Technology Education

Key Learning Area Curriculum Guide (Primary 1 – Secondary 6)

Prepared by
The Curriculum Development Council

Recommended for use in schools by
The Education Bureau
HKSARG
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Preamble

The development of the Hong Kong school curriculum has advanced into a new phase of ongoing renewal and updating. It ushers in a new era for curriculum development to keep abreast of the macro and dynamic changes in various aspects in the local, regional and global landscapes in maintaining the competitiveness of Hong Kong. For the ultimate benefits of our students, schools are encouraged to sustain and deepen the accomplishments achieved since the Learning to Learn curriculum reform started in 2001, and to place new emphases on future needs in curriculum development for achieving the overall aims and learning goals of the school curriculum.

The eight Key Learning Area (KLA) Curriculum Guides (Primary 1 - Secondary 6) have been updated and recommended by the Curriculum Development Council (CDC)[1] to support the ongoing renewal of the school curriculum at the primary and secondary levels.

In updating the KLA Curriculum Guides, the respective KLA committees under the CDC have taken into consideration the concerns, needs and suggestions of various key stakeholders including schools, principals, teachers, students and the public at large. A series of school briefing cum feedback collection sessions coupled with a territory-wide school survey were conducted in 2015 to gauge schools' views on the major updates of the respective Curriculum Guides.

The eight KLA Curriculum Guides (2017) supersede the 2002 versions. Each KLA Curriculum Guide presents the updated curriculum framework which specifies the KLA's curriculum aims, learning targets and objectives, delineates the direction of ongoing curriculum development at the KLA level, and provides suggestions on curriculum planning, learning and teaching strategies, assessment, as well as useful learning and teaching resources. In addition, updated examples of effective learning, teaching and assessment practices are provided for schools' reference. Supplements to some KLA Curriculum Guides and subject curriculum guides are also available to provide further suggestions on their implementation at specific key stages. Schools are encouraged to adopt the recommendations in the KLA Curriculum Guides, taking into account the school contexts, teachers' readiness and learning needs of their students.

For a better understanding of the interface between various key stages and connections of different learning areas, and how effective learning, teaching and assessment can be achieved, schools should make reference to all related curriculum documents recommended by the CDC and the latest versions of the Curriculum and Assessment Guides jointly prepared by the CDC and the HKEAA for the senior secondary curriculum to ensure coherence in curriculum planning at the school, KLA and subject levels.

As curriculum development is a collaborative and ongoing process, the KLA Curriculum Guides will be under regular review and updating in light of schools' implementation experiences as well as the changing needs of students and society.

[1] The CDC is an advisory body offering recommendations to the Government on all matters relating to school curriculum development from kindergarten to secondary levels. Its membership includes heads of schools, teachers, parents, employers, academics from tertiary institutions, professionals from related fields or related bodies, representatives from the Hong Kong Examinations and Assessment Authority (HKEAA), and officers from the Education Bureau.

Views and suggestions on the development of the Technology Education KLA Curriculum are always welcome. These 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 values and attitudes in using resources to create products or systems to meet human needs and wants.

(Section 1.2.1)

- Technology influences and is influenced by the cultures of people, and is part of our daily life.

(Section 1.2.2)

Technology Education

- Technology Education (TE) is the entitlement of each student. It is the learning of 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.

(Sections 1.3.1 – 1.3.2)

Subjects under TE KLA

- At the primary level, the content of TE is subsumed in the General Studies curriculum.
- At the junior secondary level, many schools are adopting subject-based learning approach through subjects such as Computer Literacy, Design and Technology, and Home Economics/Technology and Living to implement the learning element modules of the TE curriculum.
- At the senior secondary level, five elective subjects are offered to facilitate students in pursuit of a wide range of future studies or career pathways.

(Sections 1.3.4 – 1.3.6)

Direction for the Development of the TE KLA

- The development of the TE KLA will be moving from acquisition of confined discipline-based knowledge and skills to understanding of broader technological contexts so as to keep abreast of changes in the world.

(Section 1.4.2)

Major Emphases in the Implementation of TE KLA in Schools

- At the primary level, schools are expected to strengthen learning activities for students to explore technology concepts and be aware of technological development and its impacts on the society.
- At the junior secondary level, schools are expected to offer a broad and balanced TE curriculum that could prepare students to continue their studies in TE or other aspects at higher level.
- At the senior secondary level, schools are expected to provide TE subjects as elective subjects so that students could specialise for lifelong learning or preparation for work. Schools should offer a diversified choice of elective subjects to cater for students' interests, abilities and needs.

(Section 1.5.2)

Aims of TE

- The TE KLA curriculum aims to develop **technological literacy** in students through the cultivation of ***technological capability, technological understanding*** and ***technological awareness***.
    - 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 society and the environment.

(Section 2.1.1)

Principles in Implementation

- - Schools could build on their strengths and use different modes of curriculum implementation to provide a more balanced and enriched TE KLA curriculum, shifting the emphasis from rigid subject-based contents towards a more open, flexible and updateable curriculum.
- Schools should choose the contexts, contents, learning and teaching strategies, and activities most suited to the needs and interests of their students.
- 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.

(Sections 1.5.1 & 3.2.4)

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:
    - Process in Technology
    - Impact of Technology

(Section 2.2.1)

Core and Extension Modules

- 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.
- For each Knowledge Context, extension learning elements are provided to help students excel in areas of their own choice.

(Section 2.4)

Emphasis of the TE Curriculum at Different Key Stages

- Key Stages 1 and 2 (Primary 1 – Primary 6 in General Studies): Awareness and Exploration
- Key Stage 3 (Secondary 1 – Secondary 3): Experiencing and Application
- Key Stage 4 (Secondary 4 – Secondary 6) and beyond: Orientation for Lifelong Learning and Specialisation

(Sections 1.4.4)

Central Curriculum and School Curriculum Development

- Consideration factors:
  - Vision and mission of the school and its sponsoring body
  - Strengths of the school and its teaching force
  - Background and learning needs of students
  - Provision of a broad and balanced curriculum for students
  - Resources of the school that can support learning and teaching

(Section 3.2.1)

- Modes for the implementation of TE curriculum in schools:
  - Subject-based learning
  - Aligning subjects/knowledge contexts
  - Collaborative teaching of subjects/knowledge contexts
  - Theme-based learning
  - Life experiences of students

(Section 3.2.7 - 3.2.9)

Learning and Teaching

- The learning and teaching of TE should:
  - be purposeful
  - be progressive and iterative in nature
  - involve the coordination of the hands and mind
  - integrate the different knowledge contexts in TE curriculum
  - nurture in students the basic knowledge, skills and attitudes for lifelong learning
  - enable the pursuit of excellence in specialised fields for students with interest or talent in TE
  - infuse MRE of the ongoing renewal of the curriculum such as promoting STEM education

