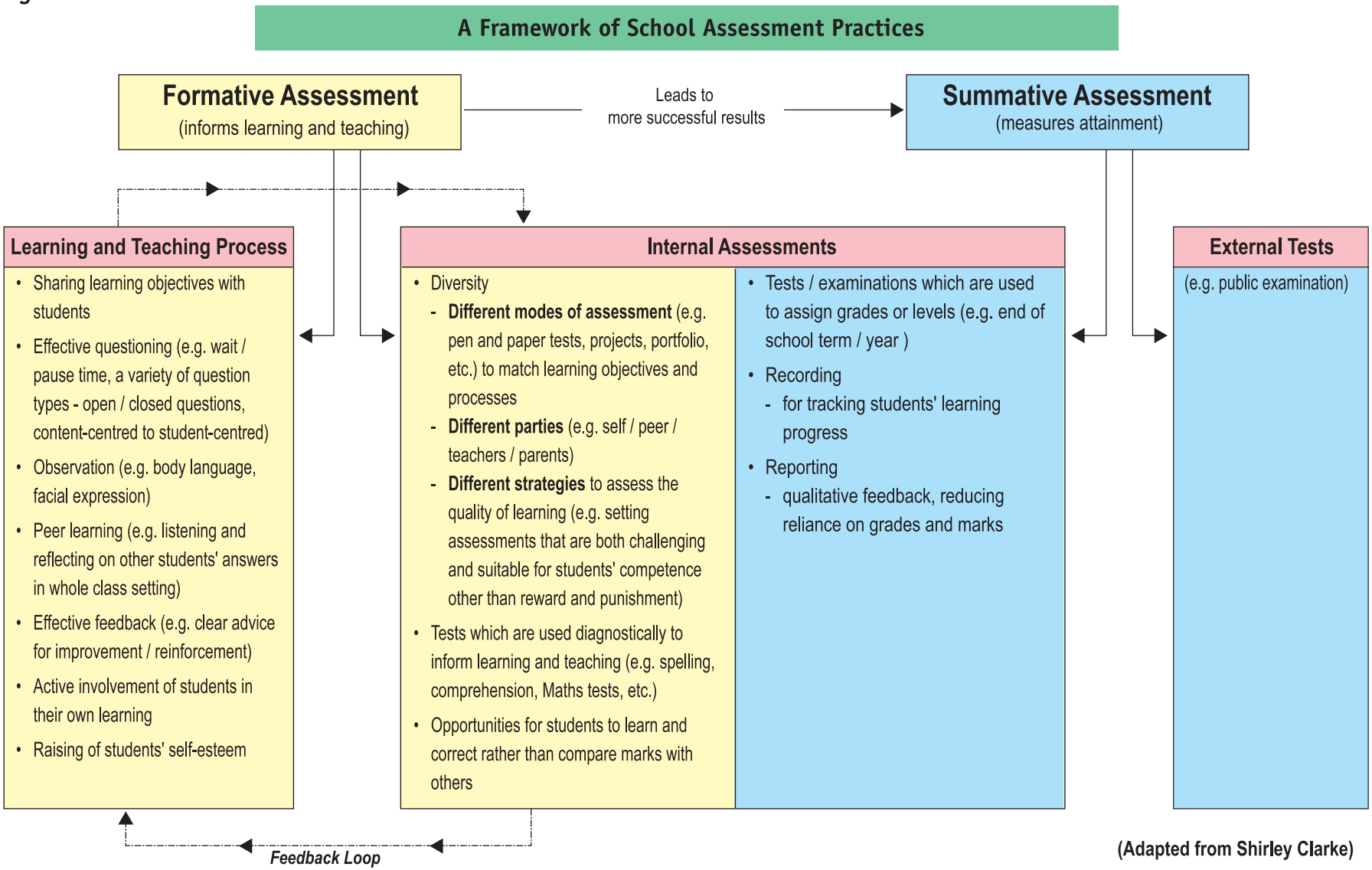


Figure 10



(Adapted from Shirley Clarke)

Chapter 5 Assessment

This chapter focuses on the guiding principles and strategies for formulating assessment in Technology Education (TE). Details of the functions of assessment and the connections between curriculum and assessment as well as the development of a school assessment policy to achieve a balance between assessment for learning and assessment of learning are deliberated in Booklet 5, ***Basic Education Curriculum Guide - Building on Strengths*** (2002).

5.1 Principles to Guide Actions

5.1.1 Assessment aims at collecting evidences of student learning to inform students, teachers, schools, parents, etc. of how students are progressing in their learning.

5.1.2 In developing strategies for assessment in TE, the following guiding principles may be considered:

- The learning of TE is purposeful and holistic and so is TE assessment.
- Assessment in TE should reflect all the components of TE learning: knowledge, concepts, generic skills, values and attitudes and the three strands of Knowledge Contexts, Process in Technology and Impact of Technology.
- Formative assessment (i.e. assessment for learning) and summative assessment (i.e. assessment of learning) are equally important for enhancing student learning and charting their progress.
- Observations and testing are used to ensure that students progress smoothly in their learning process with adequate prior knowledge and skills. Such methods of assessment provide evidence on students' use of tools and equipment and whether they observe safety and health measures in TE learning.
- Assessment should be part of the learning process.
- It is important that everyone involved in the assessment process, including teachers, students, parents and other users of assessment results, such as school authorities, know how to interpret and make use of the assessment results, i.e. they should know where to go next according to the assessment results.

5.2 Modes of Assessment

5.2.1 Student learning in TE includes:

- the development of manipulative skills in handling tools and equipment in using various materials and in constructing systems;
- the ability to observe safety measures when using tools, equipment and machines;
- the ability to apply concepts and principles in the design and realization process when formulating technological solutions;
- the ability to use the language of technology appropriately, as well as visual forms of presentation for communicating ideas effectively;
- the development of generic skills, values and attitudes;
- the understanding of the concepts and principles involved in selected knowledge contexts;
- the ability to apply concepts and principles in both actual and hypothetical situations;
- the development of awareness of the impact of technology on the individual, family, society and environment;
- the ability to integrate various TE learning elements to process, interpret and solve complex issues related to technology;
- etc.

Different assessment modes could be adopted to assess the various forms of student learning listed above.

5.2.2 In line with the nature of TE learning which is authentic, purposeful and holistic, the following categories of assessment are suggested as particularly appropriate:

- Project Work Assessment
- Task-based Assessment
- Assessing Essential Manipulative Skills
- Assessing Knowledge and Concepts

5.2.3 *Project Work Assessment*

In Project Work Assessment, students are generally given a loosely defined problem and are requested to produce a final deliverable which could be a real artefact or a working model of a system. Some examples are given below:

Example 21 Project Work Assessment - Light Source

The torch is a useful tool for working in the dark.

Students are given the task to design and make a concept model of a new torch for a specific purpose that is not yet available in the market. The torch must be able to be used in leisure activities, at work or as an emergency light. It should provide sufficient light intensity and be battery-powered.

To be successful, students need to identify a real purpose for their torch by conducting market research. The final concept model needs to be practical and of a high quality in its finish.

Example 22 Project Work Assessment - Improving Our Community

Every citizen in the community can suggest ways to improve the environment.

Students are given the task of choosing a public location and deciding how it could be improved. They design with the aid of the Computer Aided Design (CAD) software and make a model to illustrate their proposals.

To be successful, students need to formulate a design brief to address a community need and work out a proposal accordingly. They also need to present their ideas in a class critique. The evaluation of the design should be conducted from the perspective of the users, and include aesthetic, economic, social, environmental and technological considerations.

Example 23 Project Work Assessment - Software for an Information Kiosk for Your School

Situation:

It is always difficult for visitors to locate different areas of the school. Some visitors are "fact-finders" and just want to locate a particular room such as the library, art room, etc. Some visitors such as parents may wish to explore for more information about the school.

What to do?

Students are required to design the software part of an Information Kiosk for the school. The unit is to be placed at the school entrance. A user-friendly and logical interface and foolproof inputs are desired. The system may be developed using a web-based software, presentation or authoring software, or any other software as appropriate. Students have to prioritize the information to be displayed and should not include too much. A clear site map or information flow diagram should be designed.

5.2.4 The focus of the Project Work Assessment is on the process as well as the product. Students would be assessed on their abilities to:

- specify the requirements for the solution;
- understand and analyze the problems at hand with sensitivity;
- search and identify relevant information;
- make the necessary deductions;
- solve the problems with originality;
- plan the actual production of the artefacts in the form of a finished product or prototype;
- experiment with the proposal and make necessary adjustments;
- produce and construct the final solution;
- evaluate the solution against the specifications;
- communicate the process and product effectively, accurately and confidently through verbal, written and graphical communication; and
- organize, coordinate with and solicit support from others for the project.

5.2.5 In general, students are requested to submit a portfolio of their studies, which

include the documentary samples of their work with comments and suggestions from teachers and peers and their own reflections, and final products with annotations. An illustrative exemplar of a Project Work Assessment can be found at Exemplar 9.

5.2.6 *Task-based Assessment*

Task-based Assessment is generally referred to as a purposeful, contextualized and authentic assessment. The use of a well-defined task is more likely to elicit the use of specific skills and knowledge on which teachers can provide feedback. Task-based Assessment may be particularly applicable in TE which emphasizes authentic, hands-on activities.