(Section 4.1.1)

Assessment

- Guiding principles for developing assessment strategy for the TE KLA:
  - Purposeful and holistic
  - Reflect all the components of the TE curriculum
  - Formative assessment (i.e. assessment for learning) and summative assessment (i.e. assessment of learning) are equally important
  - Observation and testing are used
  - Assessment should be part of the learning process
  - Everyone involved in the assessment process knows how to interpret and make use of the assessment results

(Section 5.1.2)

- Some common modes of assessment:
  - Project work assessment
  - Task-based assessment
  - Assessing essential manipulative skills
  - Assessing knowledge and concepts
  - e-Assessment

(Section 5.2.2)

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Introduction

Chapter 1 Introduction

In response to the changing needs of society, the rapid development of science, technology and engineering in the world, the views of stakeholders collected through various surveys and engagement activities as well as the need to align with the direction for the ongoing curriculum renewal of the school curriculum, the recommendations provided in the *Technology Education Key Learning Area Curriculum Guide (Primary 1 - Secondary 3)* (2002) have been reviewed. Building on the strengths of Hong Kong students in technology, the curriculum emphases of the Technology Education Key Learning Area (TE KLA) have been updated, together with the aims, targets and objectives of Technology Education for different key stages to highlight the Major Renewed Emphases (MRE) of the ongoing renewal of the school curriculum, in particular STEM[2] education. Given that elements of STEM education are already embedded in individual KLAs of Science Education, Technology Education and Mathematics Education of the school curriculum, there is a need to further strengthen the coherence and collaboration among KLAs. In this connection, the promotion of STEM education is a development focus to further enhance the quality and effectiveness of learning, hence enabling students to become more effective lifelong learners in the 21st century.

The ***Technology Education Key Learning Area Curriculum Guide (Primary 1 - Secondary 6)*** (2017) (this Guide) is prepared by the Curriculum Development Council (CDC) Committee on Technology Education. It is an updated version of the *Technology Education Key Learning Area Curriculum Guide (Primary 1 - Secondary 3)* (2002) and has been extended to include the three-year senior secondary Technology Education to provide reference for schools in developing a coherent school Technology Education curriculum.

The direction for the development of this Guide aligns with the Seven Learning Goals of Primary and Secondary Education (see Appendix 1 for the Seven Learning Goals of Primary Education and the Updated Seven Learning Goals of Secondary Education) and the major recommendations in the ***Basic Education Curriculum Guide – To Sustain, Deepen and Focus on Learning to Learn (Primary 1-6)*** (2014) and the ***Secondary Education Curriculum Guide (Secondary 1 - 6)*** (2017).

This Guide provides the overall direction for the development of the Technology Education curriculum in the five to ten years to come. It reinforces the curriculum emphases provided in the *Technology Education Key Learning Area Curriculum Guide (Primary 1 - Secondary 3)* (2002) to enhance learning and teaching and puts forth MRE which take into account the significant developments in our society and around the world in various fields, and for the ultimate benefits of student learning. This Guide includes examples relevant to different key stages of learning to illustrate the concepts and ideas introduced and to narrow the gaps in curriculum implementation.

This Guide helps schools move from the existing subject orientation towards a balanced Technology Education (TE) curriculum framework and its associated curriculum planning. Schools should make reference to the following curriculum documents for suggestions on

[2] STEM is an acronym that refers collectively to the academic disciplines of Science, Technology, Engineering and Mathematics. In the Hong Kong curriculum context, STEM education is promoted through the Science, Technology and Mathematics Education KLAs.

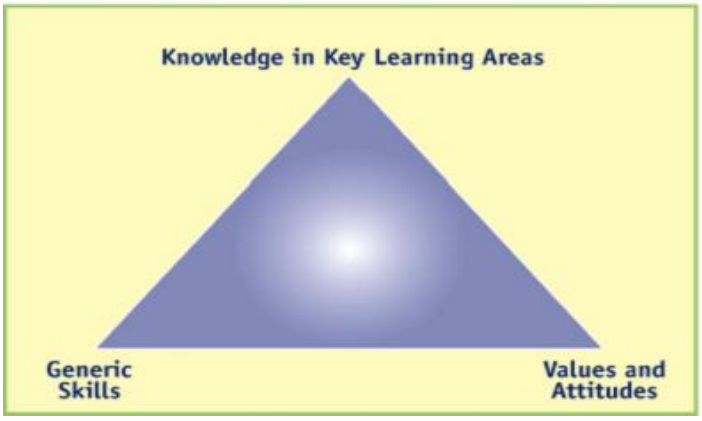
the planning and development their school TE curriculum as well as strategies for the learning, teaching and assessment at different key stages:

- *General Studies Curriculum Guide (Primary 1 - 6)* (2017)
- *Technology Education Key Learning Area Curriculum Guide Supplementary Notes (Secondary 1 - 3)* (2013)
- *Business, Accounting and Financial Studies (BAFS), Design and Applied Technology (DAT), Health Management and Social Care (HMSC), Information and Communication Technology (ICT) and Technology and Living (TL) (Food Science and Technology/Fashion, Clothing and Textiles) Curriculum and Assessment Guides (Secondary 4 - 6)* (2007) (with updates in November 2015)

1.1 What is a Key Learning Area?

A Key Learning Area (KLA) is an important part of a 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 generic skills (e.g. communication, critical thinking and collaboration skills, creativity), subject-specific skill as well as 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 organised into subjects, modules, units, tasks or other modes of learning.

The three interconnected components of the curriculum framework, i.e. Knowledge in KLAs, Generic Skills, and Values and Attitudes can be represented in the figure 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 values and attitudes in using resources to create products, services or systems to meet human needs and wants. It involves novel ideas and

problem solving process to improve the well-being of human. Technologies have been employed and constantly improved over time to satisfy human needs and wants in various aspects of our life, for example:

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 housing:

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
↓
High-speed 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, society and environment. The inventions and innovations of technology influence the development of human civilisation, affecting and changing the interactions among people, organisations, systems, etc.

1.2.3 Technology also constitutes an influential factor in the social and economic development of our society. There are significant technological developments in areas of information and communication, transportation, medical, automation and food production in recent decades. 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. A few examples are provided in the following box for illustration.

- **Papermaking printing** and **word processing** facilitate the keeping of records, the passing on of knowledge and the process of communication.
- It is more feasible to explore the world with a **compass**, resulting in greater mobility. The invention of **Global Positioning System (GPS)** makes navigation more accurate and convenient.
- 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. The appearance of the smart phones enables people to communicate more efficiently across boundaries.

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 keep Hong Kong students 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, creative media, engineering, etc. which should be updated whenever required.