5.2.7 To enable teachers to think through the design of assessment criteria to inform the learning and teaching process, they may work out a framework of assessment task specifications with the following suggested major components:

- Task title
- Purpose of assessment
- Duration of task
- Objectives/Competence focus
- Context (Scenario)
- Input format and characteristics (e.g., channel, form, rubrics, text prompt)
- Expected response format and characteristics (e.g., channel, form, length)
- Scoring procedures and marking schemes
- Procedures (e.g., pre-task activity, while-task activity, post-task activity)

Example 24 **Task-based Assessment**

Task : Writing a letter to obtain product information
Level : S.3
Time : 40 minutes

Situation:
In a Design and Technology lesson, students are given the task of designing a magazine rack. They are asked to prepare a letter to be sent to various companies to obtain the information about the relevant products.

The purpose of the task is to assess students' business communication skills. The task aims to assess students' competence in understanding the function of some commonly used business documents, using the given information and applying word processing skills to produce a document to achieve a given purpose. The task input is in the form of written instructions and students are required to write a letter. The assessment may focus on students' performance in organizing information, using language accurately and appropriately, and presenting the document appropriately.

5.2.8 *Assessing Essential Manipulative Skills*

In the TE learning process, it is important to ensure that students understand and observe safety measures, and master the required manipulative skills.

5.2.9 A variety of instruments can be used to assess students' manipulative skills. They include:

- asking students to perform a simple task and observing what happens;
- asking students to perform project work.

Example 25 Assessing Essential Manipulative Skills

In developing the manipulative skills of sawing and chiseling, it is important for the teacher to provide immediate feedback to students regarding correct body coordination and appropriate safety habits when performing the cutting action. The teacher can use an observation checklist to collect evidence of student learning of various skills such as holding tools, fixing workpieces, applying a striking force and working safely, and then providing feedback to students on their bad practices.

In the excerise on a balanced diet, a checkist is adopted to assess the competence of students' manipulative skills such as:

- preparing ingredients, e.g. by slicing, dicing, etc.;
- using the proper way to cook food, e,g. by steaming, baking, etc.;
- adopting hygienic practices, e.g. storage of food, handling of raw and cooked food, washing up, etc.;
- observing safe practices, e.g. safe use of sharp tools, gas cookers, electrical appliances, etc.

(Extracted from Exemplar 8)

5.2.10 *Assessing Knowledge and Concepts*

In TE learning, the understanding of knowledge and concepts are important for students to further their studies.

5.2.11 In most cases, the assessment of students' understanding of knowledge and concepts could be done through projects or tasks. On some occasions, teachers may consider using structured assessment tasks such as paper-and-pencil tests, presentations, group discussions, etc.

5.3 Formative Assessment

5.3.1 The formative function of assessment is to inform students and teachers of the progress of learning so as to provide timely and effective feedback to both students and teachers to facilitate student learning.

5.3.2 As TE learning involves the use of both the hands and the mind and is purposeful with deliverables, a typical TE learning activity includes the following processes:

- briefing students on the objectives of the learning activity (including the final deliverable as appropriate);
- discussing and negotiating with students until they can understand the aims and objectives;
- students starting the activity and teachers observing and providing feedback during the process;
- in some situations, students presenting their interim results, receiving feedback from their classmates and teachers, and learning from each other;
- students producing a system or a product and a record of their learning process in the form of a portfolio;
- in most situations, students presenting their portfolios, together with the system and the product, and receiving feedback from their classmates and teachers.

5.3.3 Timely and effective feedback are provided to students through different strategies and by different parties. Students learn from each other and are also responsible for their own learning. In fact, the formative function of assessment, i.e. assessment to enhance learning, should always be a feature of the learning process in TE.

Examples of TE learning, teaching and assessment are given in Exemplars 4 to 9.

5.4 Summative Assessment

5.4.1 The summative function of assessment is to see how students perform and what they have learnt at the end of a teaching module/school term/school year/key stage and to provide students, teachers, parents, etc. with information about student learning progress so that they can plan appropriately for the future.

5.4.2 TE learning is multi-dimensional. It involves the learning of knowledge and concepts, processes and skills as well as developing awareness about the impact of technology. Therefore, assessment in TE should be multi-dimensional too and not just simply rely on paper-and-pencil tests or a project product. With clear and agreed learning objectives, students may assess and report their own learning while teachers verify and confirm it. This approach serves the dual purposes of assessing the multi-dimensional aspects of TE learning and enabling teachers and students to better understand how to plan and prepare for the next stage of learning.

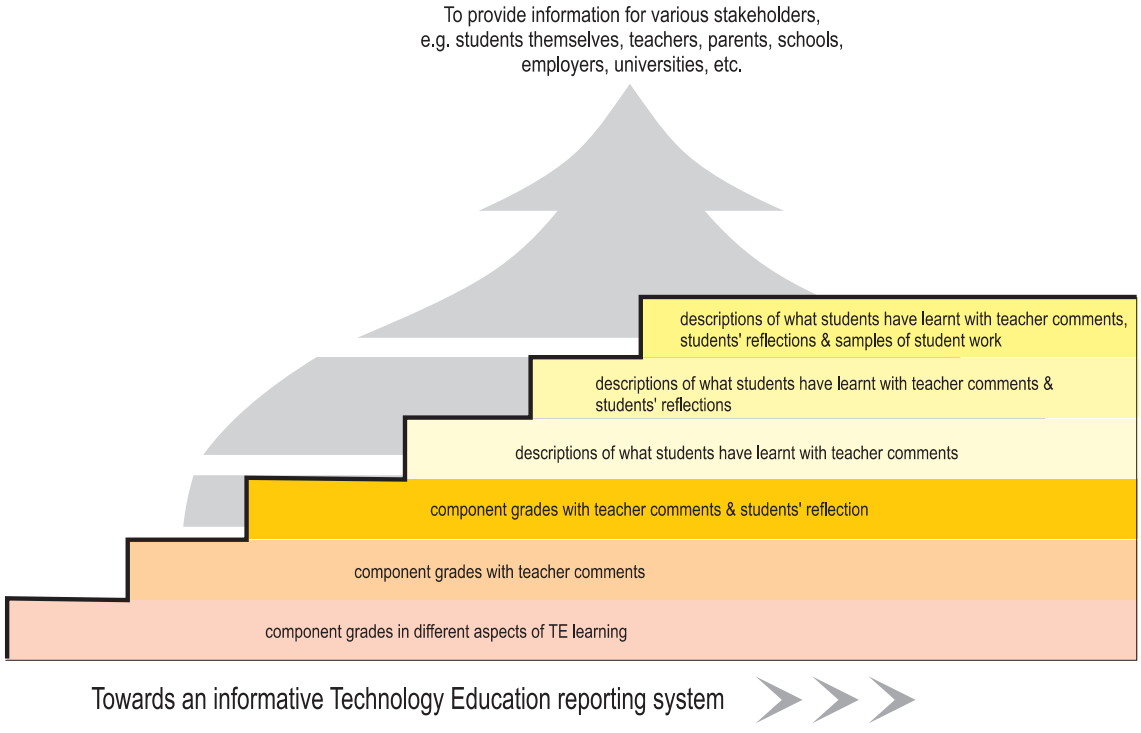
5.5 Reporting

5.5.1 The purpose of reporting is to provide information on student learning progress at a particular time to various stakeholders, including the students themselves, teachers, parents and schools, etc. In this connection, reporting should be a process of summative assessment.

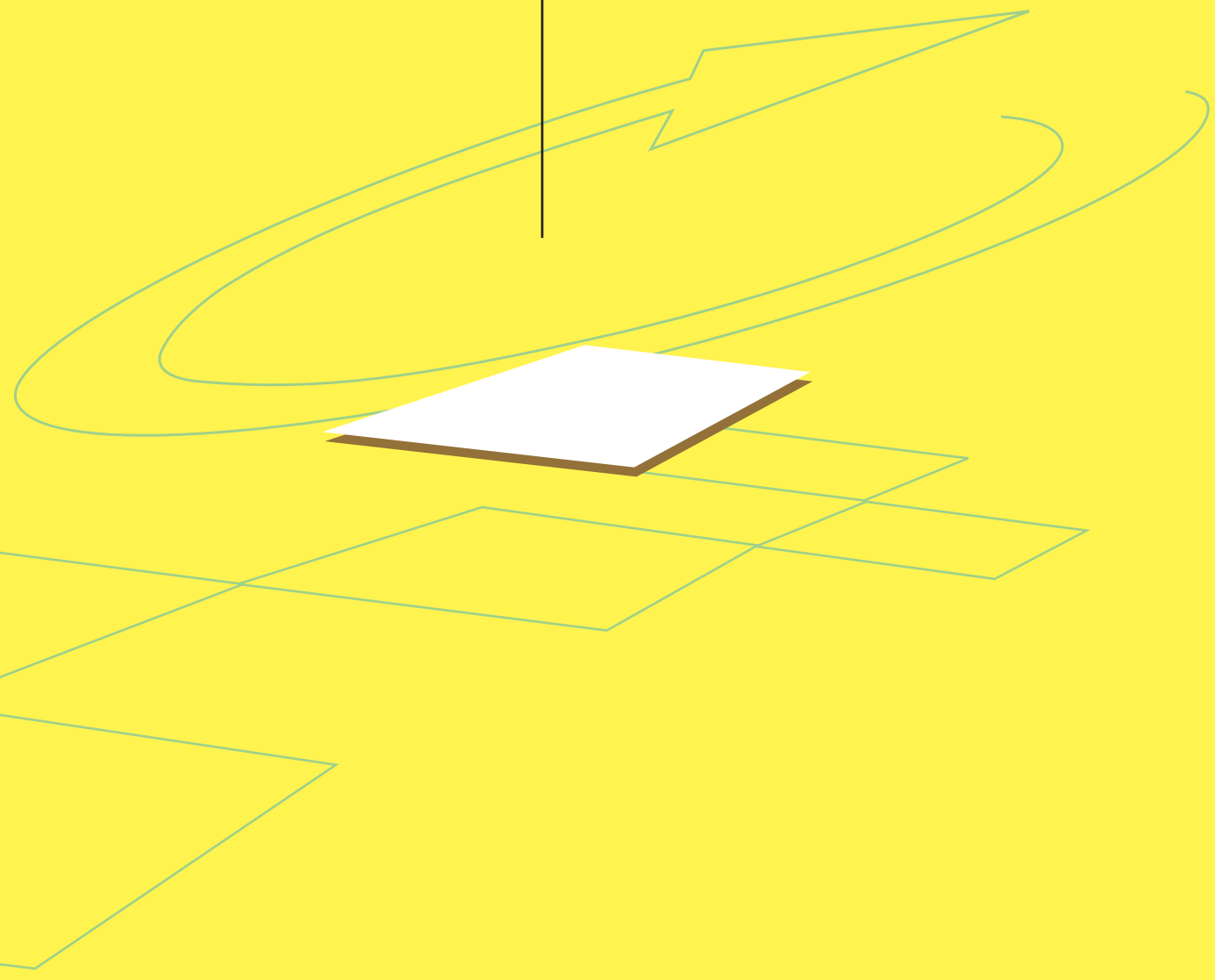
5.5.2 In view of the multi-dimensional nature of TE learning, reporting should not just rely on grades and marks. Reporting should provide information on what students have learnt in the different aspects of TE and on how they can improve or excel in their learning.

5.5.3 Schools and teachers could consider adopting one of the reporting systems suggested in Figure 11 according to their own needs.

Figure 11 Technology Education Reporting System



Chapter 6
Learning and Teaching Resources



Chapter 6 Learning and Teaching Resources

Basic considerations in the selection of resources including textbooks can be found in Booklet 7, ***Basic Education Curriculum Guide - Building on Strengths*** (2002).

6.1 Textbooks

6.1.1 In Technology Education(TE), textbooks are mainly published in the subjects of Computer Literacy, Design and Technology and Home Economics. A recommended textbook list related to TE can be found at http://cd.ed.gov.hk/cr_2001/eng/textbook/index.htm.

6.2 Quality Learning and Teaching Resources

6.2.1 Due to the fact that TE must meet the fast changing needs of society and keep in pace with rapidly emerging new technologies, teachers shall be flexible and prepared to use a wide range of learning resources in planning learning activities. Such resources may include the information on the web, resources, tools and equipment in learning packages provided by vendors, e.g. Modular Technology on Laser and Fibre Optics, Robotics, Food Production and Services, etc. and supporting materials and learning packages developed by the Education Department.

6.2.2 A list of local and overseas references is given in Appendix B. As most of these references involve overseas contexts, schools may need to adapt and reorganize the content when using them.

6.3 Resources Management in Schools

6.3.1 Effective learning of TE requires:

- adequate physical space to carry out various learning activities;
- appropriate equipment and software to support learning, such as computer programmes, modular technology; and
- sufficient learning materials in different formats and media, such as textbooks, reference materials, pictures, graphs, models, videos, etc.

6.3.2 TE is characterized by the need to coordinate the hands and the mind, hence hands-on learning activities are essential for TE learning. It is necessary to have proper equipment in an appropriate space to enhance student learning. After considering the

learning needs of TE students, it is proposed that:

- For primary schools, it is desirable to have a multi-purpose room for housing the equipment and materials and conducting TE related learning activities.
- For secondary schools, it is desirable to have special rooms with the following designated areas to meet the learning needs of all students.

(A) Special area for the learning of Food Technology

- An area for the teaching of TE learning elements which require a high hygiene standard so as to attain the safety level.
- As food is a distinct "material" that requires careful handling and processing to avoid food poisoning, a special setting and maintenance are necessary.
- The teaching of learning elements include "Principles of food preparation and processing", "Skills in food preparation", etc.

(B) Special area for the learning of Information Technology

- Sufficient space and a wiring system should be provided for setting up a network and data lines, and housing computers with information technology equipment.

- Adequate software provisions should be planned to allow a flexible use of the room for learning elements such as "Control and Automation", "Business Environments, Operations and Organizations", etc.

(C) Special area for equipment-based TE learning

- A venue should be provided for the design and processing of different materials such as wood, plastics, fabrics and more complicated materials including composites, etc. covered in learning elements such as "Material Processing", "Fabric and Clothing Construction", etc.
- A wide range of tools and equipment for processing different materials should be provided for hands-on learning experiences.
- Computer and IT facilities should also be included in the room to allow learning through modular technology and the design cycle.

6.3.3 New secondary schools are built with all three types of special rooms in the design. The availability of the number of each type of special rooms depends on the physical endowment and the school's TE policy. Some schools may not have all these

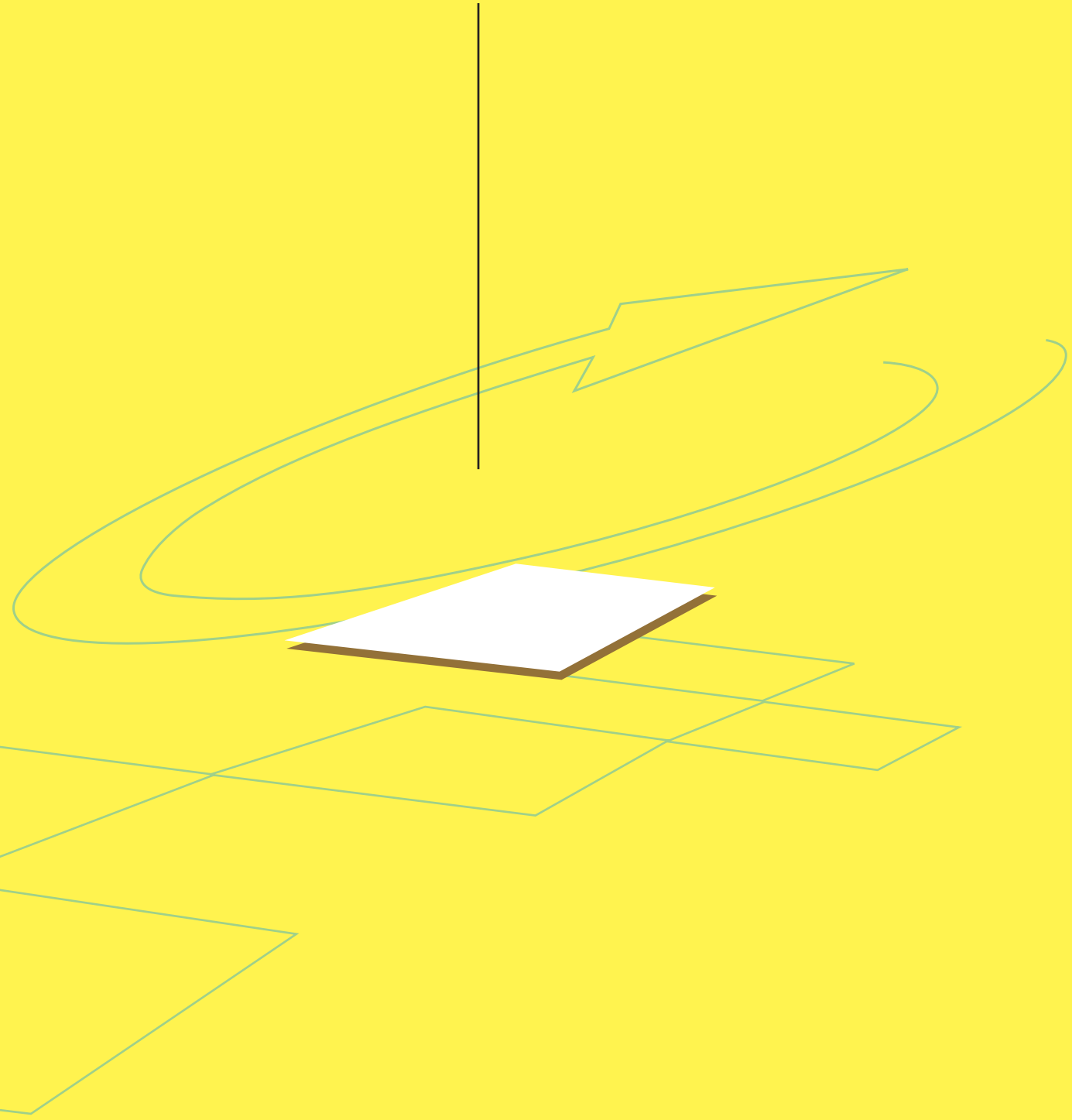
three types of special rooms due to a number of reasons, including historical ones. To ensure the entitlement of students, in the short to medium term, these schools may wish to consider establishing links with other schools in the vicinity to share resources.

6.3.4 It is important to provide a safe learning environment to our students. As the TE special areas are equipped with tools and equipment, it is essential to ensure that the tools and equipment are properly installed and maintained. Schools should assign appropriate teachers to be responsible for the management and maintenance of workshops and special rooms, etc. This requirement is set out in Part IV of the Education Regulations.