1.3.2 Technology learning experiences focus on how human beings solve their daily life problems and how the process could be replicated and transferred to solve new problems that arise from time to time. Hence technology education is also an effective platform for nurturing students' problem solving skills, creativity and critical thinking skills, and for promoting learning by doing. Students are provided with ample opportunities to realise their ideas through hands-on experiences which cater for their interests and learning styles. Technology education helps students develop the knowledge and skills for further studies, for work, or both, as well as cultivate their attitude as lifelong learners for the betterment of their adult life.

1.3.3 The existing school subjects under the TE KLA curriculum (see Figure 1) are of diversified orientations. Schools should gradually move towards a balanced study of knowledge, key concepts, skills, values and attitudes promulgated in the TE curriculum to satisfy the diverse interests and needs of students. Some subjects will be phased out and new ones phased in to align with the changes in the school curriculum and academic structure.

Figure 1 Subjects under Technology Education Key Learning Area

Primary Level (P1 - 6)	Junior Secondary Level (S1 - 3)	Senior Secondary Level (S4 - 6)
General Studies	**TE KLA Curriculum (S1-3)** (fully implemented in the 2016/17 school year)	**Elective Subjects:** • Business, Accounting and Financial Studies (BAFS) • Design and Applied Technology (DAT) • Health Management and Social Care (HMSC) • Information and Communication Technology (ICT) • Technology and Living (TL) (Food Science and Technology/Fashion, Clothing and Textiles)

Note: The TE KLA Curriculum (S1-3) comprises 6 Knowledge Contexts, namely Information & Communication Technology, Materials & Structures, Operations & Manufacturing, Strategies & Management, Systems & Control, and Technology & Living.

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

1.3.5 At the junior secondary level, many schools are adopting subject-based learning approach through subjects such as Computer Literacy, Design and Technology, and Home Economics/Technology and Living to implement[3] the learning element modules of the TE curriculum[4], and has a suggested **time allocation of 8% - 15%** of the total lesson time.

1.3.6 At the senior secondary level, five elective subjects, namely Business, Accounting and Financial Studies, Design and Applied Technology, Health Management and Social Care, Information and Communication Technology, and Technology and Living are offered for senior secondary students for specialisation of studies in the TE curriculum. The subjects are designed to facilitate students in pursuit of multiple pathways for further studies or future career development.

[3] Please refer to Figure 10 on p.104-105 for the different modes for implementation of TE curriculum in schools.

[4] Please note that the New Technical Curriculum (NTC) previously designed for ex-prevocational and ex-technical schools has been phased out completely in the 2016/17 school year.

1.4 Rationale and Direction for Development

1.4.1 Rationale for the development of the TE KLA

- The 21st century is a technology-led era. There is an urgent need to prepare students to meet the challenges of a rapidly changing world as well as maintain Hong Kong's competitive edge in the Asia-Pacific Region and in the world.
- TE subjects are therefore introduced to meet the various needs of society and prepare students for lifelong learning and work. The timely updating and reorganisation of the TE curriculum would keep students' learning in pace with the technological, social and economic developments and thus help prepare students for their adult life.
- The provision of various technology learning experiences to students gives them the opportunities to develop their potential to the fullest. In addition to an understanding of the technological development in society, schools should nurture in students the quality of innovation and an entrepreneurial spirit that the future society requires. Educational programmes should also be arranged to help students understand the world of work, develop their readiness for work, healthy lifestyle and financial literacy which are essential for their personal and professional success in future.
- Most schools provide opportunities for students to develop their basic skills in information technology. However more space should now be given for students to acquire and construct knowledge, and develop their capabilities and awareness in different areas of technology.
- With no change in the broad curriculum framework, the following MRE are put forth in response to the changing contexts and the latest education trends, and to provide suggestions for the development and implementation of the TE curriculum in the five to ten years to come:
    - The TE KLA curriculum, which comprises broad learning elements, can provide a good basis to develop the **technological literacy**[5] in students. Emphasising **technological literacy** is developed through the cultivation of technological capability, technological understanding and technological awareness (see Section 2.1.1 of this Guide for details). It facilitates students to build a solid foundation of knowledge and skills, develop generic skills, as well as nurture positive values and attitudes.
    - Promote STEM education which aims at further enhancing students' interest in learning, developing in them a strong knowledge base in the relevant disciplines, and strengthening their integrative learning and application skills. STEM education can enhance students' creativity, innovation and problem solving skills, which are the essential skills and qualities required in the 21st Century. An integrative learning and application of the related knowledge contexts in technology education can help nurture students' technological understanding and capability. Students

[5] 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 Section 2.1.1 in Chapter 2 of this Guide.

can apply technological theories and principles to design and create products/systems for improving and enhancing the quality of life of mankind.

- Highlight other elements of the ongoing renewal of the school curriculum in planning and implementing the TE curriculum in schools.
- Promote **e-learning** to motivate students' interest in learning technology, enhance interaction and collaboration, and facilitate self-directed learning, with relevant measures in parallel to strengthen information literacy (**IL)** of students.
- Emphasise the importance of **holistic curriculum planning** and the process of Planning-Implementation-Evaluation (**P-I-E**) for successful implementation of the MRE and sustainable development of technology education in schools.
- Stress the continuous need to cater for **learner diversity** in technology education through giving appropriate attention to students of different learning needs and styles, including ordinary students, students with special educational needs (SEN) and gifted students.

1.4.2 Direction for the development of the TE KLA

Schools should give due consideration to the following direction in the development of the TE KLA:

- From acquisition of confined discipline-based knowledge and skills to understanding of broader technological contexts so as to keep abreast of changes in the world
- From a choice between academic or vocational studies to a judicious balance of theoretical and practical studies for solving daily life problems, for lifelong learning and for work
- From acquisition of technical know-how to application of knowledge and generic skills in new situations to develop creativity, critical thinking and problem solving skills
- From a subject-based curriculum to diversified modes of curriculum implementation based on the strengths of schools, and the needs and interests of students
- From compartmentalised knowledge and skills in respective TE subjects to integrated knowledge and skills in STEM education to solve problems in authentic contexts and make inventions to improve the quality of life in the contemporary world

1.4.3 **Aims and design of the TE KLA curriculum**

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

1.4.4 Emphasis of the TE curriculum at different key stages

Primary Level **Key Stages 1 and 2**	**Junior Secondary Level** **Key Stage 3**	**Senior Secondary Level** **Key Stage 4**
Awareness & Exploration	**Experiencing & Application**	**Orientation for Lifelong Learning and Specialisation**
		
Through strands in General Studies	**Through the junior secondary subjects/core and extension modules in the TE KLA curriculum**	**Through the senior secondary elective subjects: BAFS, DAT, HMSC, ICT & TL**

- At the primary level (Key Stage 1 (KS1) & Key Stage 2 (KS2)): Awareness and Exploration

Example 1 Emphasis on Awareness and Exploration

Through 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 referring to the number of turns given to the elastic rubber band, or the rubber bands with different elasticity. They can also 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, as well as their ability to examine technological products critically.

- At the junior secondary level (KS3): Experiencing and Application

Example 2 Emphasis on Experiencing and Application

In TE classes at the junior secondary level, students learn about the characteristics of energy supplied through the mains (gas and 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, apply what has been learned, and know what to do and what not to do when there is a gas leak. Students may work on simple projects such as using different energy sources to drive vehicles.

- On progressing into the senior secondary level (KS4): *Orientation for Lifelong Learning and Specialisation*

Example 3 Emphasis on Exploring Orientation for Lifelong Learning and Specialisation

Through further studies on energy sources, students acquire in-depth knowledge about how the power generated by different energy sources can be controlled, how the efficiency can be maximised, and how the design and control concepts can be integrated to develop systems or products to satisfy identified needs such as energy saving. 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.

1.4.5 Interface across key stages

For the benefits of student learning, a smooth interface in the planning of the TE curriculum across different key stages is important. TE teachers should fully understand the knowledge, skills and experience of their students should acquire or have acquired at different key stages so that their planning of the learning experiences could be meaningful and constructive. For better articulation of students' learning, relevant contents and challenging learning activities could be organised by building on what students have learned and experienced in school and their daily life.

1.5 Strategies for Development

1.5.1 In adopting strategies for the development of their school TE curriculum schools need to ensure that.

- The development is gradual, based on the strengths of existing subjects such as Design and Technology, Computer Literacy, Home Economics/Technology and Living, and the linking up of common learning elements among them.
- Generic skills are infused into the learning and teaching process 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 Four Key Tasks, in particular Project Learning, Reading to Learn: Towards Reading across the Curriculum, and Information Technology for Self-directed Learning, are used to promote technological capability, understanding and awareness.
- Schools could build on their strengths and use different modes of curriculum implementation to provide a more balanced and enriched TE KLA curriculum, shifting the emphasis from rigid subject-based contents towards a more open, flexible and updateable curriculum.
- Schools should choose the contexts, contents, learning and teaching strategies, and activities most suited to the needs and interests of their students.

1.5.2 Schools need to consider the following for the implementation of their own TE KLA curriculum.

Curriculum and Planning

- Schools should ensure the equal opportunities of learning TE for all students and of diversified learning needs and interests.
- Holistic curriculum planning is important and schools should give due consideration to the provision of different scenarios for students to integrate and apply knowledge and skills across disciplines.
- At the primary level, schools are expected to strengthen the learning activities for students to explore technology concepts, raise their awareness of technological developments and their impact on society.
- At the junior secondary level, schools are expected to offer a broad and balanced TE curriculum which nurtures students' capability for understanding various technologies, raises their awareness of the impact of technology on our daily life, provides opportunities for students to develop creativity, problem solving and critical thinking skills in authentic contexts, and prepares them to continue their studies in technology at a higher level or future development in other aspects.
- At the senior secondary level, schools are expected to provide TE subjects as elective subjects so that students could specialise for lifelong learning or preparation for work in areas of their interest, such as business, information technology, engineering, design, health, food science and fashion design.

Schools should offer a diversified choice of elective subjects to cater for students' interests, abilities and needs.

- Schools may implement the TE curriculum in different modes, including the subject-based and modular approach for the TE KLA curriculum at the junior secondary level.
- TE KLA co-ordinators and panel heads should develop a coherent and progressive school TE curriculum, with strong connections among the subject disciplines within the TE KLA and collaboration with other KLAs.
- Schools should provide a favourable environment with ample opportunities for students to integrate and apply knowledge and skills across the STEM-related KLA curricula during the learning process.
- Schools should plan for long-term development by considering their school curriculum and the resources required for the sustainable development of TE.

Students' Learning

- Students should be engaged in authentic, hands-on problem solving learning activities using easily available materials and equipment.
- Students should be encouraged to solve problems and to develop programming-related capabilities, coding skills, etc.
- Students should develop the knowledge and skills to cope with the rapidly emerging technologies.
- Students should develop the willingness to update their knowledge and skills in technology from time to time.
- Students should appraise the impact of technology and develop critical thinking ability.
- Students should be provided with opportunities to think critically and creatively and to come up with fresh problem solving ideas that can be applied in simulated and/or authentic situations.
- Students should be encouraged to participate in STEM-related competitions and other fun-filled learning activities organised by local and overseas organisations or different professional bodies.

Teachers' Professional Development

- Teachers should explore and introduce new technologies or learning elements to continuously update and enrich the TE curriculum in schools.
- TE teachers' professional knowledge and skills for the implementation of the TE curriculum should be continuously enhanced, including the ability to select and use different pedagogical approaches (such as case studies, thematic projects) for organising the technology learning experience for students, and use a variety of methods to assess students' learning progress and outcomes.

- Teachers can make use of various e-platforms and participate actively in related teachers' networks or learning communities for peer support, collaboration and sharing of experiences and good practices to enhance their professionalism.
- TE KLA teachers could work in collaboration with other STEM-related KLA/subject teachers to develop integrated and cross-disciplinary learning experiences for students.

Engagement in Broader Contexts

- Schools should provide more opportunities for students' life-wide learning by encouraging them to participate in a wide variety of interschool, regional or international activities such as visits or competitions to enhance students' interests in learning, broaden their exposure to technology development and nurture their entrepreneurial spirit.
- Teachers may strengthen the connection with tertiary institutions to seek advice from experts on students' project work, and learn about the latest research and development in different areas of technology.
- Schools may establish networks with industry for understanding of the innovative development of technology, the operation and marketing strategies of enterprises, as well as for seeking opportunities to arrange job attachments or industry projects for students.

1.6 Structure of the Guide

Chapter 1 sets out an overview of the TE KLA and the direction and strategies for development of the TE KLA curriculum.

Chapter 2 defines the TE curriculum framework.

Chapter 3 provides suggestions on the planning and organisation of TE curriculum at the primary and secondary levels, as well as the principles and strategies for holistic curriculum development of TE in schools.