6.3.5 To provide a safe environment for TE learning, schools are advised to refer to up-to-date safety information related to different subject disciplines and curriculum support materials such as:

- Teaching Home Economics in Secondary Schools Safety Booklet (which can be found at the following website: http://www.ed.gov.hk/eng/index.asp?id=6),
- circulars on safety issued by the Education Department, and
- updated information from the appropriate government departments such as:
  - Auxiliary Medical Service (http://www.info.gov.hk/ams/index_start.htm)
  - Electrical and Mechanical Services Department (http://www.emsd.gov.hk/emsd/)
  - Environmental Protection Department (http://www.info.gov.hk/epd/eindex.html)
  - Fire Services Department (http://www.info.gov.hk/hkfsd/english/ehome.htm)
  - Food and Environmental Hygiene Department (http://www.info.gov.hk/fehd/indexe.html)
  - Information Technology Services Department (http://www.itsd.gov.hk/itsd/english/emenu.htm)
  - Labour Department, Occupational Safety Section (http://www.info.gov.hk/labour/eng/organ/content2.htm)

Exemplars



Exemplars of Developing a Technology Education School-based Curriculum in Primary and Secondary Schools

1. Technology Education Curriculum in ABC Secondary School

(A) Background of the School

- Coeducational grammar school established for 15 years
- Sponsored by a charitable organization
- Most teachers with more than 10 years' teaching experience
- Track record showing that most of the school leavers further their studies at university

(B) Planning: School Level

Aims of Technology Education (TE) in School

The school aims at nurturing students' creativity and innovation through TE. The TE curriculum is designed to:

- be broad and balanced
- be offered to all students at S.1 to S.3 levels
- develop students' independent learning ability through: project learning, reading to learn and information technology for interactive learning.
- develop competence in Technology:
  - information technology (IT), e.g. information processing and presentation skills
  - Design and Technology (D&T), e.g. materials and structure, systems and control, and operations and manufacturing
  - Home Economics (HEc), e.g. healthy living habits
- include a variety of learning experiences to cater for student diversity

Resources

- A TE coordinator is to be appointed to coordinate the planning and implementation of a coherent TE curriculum
- Members: 3 computer teachers, 1 D&T teacher and 1 HEc teacher
- Special rooms: 1 HEc complex, 1 D&T workshop, 1 computer room and 1 Multi-media Learning Centre
- Facilities to be upgraded: The school will provide the resources required for the exploratory technology units
- Time allocation: 4 periods per 6 day-cycle, 24 cycles per year

Assessment

The use of a variety of assessment modes are encouraged to assess student learning:

- Assessment of practical work
- Assessment of project work with checkpoints set up at different stages
- Portfolio-building demonstrating students' progress
- Results of all assessments count towards final results
- Using a profile to display the assessment results

(C) Planning: Form level

Considerations for Planning

- To develop a broad and balanced knowledge base of technology
- To develop exploratory skills in technology
- To integrate knowledge learned in the three subjects when attempting design activities
- To enhance students' knowledge and interests in technology through extended learning activities and learning experiences outside the classroom

Programme Structure

Rationale

- The TE curriculum over these three years should draw together the essential contents in the existing TE subjects in order to provide a balanced knowledge context for student learning.
- The TE curriculum will be arranged in modules to allow flexibility of sequencing and regular updating of content. The school is considering adopting a modular instructional approach in a range of areas.
- The TE content should be organized in such a way that students can make reference to their experiences of family life and social life.

Modules

The school will offer the following modules at each level from S.1 to S.3:

- Technology modules:
  - core elements to be studied by all students
  - focus on developing understanding of knowledge and application of skills in different TE subjects (e.g. D&T and HEc)
- Project modules:
  - each student chooses a project theme in D&T, HEc or IT or in an area in which the three subjects can be intergrated.
  - focus on developing the design capability of students in different areas

- Application modules:
  - optional modules to be selected by students to cater for their diverse needs, interests and abilities
  - focus on extending knowledge and skills in different areas (e.g. control, home living, computer graphics, etc.)
- Extended activities:
  - learning outside timetabled lessons
  - additional and follow-up work (e.g. out-of-school activities, etc.)
  - technology week (e.g. exhibition of students' design work and portfolio, etc.)
  - technology club
  - workplace experiences (e.g. visits to technology sites and attachments, etc.)
  - integrated learning with other Key Learning Areas (KLAs) (e.g. the study of products of technology in different periods of Chinese History, etc.)
  - internal and external competitions

(D) Programme Content

Secondary 1

TE modules (12 cycles)	Project modules (8 cycles)	Application modules (4 cycles)
HEc (4 cycles) • Safety & Health - protective clothing, choice, use & care of household appliances • Food & Nutrition - hygienic & safe practices, food groups & eating habits • Food Preparation & Processing - simple food preparation & processing skills	Project themes: e.g. • Desktop tidy • Snack design	HEc • Food & Nutrition - dietary goals
D&T (4 cycles) • Materials & Resources - single medium • Tools & Equipment - simple hand tools and machine tools (e.g. drilling machines) • Design & Applications - 2D CAD		D&T • Structures & Mechanisms: 4-leg walking toy
IT (4 cycles) • Information & Communication Technology - basic computer operation, using the Internet, using common information processing tools		IT • Components of computer systems

(E) Progression

- Learning and Teaching: It is expected that there will be an increase in student exploration and less teacher control in learning and teaching from S.1 to S.3.
- Context: From personal (S.1) $\rightarrow$ to family (S.2) $\rightarrow$ to community (S.3)

2. Technology Education Curriculum in LCM Secondary School

(A) Background of the School

- Coeducational school sponsored by a church body
- The statistics of the school in the last three years show that 60% of their students will join the labour market after completing S.5

Positioning of Technology Education (TE) in the School Curriculum

- The provision of a balanced curriculum with a strong inclination towards technology for all students throughout their schooling is deemed desirable, thus about one-third of the curriculum time in junior secondary is allocated to TE.
- Through studying various TE subjects, students develop their generic skills, values and attitudes, thus enhancing their ability and attitude for life-wide and life-long learning.
- Students learn knowledge and skills applicable in their daily life.
- The learning experiences in TE enhance the employability of students and prepares them for further studies and work.

(B) Planning: School Level

Aims of TE in School

The TE curriculum at the junior secondary level aims at:

- helping students to explore their interests, aptitudes and abilities so as to prepare them for further studies and work;
- providing students with a variety of subjects to nurture their technological literacy as well as their generic skills, values and attitudes;
- providing students with authentic hands-on learning experiences, developing their knowledge and skills to cope with new emerging technologies, making them aware of the impact of technology and developing their critical thinking ability;
- enabling students to make their own choices in life according to their interests and abilities.

Resources

- The school has four computer rooms and six workshops.

- The Technology Education panel comprises 12 teachers specializing in the following disciplines:

No. of Teachers	Discipline
3	Business
3	Computer and Information Technology
2	Electronics and Electricity
1	Graphic Design
2	Mechanical and Production Engineering
1	Media Production and Photography

Details

The Panel should observe the following directives in designing the TE curriculum at the junior secondary level:

- Time Allocation
  - 16 periods per six-day cycle

- Learning Elements
  - the curriculum includes learning elements in Computer Literacy, Desktop Publishing, Graphical Communication, Electronics and Electricity, Retail Merchandising and the three fundamental subjects in technology, i.e. Business Fundamentals, Design Fundamentals and Technology Fundamentals;

- Role of the Panel
  - school administrators mobilize adequate resources, such as timetable arrangements, facilities, equipment and human resources.
  - the Panel ensures that the curriculum content, timetable organization, strategies in planning students' learning experiences, assessment policy, etc. are in line with school policy;
  - the Panel is responsible for planning, organizing, implementing and evaluating the programme so as to provide the desired learning experiences for students;
  - students are provided with learning experiences in authentic contexts, obtaining hands-on experiences of exploring and applying ideas to solve practical problems in life;
  - students apply knowledge, skills and experiences in using resources to create products or systems to satisfy basic needs in their daily life;
  - opportunities are provided for students to acquire life-wide learning experiences via participating in activities such as visits to various organizations, the sharing

of ideas through inter-school competitions and community activities.

Programme

- The learning of existing TE subjects is moving away from skill-based or content-based teaching towards learning and teaching for a balanced development of capability, understanding and awareness of technology.
- The programme is implemented in three phases, starting with S.1 in September of Year 1, S.1-S.2 in September of Year 2 and S.1-S.3 in September of Year 3, so that the change will occur gradually. The programme will be reviewed once every three months or whenever desirable to ensure that it is working in the best interests of the students.
- Commencing in S.1, the students will experience about 4 themes every year. The learning experiences for each theme, including activities such as classroom teaching, workshop sessions, small group activities, reading assignments and projects, last for about two months. The themes should incorporate the aforesaid learning topics with the following characteristics. They should:
  - be progressive in nature
  - integrate the different knowledge contexts of TE
  - nurture students' basic skills, attitudes and their ability for life-long learning
  - ensure basic competence in core elements and encourage the pursuit of excellence in specialized fields

Assessment

The Panel observes the following directives in designing TE assessment at the junior secondary level:

- The use of a variety of assessment modes, such as practical work, observation, presentation, quizzes and peer assessment, is encouraged. The results of all assessments count towards final results.
- A profile for individual students will be used to display their assessment results.
- Assessment within projects should include the management of time and resources in the search for information and in presentation.

Note: As this Guide focuses on Basic Education, suggestions for the planning of TE policy at the senior secondary level will be illustrated in other contexts as appropriate.

(C) Planning: Form Level

Form Level: S.3

Theme: Planning Our Ideal Community

Time allocation: 128 periods (16 periods per six-day cycle for 8 cycles)

Teachers involved in the form level planning and implementation: 8 teachers in the Technology Education panel specializing in the following disciplines.