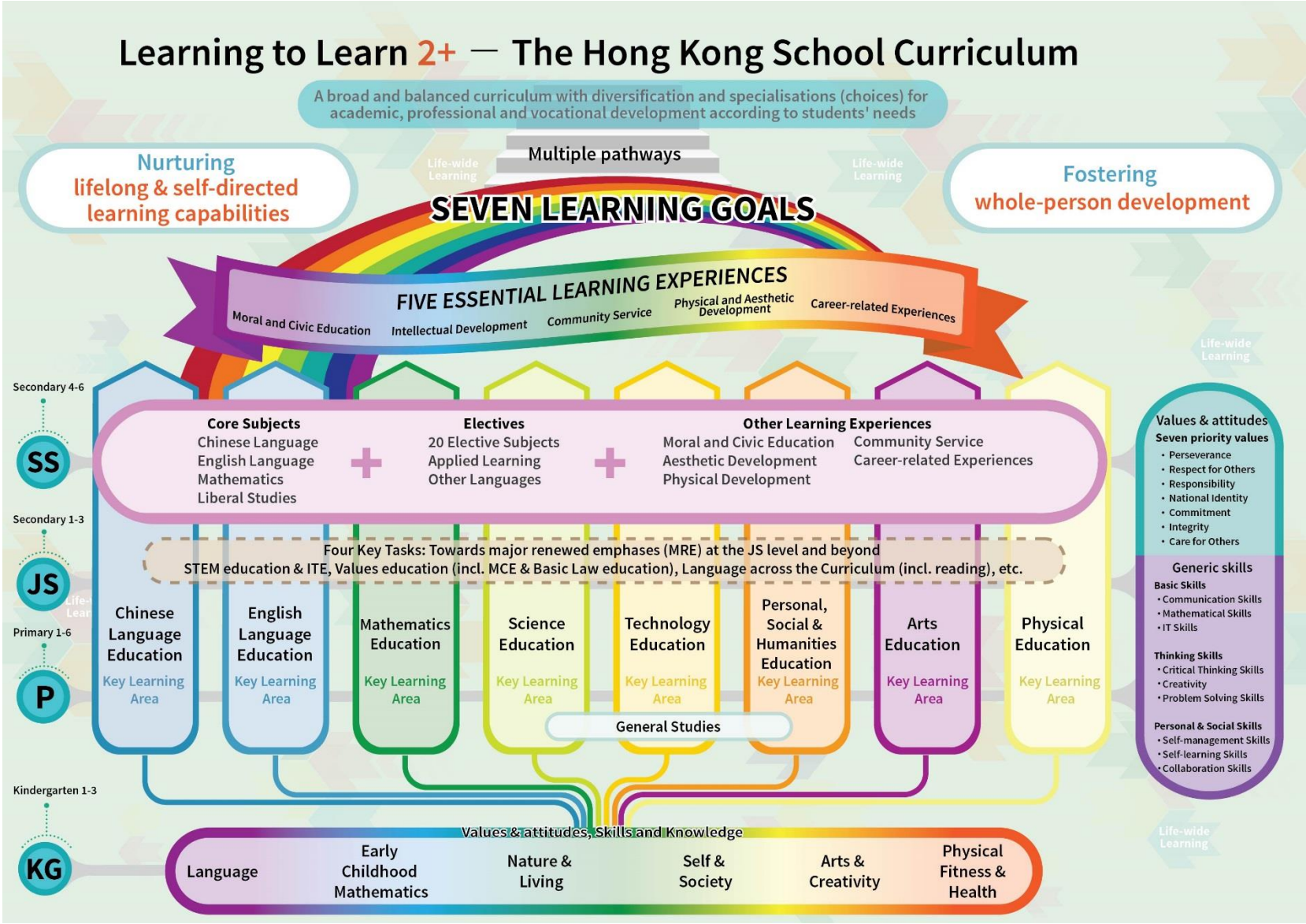
Chapter 4 focuses on the principles and strategies for organising learning and teaching in the TE curriculum.

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

Chapter 6 provides information on the learning and teaching supports for technology education.

The examples and appendices illustrate the concepts and ideas introduced as well as the suggestions made in this Guide.

Chapter 2
Curriculum Framework


Learning to Learn 2+ — The Hong Kong School Curriculum
A broad and balanced curriculum with diversification and specialisations (choices) for academic, professional and vocational development according to students' needs
Multiple pathways
Nurturing lifelong & self-directed learning capabilities
Fostering whole-person development
SEVEN LEARNING GOALS
FIVE ESSENTIAL LEARNING EXPERIENCES
Moral and Civic Education
Intellectual Development
Community Service
Physical and Aesthetic Development
Career-related Experiences
Life-wide Learning
Secondary 4-6
SS
Core Subjects
Chinese Language
English Language
Mathematics
Liberal Studies
Electives
20 Elective Subjects
Applied Learning
Other Languages
Other Learning Experiences
Moral and Civic Education
Aesthetic Development
Physical Development
Community Service
Career-related Experiences
Values & attitudes
Seven priority values
• Perseverance
• Respect for Others
• Responsibility
• National Identity
• Commitment
• Integrity
• Care for Others
Secondary 1-3
JS
Four Key Tasks: Towards major renewed emphases (MRE) at the JS level and beyond
STEM education & ITE, Values education (incl. MCE & Basic Law education), Language across the Curriculum (incl. reading), etc.
Generic skills
Basic Skills
• Communication Skills
• Mathematical Skills
• IT Skills
Thinking Skills
• Critical Thinking Skills
• Creativity
• Problem Solving Skills
Personal & Social Skills
• Self-management Skills
• Self-learning Skills
• Collaboration Skills
Primary 1-6
P
Chinese Language Education
English Language Education
Mathematics Education
Science Education
Technology Education
Personal, Social & Humanities Education
Arts Education
Physical Education
Key Learning Area
General Studies
Kindergarten 1-3
KG
Values & attitudes, Skills and Knowledge
Language
Early Childhood Mathematics
Nature & Living
Self & Society
Arts & Creativity
Physical Fitness & Health

Chapter 2 Curriculum Framework

2.1 Aims of Technology Education

2.1.1 The TE KLA curriculum aims to develop **technological literacy** in students through the cultivation of ***technological capability***, ***technological understanding*** and ***technological awareness***. Technology education 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 keeps Hong Kong students 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

The aims of the TE curriculum also contribute to achieving the Updated Seven Learning Goals of Secondary Education as stated in Booklets 1 & 2 of the *Secondary Education Curriculum Guide (SECG) (Secondary 1 – 6)* (2017). Please refer to following table for details.

Aims of the TE Curriculum	Updated Seven Learning Goals of Secondary Education
To enable students to:	To enable students 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	• develop and apply generic skills in an integrative manner, and to become an independent and self-directed learner for further study and work • use information and information technology ethically, flexibly and effectively • be proficient in biliterate and trilingual communication for better study and life
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	• acquire and construct a broad and solid knowledge base, and to understand contemporary issues that may impact on students' daily lives at personal, community, national and global levels
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	• become an informed and responsible citizen with a sense of national and global identity, appreciation of positive values and attitudes as well as Chinese culture, and respect for pluralism in society • lead a healthy lifestyle with active participation in physical and aesthetic activities, and to appreciate sports and the arts • understand one's own interests, aptitudes and abilities, and to develop and reflect upon personal goals with aspirations for further studies and future career

2.2 The Curriculum Framework

The curriculum framework for TE is the overall structure for organising learning, teaching and assessment for the subjects of the TE KLA. The core part of the framework is a set of interlocking components including:

- knowledge contexts;
- generic skills; and
- values and attitudes.

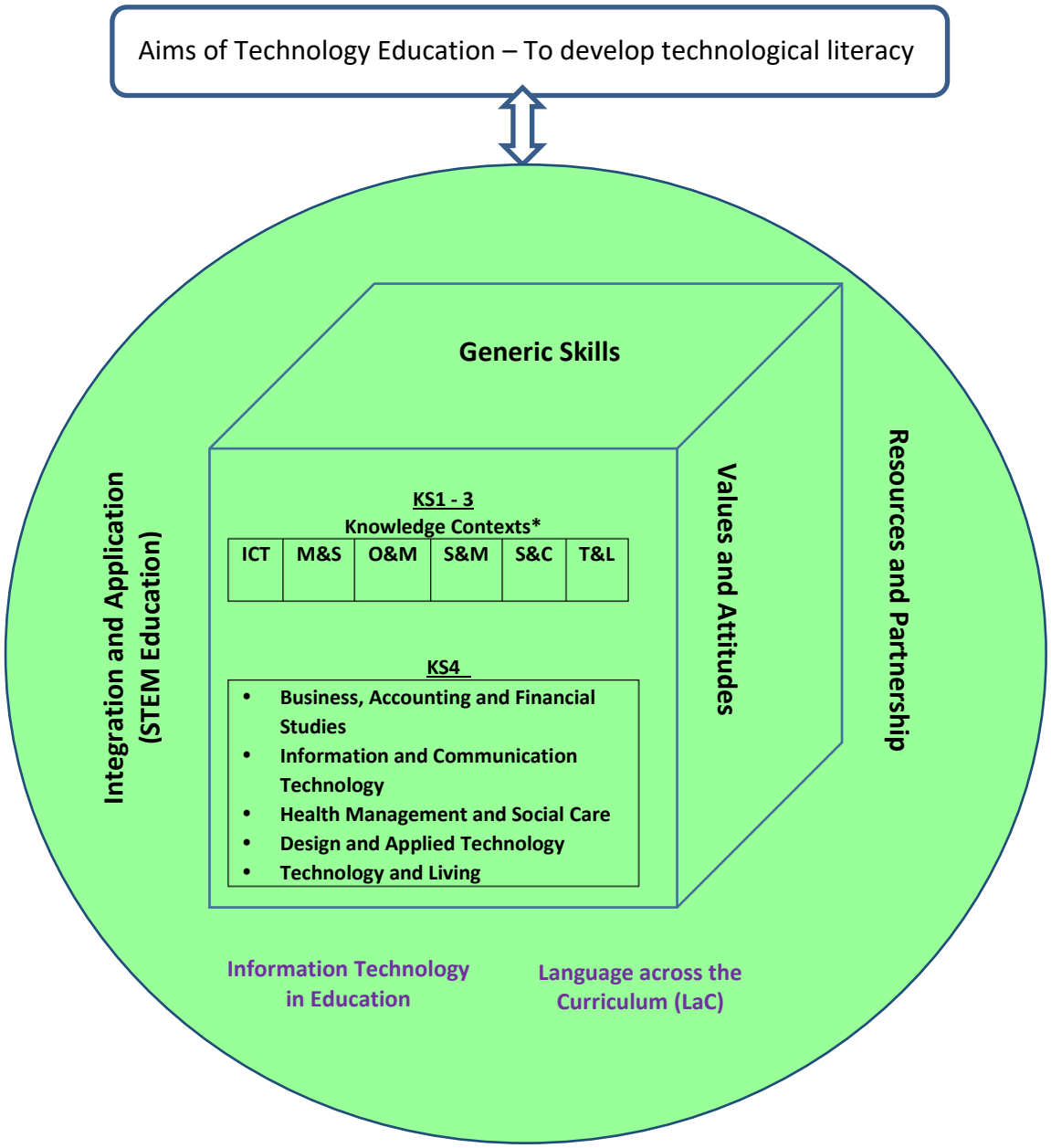
The framework sets out what students should know, value and be able to do at various key stages of schooling. It gives schools and teachers flexibility and ownership to plan and develop their school TE curriculum according to their strengths and the different needs and aspirations of their students.

Figure 2 is a diagrammatic representation of the updated TE curriculum framework.

- The learning needs of students under the contemporary contexts, including the development of students' information literacy and abilities to apply literacy skills to construct knowledge are also included in the framework.
- Great emphasis is placed on integration and application of knowledge and skills when connecting learning in the TE KLA and other KLAs/subject disciplines. This is particularly important in STEM education, which is promoted through three KLAs including TE.
- The learning of technology also requires the effective use of resources and strong partnerships with tertiary institutions, professional bodies and technology-related organisations in the provision of a range of meaningful and authentic learning experiences.

Figure 2

Diagrammatic Representation of the Technology Education Curriculum Framework



*The six Knowledge Contexts for KS1 - 3:

Information and Communication Technology (ICT)	Operations and Manufacturing(O&M)	Systems and Control (S&C)
Materials and Structures (M&S)	Strategies and Management (S&M)	Technology and Living (T&L)

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 the TE curriculum, students achieve the aims of TE learning, enhance 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

Strand A Knowledge Contexts in Technology

Knowledge Contexts refer to a broad base of learning elements in the TE curriculum 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 daily life, local business or industries;
- updated and in line with current scientific and technological development;
- related to the experiences and interests of students; and
- related to the innovative development of the designed world, etc.

The following **six knowledge contexts** in TE are considered essential for our students to meet the challenges in the current Hong Kong context:

(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 (M&S)
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 (O&M)
It is important that students acquire the necessary knowledge and skills to manage the resources and processes required to realise their design solutions.

(iv) Strategies and Management (S&M)
As Hong Kong is an important international centre of trade and finance as well as 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 (S&C)*
Systems at both 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 (T&L)*
Technology affects our lives and enhances the nurturing of quality people and quality homes.

The six knowledge contexts in the TE curriculum provide the platforms for the organisation of student learning. With reference to the TE learning targets and the existing subject curricula, learning elements for Key Stages 1 to 3 (P1 - S3) under the six knowledge contexts are developed for schools' reference (see Figure 3). 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. Contents of learning elements are listed in Figure 7 under Section 2.3 of this Guide.