No. of Teachers	Discipline
2	Business
2	Computer and Information Technology
1	Electronics and Electricity
1	Graphic Design
1	Mechanical and Production Engineering
1	Media Production and Photography

Objectives

To enable students to:

- know more about their community and enhance their sense of belonging.
- understand how technology is used to improve the quality of life.
- engage in authentic, hands-on problem-solving learning activities to nurture their transferable skills.
- develop their critical thinking ability by appraising solutions suggested by peers, and learn how to respect the ideas of other people.
- recognize that different stakeholders in the community may have different needs and know how to work out a solution to suit their needs.
- acquire knowledge and concepts related to redevelopment, conservation, revitalization and rehabilitation.
- integrate their technological knowledge with that of other Key Learning Areas (KLAs) such as Personal, Social and Humanities Education (PSHE), Arts and Mathematics through engaging with issues in community planning, heritage conservation and the construction of new buildings.
- acquire life-wide learning experiences by interacting with various stakeholders in the community.

Programme

The Technology Education panel should plan stages of learning, and organize the content in this area - knowledge, skills, values, and attitudes according to the interests and abilities of the students. The allocation of tasks among teachers should be made in accordance with their own expertise.

Stages	Knowledge Contexts in Technology and Living	
	Learning Elements	**Learning Activities**
1. Knowing the community (2 cycles)	• Technology and Society • Business Environments: economic, technological, social and cultural, physical, political and legal • Family Living • Safety and Health • Information Processing and Presentation	• Searching for information • Reading to learn • Group discussions • Lecturing • Visits and participation in the activities organized by the community representatives
2. Planning the ideal community (2.5 cycles)	• Information Processing and Presentation • Resources Management • Design and Applications • Technology and Society • Safety and Health • Family Living	• Searching for information • Information analysis • Reading to learn • Group discussions • Lecturing • Visits and participation in activities organized by the community
3. Model building (2.5 cycles)	• Design and Applications • Materials and Resources • Information Processing and Presentation • Material Processing • Structures and Mechanisms • Safety and Health • Technology and Society • Consumer Education	• Reading to learn • Group discussions • Lecturing • Workshop
4. Presentation and Evaluation (1 cycle)	• Consolidation of the above TE content	• Discussions • Self-reflection • Peer assessment

Assessment

Assessment should be planned to motivate students and provide feedback.

Assessment	Assessor
• Project portfolio as an accumulation of pieces of work	• Self, teachers
• Observation on students' progress	• Teachers
• Final product - artefacts such as models, computer graphics, sketches to show the layout of the plan - reports to describe the purposes of the designs, problems encountered, areas for improvement, etc.	• Self, peers, teachers, parents and stakeholders of the community
• Oral presentation	• Self, peers, teachers, etc.
• Written examination on the related knowledge	• Teachers

3. Technology Education Curriculum in DEF Primary School

(A) Background of the School

- Coeducational school established for over 30 years
- Sponsored by a church body
- Most teachers with more than 10 years' teaching experience

(B) Planning: School Level

Aims

Technology Education (TE) is currently embedded in General Studies (GS) at the primary level. It aims at:

- providing students with the knowledge of technology required to recognize some of the technologies being used around them;
- developing students' curiosity in technology, so that they become aware of why and how it is used and of safety issues;
- providing students with simple hands-on learning experiences for exploring and experiencing how technology works, and developing their interests and confidence in tackling simple technology problems; and
- nurturing students' creativity and innovation through TE.

Resources

- The school has one GS room and one computer room.
- The GS panel comprises 25 teachers and all of them have received basic training in implementing TE in the GS curriculum.
- Time allocation: 6 periods per week.

Assessment

- Different modes of assessment are used to suit the purposes and process of learning including:
  - projects
  - observation
  - portfolios
  - tests and examinations, etc.
- The results of all assessments count towards the final results.
- A profile for individual students will be used to display their assessment results.

(C) Planning: Class Level

Level: P.3

Theme: Water Filter

Time allocation: 8 periods and one half-day session for a visit

Teachers involved in the class level planning and implementation: 5 teachers from the GS panel

Objectives

To enable students to:

- understand the properties and functions of the materials used for building a water filter.
- take into account various factors, such as limited resources and environmental issues, when developing a solution.
- suggest, implement and improve a solution.
- see that there are various ways of tackling a problem.
- integrate their technological knowledge with that of other Key Learning Areas (KLAs) such as Science, Personal, Social and Humanities Education (PSHE), Arts, Mathematics and Languages in a project.
- acquire life-wide learning experiences through, for example, visiting a water treatment plant.

Programme

The GS panel plans the stages of learning and organizes the knowledge, skills, values and attitudes involved in the context of water filtering according to the interests of the students.

Stages	Knowledge Contexts in Technology Education	
	Learning Elements	**Learning Activities**
1. Understanding the need for water filtering (2 periods and 1 half-day visit)	• Hygiene • Health issues • Environmental issues	• Searching for information • Reading to learn • Visit to a water treatment plant • Group discussions • Lecturing
2. Designing a water filter (2 periods)	• Finding out needs of end users • Basic elements of design • Design considerations • Environmental issues • Health issues • Effective communication skills	• Searching for information • Information analysis • Reading to learn • Group discussions • Lecturing
3. Prototype building (2 periods)	• Basic elements of design • Design considerations • Effective communication and presentation skills • Types and nature of materials • Material properties and testing • Processing of materials	• Reading to learn • Group discussions • Workshop • Lecturing
4. Presentation and evaluation (2 periods)	• Consolidation of the above TE contents	• Discussions

Assessment

Assessment could be done in different stages to provide information for both students and teachers to improve learning and teaching.

Learning Expectation	Assessment	Assessor
• Describe the physical properties of a given material	• Verbal /Written responses	• Teacher / Students
• Identify the different tools used for product making	• Verbal /Written responses	• Teacher / Students
• Refer to the design cycle for product making	• Work report	• Teacher
• Test a product solution under different conditions	• Work report / Teacher observation	• Teacher
• Evaluate a product design based on specific requirements	• Peer evaluation	• Students
• Operate different tools or devices for production	• Presentation/ Performance	• Teacher
• Communication skills, collaboration skills and learning attitude	• Teacher observation • Self-reflection • Peer evaluation	• Teacher / Students

4. A Presentation to Promote the Image of Hong Kong

Key Stage: 3

(A) Key Features

In this learning activity, students are expected to:

- understand the basic concept of marketing and the use of simple tools in market research;
- identify the needs of a target audience when giving a multimedia presentation;
- demonstrate awareness of the cultural background of a target audience and how this might affect the choice of information to present;
- understand and apply the basic rules and techniques of communication and presentation so that multimedia information can be presented to the audience in an effective way;
- implement, manage and evaluate a multimedia project.

(B) Task Definition

In this activity, students participate actively in planning and developing a multimedia presentation with the aim of promoting the image of Hong Kong in order to attract potential overseas tourists. Students are divided into groups and work collaboratively. The teacher stimulates students to think and solve problems.

(C) Integrated Dimensions of Technology

In developing this learning activity, students will incorporate the following learning elements:

- Information Processing and Presentation
- Design and Applications
- Marketing
- Technology and Society

(D) Intended Learning Objectives

Knowledge Contexts	Process	Impact
Students should be able to: • understand the underlying concepts and principles of effective communication and presentation • understand the strategies, process and procedures used in the production, communication and evaluation of a multimedia project • understand the basic concept of marketing and the simple tools used in market research	Students should be able to: • identify the needs of target audience / potential customers • produce the proposed multimedia presentation using the appropriate knowledge, skills and resources • use the language in multimedia technology for effective communication and documentation • evaluate whether the finished product meets the requirements	Students should be able to: • be aware of the beliefs, values and ethics of a target audience and of how this might affect the choice of information to be presented

(E) Lesson Sequence

1. Teacher and students discuss the significant contribution of the tourist industry to local Gross Domestic Product (GDP) and the need to promote the image of Hong Kong to potential overseas tourists.
2. Students investigate and identify Hong Kong's attractions for overseas tourists. During the investigation, students take into account the cultural background of different target groups. Useful information can be collected from sources such as websites, magazines and also from interviewing tourists.
3. Students list the design and development plan for the multimedia presentation promoting Hong Kong.
4. Students are divided into groups to collect, select and organize multimedia resources. Students are encouraged to explore the use of different hardware and software to meet their needs. For example, students can collect information by downloading them from the Internet, by using a digital camera or a scanner, etc.

5. Students develop their multimedia presentation according to the initial design and planning. Each group should make a schedule and divide the tasks among group members.
6. Students evaluate the solution continuously during the process in the light of the requirements identified.
7. Each group prepares a presentation of its work to the class at the end of the project.
8. Teacher gives feedback to each group and supports the students throughout the process.

(F) Evaluation

At the beginning of the project, the teacher can evaluate the students' initial understanding of the needs and requirements of the project through asking questions or brainstorming.

During the project, students' language and manipulative skills can be assessed by observing what they say and do.

Understanding of the concepts and principles involved in a project can be evaluated through using a structured assessment task, such as presentation of a product or a written test.

Students' problem-solving skills, communication skills and collaboration skills can be evaluated through teacher observation of student performance, together with an examination of students' pieces of work kept in their portfolio.

5. Poster Design

Key Stage: 3

(A) Key Features

In this learning activity, students are expected to:

- identify key features of a commercial product;
- recognize customers' behaviour and interests;
- understand the use of a poster for advertising a commercial product;
- understand the basic concepts involved in poster design;
- generate a creative design idea for a poster of a commercial product;
- design and make a poster for a commercial product using computer graphic tools;
- share ideas with peers, and reflect.

(B) Task Definition

Students design and produce a poster of a selected commercial product of their own choice. In the process:

- Students select particular commercial products that they are interested in.
- They identify features of the products that will convince the target customers.
- Key messages are formulated for advertising purposes. Students then apply design concepts and skills in using computer graphic tools to produce a poster for the commercial products.

(C) Integrated Dimensions of Technology

In developing this learning activity, students will incorporate the following learning elements:

- Consumer Education - finding out the key features of a commercial product, conducting simple research to investigate the interests of the target customers and designing the key message of the poster;
- Design and Applications - understanding the basic concepts of poster design and applying them to the design of a poster to attract target customers to purchase a commercial product;
- Information Processing and Presentation - applying computer graphic skills to produce the designed poster.

(D) Intended Learning Objectives

Knowledge Contexts	Process	Impact
Students should be able to: • understand the basic concepts of using posters to advertise a commercial product • understand the basic concepts involved in poster design	Students should be able to: • conduct a simple research to investigate the features of a commercial product and the behaviour and interest of customers • generate creative ideas • use basic skills in producing posters by using computer graphic tools	Students should be able to: • appreciate the poster as a vehicle for visual representation and effective communication • appreciate others' works, and reflect • value information technology tools as effective learning tools

(E) Lesson Sequence

1. Teacher shows some posters of commercial products and discusses the features of the products and the key messages presented in the posters to convince target customers to buy them.
2. Students select a commercial product that they are interested in. They find out the features of the product.
3. Students discuss with their family, classmates or friends the image of a particular product and how and why they are attracted to it.
4. Students identify target customers for the product. They also design the key message and an eye-catching slogan to convince the target customers to buy.
5. Teacher shows some posters and discusses the basic concepts involved in each design.
6. Students formulate design details, such as background, diagrams, slogan, etc. for a poster.
7. Students discuss and comment on each design in groups. Teacher also gives feedback on their ideas.
8. Teacher supports students to acquire the necessary skills in using computer graphic tools for producing the posters.
9. Students generate the basic elements of the poster by taking photographs, scanning pictures, getting graphics from the Internet, drawing figures, etc. Students use computer graphic tools to produce a poster.

10. Students are reminded to acknowledge all sources of information.

(F) Evaluation

Various assessment tasks are arranged which will provide useful feedback on students' learning.

Manipulative skills and development of the language of technology

During the activity, the teacher observes students' progress. The teacher gives timely feedback on their use of technological language. Guided questions and clues for tackling problems and making improvements are provided whenever necessary. The teacher keeps a progress logbook for the students. When a student shows that he/she has acquired a specific manipulative skill, the teacher puts a "✓" on the logbook. A "*" is recorded when the manipulative skill is demonstrated with outstanding performance. The progress logbook gives the teacher an overview of students' progress and performance in mastering manipulative skills.

Integrating various learning elements

Students are requested to keep a portfolio of their work. They also discuss in groups and comment on each other's poster design. Feedback gathered from the teacher, peers and from self-evaluative reflection provides the basis for future improvement. Students present their posters to each other discussing their underlying ideas. The teacher can then evaluate the students' problem-solving skills and creativity. The teacher integrates what has emerged about their learning from examining their portfolio, looking at their posters and listening to their presentation.

6. From Tough to Tender - Methods of Tenderizing Meat

Key Stage: 3 (Secondary 2)

(A) Key Features

In this learning activity, students are expected to:

- identify the characteristics of meat tissues;
- explain factors that cause some meat cuts to be tougher than other cuts;
- suggest different ways of tenderizing meat using natural resources;
- choose suitable methods of tenderizing meat in daily cooking based on factors such as available resources, volume of meat to be tendered, etc.;
- cooperate with team members in a group task;
- manage time and resources in completing the investigation;
- apply strategies in communicating, presenting and evaluating technological solutions.

(B) Task Definition

Through the understanding of connective tissues in meat and investigating different methods of tendering, students identify how meat can be tenderised. During the process, students develop their ability to make informed decisions on the appropriate method of meat tendering in their daily cooking. They also develop manipulative skills and observe safety measures when using tools and equipment.

> Connective tissue is made up of long, thin threads that hold muscle tissues together in meat. It is very strong and can make meat tough. Less tender meat cuts contain more connective tissues and often cost less than more tender meat cuts. There are several methods one can use to break down connective tissues and tenderize meat.

(C) Integrated Dimensions of Technology

In developing this interactive learning activity, students will incorporate the following learning elements:

- Food Preparation and Processing
  - Understand the principles involved in food preparation and processing
  - Apply skills in food preparation and processing

- Safety and Health
  - Choice, use and care of tools and equipment
  - Good housekeeping in the work area
- Tools and Equipment
  - Choose and use appropriate tools and equipment
- Production Process
  - Skills, procedures and resources for production process

(D) Intended Learning Objectives

Knowledge Contexts	Process	Impact
Students should be able to: • recognize that the length of tissue affects the tenderness of the meat • realize that acid helps to dissolve the connective tissues • recognize that meat tissues can be softened in liquid	Students should be able to: • apply suitable and safe technology, materials, tools and processes in developing solutions • manage time and resources in completing the investigation • apply strategies in communicating, presenting and evaluating technological solutions	Students should be able to: • be aware that there are different methods of tenderizing meat • apply suitable methods of tenderizing meat in daily cooking • promote management and critical thinking skills among students

(E) Lesson Sequences

1. Teacher illustrates connective tissues of meat under the microscope.
2. Teacher introduces different cuts of meat, and explains the factors that cause some meat cuts to be tougher than others.
3. Students are divided into groups to investigate how meat can be tenderized.
   Task A - through using a physical method
   Task B - through using a chemical method
   Task C - through ways of cooking

Learning activity arrangement:

Groups 1 and 3: tasks A & C

Groups 2 and 4: tasks B & C

4. Each group reports on how meat can be tenderized.

   Task A

   Physical method - grinding, pounding or cutting

   Reasons - this breaks the connective tissues into short pieces. The shorter the connective tissue, the more tender the meat will be.

   Task B

   Chemical method - marinating the meat in an acid, such as lemon juice or vinegar or sprinkling the meat with meat tenderizer

   Reasons - this dissolves the connective tissues.

   Task C

   Ways of cooking - to fry or stew meat

   Reasons - cooking causes the connective tissues to soften. The slower the cooking, the more time is needed for the connective tissues to become soft and tender. At high temperatures, meat cooks so quickly that connective tissues do not have enough time to soften. Cooking meat in liquid also softens the connective tissues and helps to make meat tender.

5. Conduct a taste test to compare the texture of the meat prepared by different groups.

6. Students' comment on different ways of tenderizing meat. They then suggest suitable methods of tenderizing meat in daily cooking.

(F) Evaluation

Assessment of Processing Skills

Learning Expectation	Assessment	Assessor
Apply suitable tools and equipment	Observation Checklist	Teacher
Manage time and resources wisely	Observation Checklist	Teacher
Communicate and present ideas effectively	Observation Checklist	Teacher
Cooperate with team members in completing the task	Observation Checklist and Rating Scale	Teacher and Peer

Assessment of Knowledge, Concepts and Processing Skills

Learning Expectation	Assessment	Assessor
Demonstrate ability in processing and interpreting issues in food technology	Students' presentation and report of findings	Teacher and Peer
Evaluate the effectiveness of different ways of tenderizing meat	Students' presentation and report of findings	Teacher and Peer

7. Building a Tower

Key Stage: 3

(A) Key Features

In this learning activity, students are expected to:

- make use of easily available materials
- engage in hands-on activities to analyse the different materials available
- practise a problem-solving strategy to develop a product

(B) Task Definition

Students are divided into groups of 4 or 5 to build towers with materials such as blocks, Legos, paper cups, newspapers, straws, etc., to reach specified heights, and with various bases. They will continue their explorations of how to build taller and more elaborate towers by alternating the structures (e.g. rolled newspapers and tape, twisting different materials together, etc.) to find out the best solution. At the end of this project, students will share their solutions with their classmates, compare their results orally and match their products against modern tower architectures.

(C) Integrated Dimensions of Technology

This activity is intended to cover the following learning elements:

- Design and Applications - making and testing a product according to functional, aesthetic, and ergonomic standards.
- Material Processing - applying different processes for forming, assembling, and testing of materials.
- Structures and Mechanisms - designing and creating effective structures for specific objectives.
- Creativity - encouraging students to create their own shapes and structures.
- With a respect for the environment - making use of recycled materials as resources.

(D) Intended Learning Objectives

Knowledge Contexts	Process	Impact
Students should be able to: • select appropriate materials for constructing or producing a tower • develop a working model based on technical outlines or specifications • identify the different tools used for product making • refer to the design cycle (or other problem-solving model) for product making	Students should be able to: • describe the physical properties of a given material • describe the characteristics of a given structure • join two pieces of materials with or without tools • plan a project solution by applying the design cycle • seek for the best possible solution	Students should be able to: • test a product under different conditions • make reference to existing architectures used for designing towers • ensure personal safety in operating different tools • evaluate the effectiveness of a particular problem-solving method • evaluate own performance and make improvements

(E) Activity Sequence

In the first two lessons:

1. Brief students about the classroom activity.
2. Highlight the requirements or expectations.
3. Ask students to apply a design cycle for developing their towers.
4. Require students to hand in their design outlines.
5. Manage the class by attending to:
   - time control,
   - materials supplies and distribution,
   - student grouping.
6. Collect the design outlines from each group.
7. Ask students to construct their towers as a home assignment.

In the next two lessons,

8. Provide feedback on students' outlines.

9. Require students to develop appropriate tests for their products.
10. Group presentation for their designs and testing.
11. Judge and comment on students' work.
12. Probe students with key questions.
13. Help students to summarize their findings.