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

Figure 3 Learning Elements under Knowledge Contexts in Technology Education

Knowledge Contexts	Learning Elements
Information & Communication Technology	• Computer Systems • Computer Networks • Programming Concepts
Materials & Structures	• Materials & Resources • Material Processing • Structures & Mechanisms
Operations & Manufacturing	• Tools & Equipment • Production Process • Project Management
Strategies & Management	• Business Environments, Operations & Organisations • Resources Management • Marketing
Systems & Control	• Concepts of System • Application of Systems • System Integration • Control & Automation
Technology & Living	• Food & Nutrition • Food Preparation & Processing • Fabric & Clothing Construction • Fashion & Dress Sense • Family Living • Home Management & Technology

(Further details of the learning elements at the junior secondary level, i.e. KS3 are listed in Figure 7 under Section 2.3)

Strand B Process in Technology

The ***Process in Technology*** enables students to gain experiences in identifying, developing, evaluating and refining ideas to solve technological problems. It also encourages the creation of innovative designs and the realisation 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 fulfils 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.

The ***"Process In Technology"*** strand is at the heart of the TE curriculum, enabling students to build up technological capability, and to acquire generic and transferable skills to develop further innovative technologies.

Strand C Impact of Technology

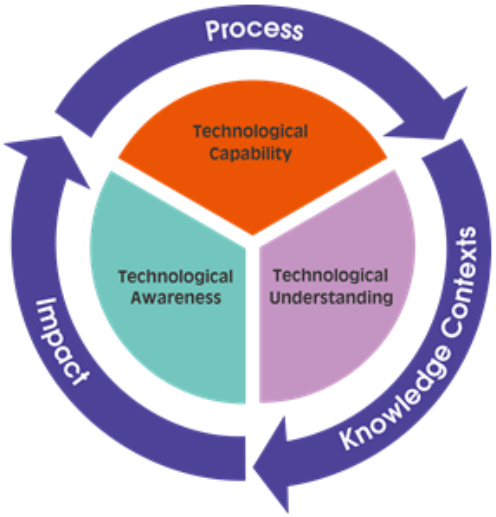
Studying the ***Impact of Technology*** helps students develop an awareness of the consequences of technological development and their applications. Students come to see how the beliefs, social values and ethics of individuals and groups influence and are influenced by such development.

Students should be provided with opportunities to appreciate how technology has improved our living, and to assess the "***Impact of Technology***" on themselves, their families, society and mankind; and to cultivate a global outlook towards innovative technological development.

However, students should not be blind followers of new technologies. They should be given opportunities to exercise values and attitudes, as well as to make decisions on the use of technologies in their daily life, and be aware of the impact of technological development in society from the perspective of a customer, a citizen, an employee, a designer or an engineer.

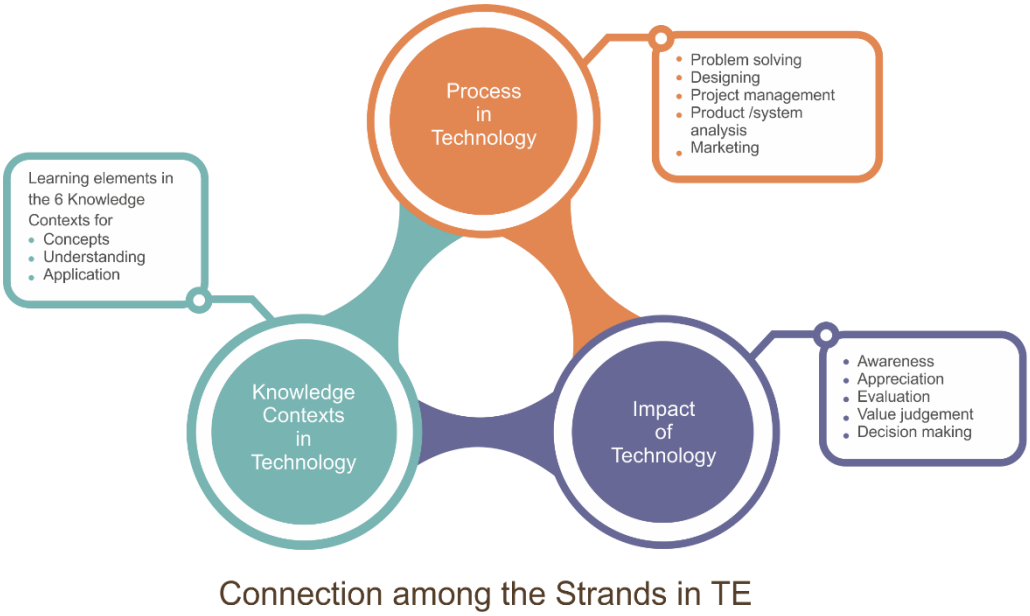
Figure 4 illustrates how the three ***strands*** of learning elements under TE are woven together to cultivate the three aspects of ***technological literacy*** in students.

Figure 4 **Development of Technological Literacy**



In Figure 5, the nature of learning in the TE curriculum is expressed as a close ***connection*** among the three strands of learning elements. Technology learning activities should be designed mainly for students' application of learning elements from the three strands in an integrated manner.

Figure 5 Connection among the Strands in the Technology Education Curriculum



The Learning Targets

Through various key stages of schooling, students will develop their technological literacy by studying the three strands in the TE curriculum as well as using the six knowledge contexts as the platform for their learning. The learning targets of the TE curriculum for primary, junior secondary and senior secondary students, as well as those for junior secondary students with a special interest and talent in technology are provided as follows.

- **Learning targets for students at the primary level (Key Stages 1 and 2, Primary 1 – 6) are to:**
  - develop an interest and curiosity in exploring everyday needs and in thinking of ways to respond to these;
  - understand the importance of good eating habits, personal hygiene and safety, and find ways of maintaining these;
  - understand the concepts and processes involved in the design cycle and applied them to solve simple problems; and
  - develop an awareness of how the business world operates and of consumers' rights and responsibilities.

- **Learning targets for students at the junior secondary level (Key Stage 3, Secondary 1 - 3) are to:**
  - master basic skills in the use of their hands and minds to solve everyday problems and develop an understanding of how to use technologies appropriately;
  - adopt a healthy lifestyle and maintain good family relationships;
  - develop a basic understanding of the business world and of how to manage their personal finances; and
  - become socially aware decision-makers who care about public morality and the environment.

- **Learning targets for students at the junior secondary level with a special interest and talent in technology are to:**
  - develop a more in-depth understanding in particular areas of technology, such as control and automation, project management and computer networks, etc.;
  - integrate various learning elements within their knowledge framework and understand their interrelationships; and
  - master the knowledge and concepts underpinning some applications of technology.

  Technology education from the primary to junior secondary levels helps students acquire a solid foundation of technological knowledge and skills. At the senior secondary level, students can choose among various elective subjects under TE KLA to further develop their interests and explore career orientations in various areas of technology.

- **Learning targets for students taking the elective subjects under TE KLA at the senior secondary level (Key Stage 4, Secondary 4 - 6) are to**:
  - develop a comprehensive understanding in different areas of technology by integrating various concepts and knowledge elements;
  - master the skills in applying the principles of technology to solve problems in authentic contexts;
  - become acquainted with the process of idea generation and could critically appraise the effects of the processes and outcomes of technology when facing technological problems or issues; and
  - develop strong interests in areas of technology and be prepared for careers orientation, further studies or lifelong learning.