(F) Evaluation

Possible assessment activities and the related assessors are suggested below:

Learning Expectation	Assessment	Assessor
Describe the physical properties of a given material	Verbal / Written responses	Teacher / Students
Describe the characteristics of a given structure	Verbal / Written responses	Teacher / Students
Identify the different tools used for product making	Verbal / Written responses	Teacher / Students
Refer to the design cycle (or other problem-solving model) for product making	Work report	Teacher
Plan a project solution by applying the design cycle	Presentation / Peer evaluation	Teacher / Students
Test the selected materials or structures under different conditions	Work report / Teacher observation	Teacher
Evaluate the effectiveness of a particular problem-solving method	Peer evaluation	Students
Make reference to existing architectures used for designing towers (or bridges)	Work report	Teacher
Join two pieces of materials with or without tools	Presentation / Performance	Teacher
Operate different tools or devices for production	Presentation / Performance	Teacher
Communication skills, collaboration skills and learning attitude	Teacher observation/ Self-reflection / Peer evaluation	Teacher / Students

8. A Balanced Diet Exercise

Key Stage: 3 (Secondary 3)

(A) Key Features

In this learning activity, students are expected to:

- understand the concepts of a balanced diet;
- identify the nutritional requirement of the target group and be able to plan a nutritive meal for the target group;
- prepare a meal to demonstrate the hygienic practices in food preparation and safe practices in the use of cooking tools and equipment;
- show a collaborative working attitude and demonstrate a sensible approach to solve a problem;
- appreciate the importance of a healthy diet;
- explore and appraise the benefits of labour-saving devices such as electrical appliances in the home.

(B) Task Definition

Working in groups of 2, students are assigned to plan and prepare a nutritive two-course lunch for a group of teenagers.

(C) Integrated Dimensions of Technology

In this learning activity, students will incorporate the concepts learned in the following topics:

- Food and Nutrition;
- Food Preparation and Processing;
- Home Management and Technology

(D) Intended Learning Objectives

Knowledge Contexts	Process	Impact
Students should be able to: • show an understanding of a balanced intake of nutrients by selecting and using food from different food groups • plan a nutritive two-course lunch for teenagers	Students should be able to: • prepare the meal according to the plan made and showing sensible use of resources such as time, labour and food • demonstrate hygienic practices in the process of preparing the meal • show safety awareness in using sharp tools and specialized equipment	Students should be able to: • appreciate the importance of a healthy diet to teenagers • value the benefits of labour-saving devices in food preparation

(E) Lesson Sequences

This unit will be completed in 5 lessons.

1. In the first 2 lessons, students plan a 2-course meal for a group of teenagers. The meal plan should include details such as:

Task	Plan and prepare a 2-course meal, which will be served as lunch for a group of four teenagers
Dishes Chosen	Dish 1: Dish 2:
Reasons for Choices	(Nutritive value and cooking methods in relation to the needs of the target group)
Ingredients	(Use of a variety of ingredients and value for money)

Time Plan	Time (Time schedule)	Task (Food preparation process)	Remarks (Tools and equipment required, job division between the two team members, etc.)

2. In the next 3 consecutive lessons, students will prepare the meal according to the meal plan completed previously.

(F) Evaluation

Written Assessment:

Assessing the "Meal Plan" and "Work Plan" made by the students against target criteria such as,

- to use a sensible approach in solving the meal planning problem;
- to state the nutritional needs of teenagers in relation to their growth and development, daily activities, etc.;
- to state the reasons for the choice of ingredients, cooking methods to fit the needs of teenagers and the taste and texture of the dishes prepared;
- to demonstrate a proper method for preparing the meal;
- to show a logical management of time and division of work between two members.

Observation of Students' Work:

A checklist to discuss the competency of students' manipulative skills such as:

- preparing ingredients, e.g. by slicing, dicing, etc.;
- using the proper way of cooking food, e.g. by steaming, baking, etc.;
- adopting hygienic practices, e.g. storage of food, handling of raw and cooked food, washing up, etc.;
- observing safe practices, e.g. safe use of sharp tools, gas cookers, electrical appliances, etc.

Peer Assessment:

Students assess and rank the work of their classmates on the following:

- Choice of dishes
- Appropriateness of the cooking methods
- Taste, texture and presentation of the meal

Feedback Session:

Students exchange ideas between groups and teachers give their feedback on the overall planning and preparation of the meal, while students serve their meals to the class.

9. Project Work Assessment - Design Challenge - Hand-held Communication Device

In a S.2 Design and Technology lesson, the teacher sets a challenge to his class to design and make a concept model of a hand-held communication device. The concept model is to show accurately what the finished product might look like.

To be successful, students need to:

- examine a range of telephones to see how styles change over the years.
- develop ideas, test and modify them, using a variety of modelling techniques and interviewing potential users.
- use a computer design software to design and print the shape and form of the model.
- build an accurate 3D model that is of a high quality finish.

Assessment focuses:

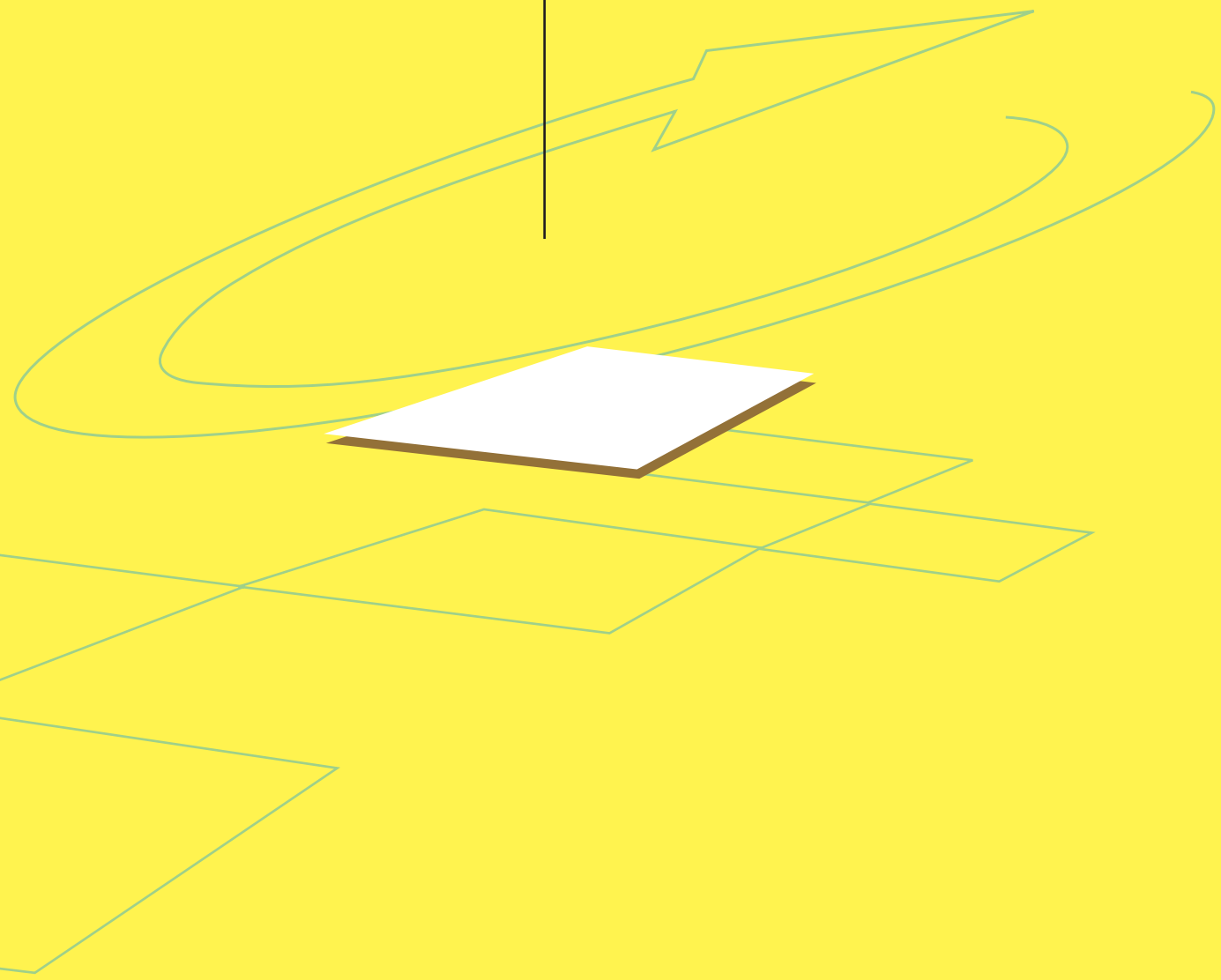
- Designing skills (design folio): research, ideas generation, and presentation;
- Modelling and making skills (concept model): knowledge and understanding of the application of materials, computer graphics, and 3D model.

Scoring rubrics:

	Designing	**Making**
Distinction	The design folio: • shows evidence of comprehensive market research and analysis • includes a full specification • contains a variety of designs that are well drawn and explained • includes a final design, chosen for reasons that refer to the specification • includes evidence of testing and evaluation.	The finished concept-product is: • finished to a high standard • suitable for consumer testing • ergonomically fit for use. Student: • works with a range of tools, materials, equipment, components and processes and understands their characteristics • uses sophisticated computer techniques to model design.

	Designing	Making
Merit	The design folio: • shows evidence that market research and analysis have been carried out • includes a specification which takes account of key points in the market research • includes some design proposals which are drawn and explained • includes a final idea which is chosen with some reference to the specification • contains some self-evaluation.	The finished concept-product is: • finished • usable to obtain feedback from customers Student: • works with a range of tools, materials, equipment, components and processes with some precision • uses appropriate computer techniques to model design.
Pass	The design folio: • includes a stated brief which may be derived from market research • contains some ideas which are drawn and explained • includes a chosen idea which may not be fully justified.	The finished concept-product: • is modelled with some limited success • completed but with little or no surface finish. Student: • selects and works with a range of tools and materials • uses limited computer techniques to model design.
Fail	Student: • displays incompetence in design • fails to relate the ideas presented to the problem. The problem is not attempted or the key aspects are not clearly defined or solved. The information produced does not help to solve the problem.	Concept-product is not completed. Student: • uses tools and equipment with low accuracy to cut and shape materials and to put together components • selects materials with limited choice • fails to produce a computer graphic model.

Appendices



Appendix A

Technology Learning Activities

When designing Technology Learning Activities (TLAs), teachers could consider:

- anticipated learning targets,
- the strands of TE and the selected knowledge contexts,
- the relevant situations,
- lateral coherence with other Key Learning Areas (KLAs),
- teachers' specialities, etc.,

to formulate authentic learning activities to address the learning needs of students.

A graphical representation of the formulation is shown in the Figure below:

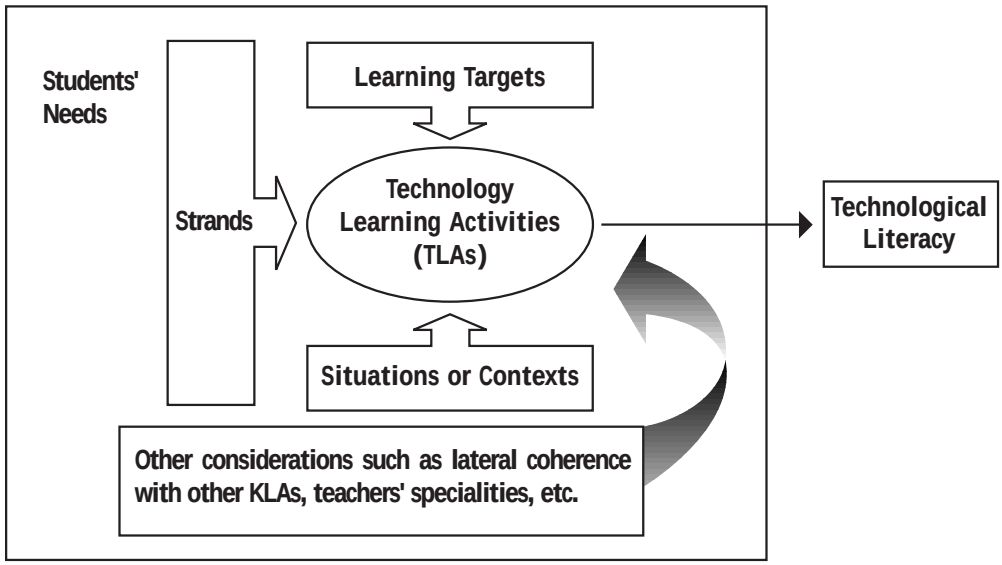


Figure on Schema for Formulating TLAs

TLAs can 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 or even business problems.

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 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 the design cycle of every TLA, it is not necessary to go through all the activities or to go through them in any particular order. 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.

Appendix B References for Teachers

i. Reference Books

Title	Author	Edition	Publisher	ISBN
Advanced Educational Technology in Technology Education	Anthony Gordon, Michael Hacker, Marc de Vries	1993	Springer-Verlag	3-540-56554-X
Assessing Technology: International Trends in Curriculum & Assessment	Richard Kimbell	1997	Open University Press	0-335-19781-7
Creative Technology	John Aitken	1990	Collins Educational	0-00-317705-X
Design it, Make it, Appraise it: Lower Secondary Technology	Susan Harriman	1996	Curriculum Corporation	1-86366-285-5
Integrating Advanced Technology into Technology Education	Michael Hacker, Anthony Gordon, Marc de Vries (ed)	1991	Springer-Verlag	3-540-54275-2
Linking the Learning Areas - Technology Education	Curriculum Corporation	1998	Curriculum Corporation	1-86366-418-1
Planning Curriculum Connections Whole-School Planning for Integrated Curriculum	Kath Murdoch, David Hornsby	1997	Eleanor Curtain	1-875327-49-5
Skills for Life	Sue Couch, Ginny Gelstehausen, Pasty Hallman	2000	West Publishing Company	0-538-43009-5

Title	Author	Edition	Publisher	ISBN
Standards for Technological Literacy - Content for the Study of Technology	International Technology Education Association	2000	International Technology Education Association	1-887101-02-0
Teaching Technology	Frank Banks	1994	Open University Press	0-415-10254-5
Technology - A Curriculum Profile for Australian Schools	Curriculum Corporation	1994	Curriculum Corporation	1-86366-209-x
Technology - A Statement on Technology for Australian Schools	Curriculum Corporation	1994	Curriculum Corporation	1-86366-202-2
Technology - in the New Zealand Curriculum	Ministry of Education, New Zealand	1995	Ministry of Education, New Zealand	0-478-02898-9
Technology for All Americans - A Rationale and Structure for the Study of Technology	International Technology Education Association	1996	International Technology Education Association	1-887101-01-02
Technology Education, Curriculum Handbook	Association for Supervision and Curriculum Development	1995	Association for Supervision and Curriculum Development	--
Technology Education for Early Learners	Department for Education and Children's Services	1997	Department for Education and Children's Services	0-7308-5102-8
Technology Education in the Classroom - Understanding the Designed World	Senta A. Raizen, Peter Sellwood, Ronald D. Todd, Margaret Vickers	1995	Jossey-Bass Publishers	0-7879-0178-4

Title	Author	Edition	Publisher	ISBN
Technology's Challenge to Science Education: catheral, quarry, or company store	David Layton	1993	Open University Press	0-335-09958-0
The Changing Face of Learning Technology	Edited by David Squires, Grainne Conole, Gabriel Jacobs	2000	University of Wales Press	0-7083-1681-6
21 世紀中國兩大支柱 — 科技教育化與教育科技化	周毅	2001	福建教育出版社	7533431006
中小幼科技教育試驗與探索	吳雷	2001	科學出版社	7030093887
中國科技教育史	梅汝莉　李生榮	1992	湖南教育出版社	7-5355-1481-2
台灣科技教育與經濟發展	--	1993	廈門大學出版社	7-5615-0535-3
科技與職業教育的課題	李隆盛	1996	師大書苑發行	957-8969-97-X
科技教育談	周寄中　梁捷著	1993	科學出版社	7-03-003060
科技教育目標研究	--	1999	師大書苑有限公司	9574960846
基礎科技教育綱要 － 21 世紀普通高中科技教育學參考綱要	--	2001	安徽教育出版社	7533627121

ii. Teaching Kits

Title	Author	Edition	Publisher	ISBN
Creative Living (Teacher's Classroom Resources)	Linda R. Glosson, Janis P. Meek, Linda G. Smock	2000	Glencoe McGraw-Hill	0-02-648146-4
Skills for Living (Teacher Resources Binder)	Frances Baynor Parnell, CFCS	1997	The Goodheart-Willcox Company, Inc	1-56637-291-7
天工開物－中國古代科技文物	教育署	2000	教育署	--

iii. CD-ROMs

Title	Edition	Publisher	ISBN
Inventors and Inventions	1995	The British Library, Interactive Learning Productions and Yorkshire Television	0-7123-4305-9
"Technology for Life" Multimedia Package （生活與科技）	2002	教育署	--

iv. Websites

American Association for the Advancement of Science - Science and Technology Policy Papers	http://www.aaas.org/
Curriculum Corporation - Technology	http://www.curriculum.edu.au/tech/
Design and Technology Online (UK)	http://www.dtonline.org/
Elementary - School Technology Education (ESTE) Program - Ball State University	http://tiger.coe.missouri.edu/~patrick/education.html
Industrial Technology and Design Teachers' Association (in Australia)	http://www.intad.asn.au/
International Journal of Technology and Design Education	http://www.wkap.nl/journals/tde
International Technology Education Association	http://www.iteawww.org/
Journal of Technology Education	http://scholar.lib.vt.edu/ejournals/JTE
Links: Technology Education Pages	http://atschool.eduweb.co.uk/trinity/other.html
National Association of Teachers of Home Economics & Technology	http://www.users.globalnet.co.uk/~nathe/
Queensland School Curriculum Council - Technology	http://www.qscc.qld.edu.au/kla/ technology/index.html
Standards for Technological Literacy by ITEA	http://www.iteawww.org/TAA/STLstds.htm
Teachers @ Work: Technology Education	http://teachers.work.co.nz/
Technology Education Federation of Australia	http://www.pa.ash.org.au/tefa/

Technology Education Index (On-line store)	http://www.technologyindex.com/
Technology Education Resources (USA)	http://ed1.eng.ohio-state.edu/techres/proforgs.html/
Technology for All Americans (TAA)	http://www.iteawww.org/TAA/TAA.html
Technology Insight	http://www.technology.org.uk/
The Curriculum Council of WA: Technology and Enterprise Curriculum	http://www.sea.wa.edu.au/
The Design and Technology Association (in UK)	http://www.data.org.uk
The Journal of Technology Studies	http://scholar.lib.vt.edu/ejournals/JTS/
九年一貫國民教育網站 - 科技課程綱要	http://cur9.wfsh.tp.edu.tw/
九年一貫課程教學示例全集 — 自然與生活科技領域	http://www.iest.edu.tw/

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