The Learning Objectives

- The six knowledge contexts, which are the platforms to organise student learning, aim at developing students' knowledge and concepts of technology, process in technology, impact of technology, generic skills, and values and attitudes.
- The learning objectives under the six knowledge contexts of KS1 to KS3 are outlined in Figure 6. These learning objectives would be further adapted for use in schools through various projects. Good practices would be disseminated from time to time for reference.
- At the primary level, the GS curriculum provides opportunities for students to integrate knowledge, skills and attitudes across three KLAs, including TE. For setting the learning objectives for KS1 and KS2, references should also be made to the *General Studies Curriculum Guide (Primary 1 – Primary 6)* (2017).
- For the learning objectives for KS4, references should be made to the Business, Accounting and Financial Studies (BAFS), Design and Applied Technology (DAT), Health Management and Social Care (HMSC), Information and Communication Technology (ICT) and Technology and Living (TL) (Food Science and Technology/Fashion, Clothing and Textiles) Curriculum and Assessment Guides (Secondary 4 - 6) (2007) (with updates in November 2015).

Figure 6 **Learning Objectives of KS1 to KS3**

Knowledge Contexts	**Learning Elements**	**Key S1 Primary 1 - 3**	**KS2 Primary 4 - 6**	**KS3 Secondary 1 - 3**
Common Topics of the six knowledge contexts	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	• 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 judgements on the use of technology • Be aware of the latest developments and limitations 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
	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	• 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

Knowledge Contexts	Learning Elements	Key S1 Primary 1 - 3	KS2 Primary 4 - 6	KS3 Secondary 1 - 3
				environment to its employees, customers and third parties • Know how to release stress and physical fatigue in the office environment
	Information Processing & Presentation	• Know how to operate computers and the related devices • Be aware of the wide applications of IT in our everyday life	• 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 • 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

Knowledge Contexts	Learning Elements	Key S1 Primary 1 - 3	KS2 Primary 4 - 6	KS3 Secondary 1 - 3
				responses from the intended audience
	Design & Applications	• Design and make artefacts with commonly available resources • Develop interest and curiosity in knowing how things work • Be aware of the functional and aesthetic aspects in a variety of designs and products	• Recognise 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
	Consumer Education	• Be aware of consumers' rights and responsibilities	• Identify the rights and responsibilities of a consumer • Be aware of the impact of advertising and other forms of promotion	• Recognise the role and functions of the Consumer Council • Make rational consumers' decisions

Knowledge Contexts	Learning Elements	KS1 Primary 1-3	KS2 Primary 4-6	KS3 Secondary 1-3
Information & Communication Technology	Computer Systems	• Be aware of the different components of a computer and their functions	• Know the meaning of hardware and software and be able to make a distinction between them • Know about operations of different computer systems and the interaction among them	• Choose the appropriate hardware, software and computer systems to perform specific tasks
	Computer Networks		• Know the meaning of a computer network • Appreciate the importance and the wide applications of computer networks • Be aware of the impact of computer networks to the society	• Develop skills to perform a variety of Internet activities

Knowledge Contexts	Learning Elements	KS1 Primary 1-3	KS2 Primary 4-6	KS3 Secondary 1-3
	Programming Concepts		• Know the meaning of program and data, and be able to make a distinction between them • Be aware of the approaches used in solving problems • Know how to write simple program with templates • Develop interest in programming and collaborate with others in the process • Be aware of the use of abstraction and pattern recognition in solving problems	• Apply different approaches in solving problems • Develop skills to solve problems systematically • Know how to develop simple programs to solve problems

Knowledge Contexts	Learning Elements	KS1 Primary 1-3	KS2 Primary 4-6	KS3 Secondary 1-3
Materials & Structures	Materials & Resources	• Identify some common materials and know their uses in daily life	• 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
	Material Processing	• Design and make artefacts with common materials	• 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 minimise damage to the environment during processing of materials

Knowledge Contexts	Learning Elements	KS1 Primary 1-3	KS2 Primary 4-6	KS3 Secondary 1-3
	Structures & Mechanisms	• Recognise some characteristics of movement	• 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
Operations & Manufacturing	Tools & Equipment	• Be aware of the importance of working with tools safely • Understand how to use small hand tools properly	• 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 realisation of design solutions

Knowledge Contexts	Learning Elements	KS1 Primary 1-3	KS2 Primary 4-6	KS3 Secondary 1-3
	Production Process		• 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 process • Understand a range of materials in the joining and finishing process • Manipulate the tools and equipment in various production processes
	Project Management	• Be aware of the importance of planning and organising work into steps or procedures for given tasks	• Understand and apply concepts related to planning and organising the working procedures in formulating solutions	• Co-operate with individuals in projects and in decision-making, planning, organisation, control and evaluation

Knowledge Contexts	Learning Elements	KS1 Primary 1-3	KS2 Primary 4-6	KS3 Secondary 1-3
Strategies & Management	Business Environments, Operations & Organisations		• Be aware of how innovative ideas could serve others via businesses • Be aware of how innovative ideas could be commercialised and protected by law	• Know the business environments and different types of business organisations • 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, organisation, control, evaluation, and quality assurance in business operations and projects

Knowledge Contexts	Learning Elements	KS1 Primary 1-3	KS2 Primary 4-6	KS3 Secondary 1-3
	Resources Management		• 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) wisely for self and the accounts of organisations such as class associations • Understand how to prepare and control simple budgets and prepare 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
	Marketing		• 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	KS2 Primary 4-6	KS3 Secondary 1-3
Systems & Control	Concepts of System		• Recognise 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
	Application of Systems			• 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
	System Integration			• 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

Knowledge Contexts	Learning Elements	KS1 Primary 1-3	KS2 Primary 4-6	KS3 Secondary 1-3
	Control & Automation			• Recognise various applications of control and automation technologies in existing products (e.g. robotics, pollution monitoring systems, automation, remote sensing) • 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	KS2 Primary 4-6	KS3 Secondary 1-3
Technology & Living	Food & Nutrition	• Be aware of the importance of food to health	• Develop healthy eating habits	• Be aware of the importance of a healthy lifestyle, including nutrition and a balanced diet, to personal development
	Food Preparation & Processing		• 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
	Fabric & Clothing Construction		• 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
	Fashion & Dress Sense			• Appreciate the functional and aesthetic aspects of a design • Know how to equip one's wardrobe for different activities

Knowledge Contexts	Learning Elements	KS1 Primary 1-3	KS2 Primary 4-6	KS3 Secondary 1-3
	Family Living	• Treasure harmonious relationships with family members, peers and others	• 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
	Home Management & Technology	• Be aware of the use of technology in solving problems at home	• 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 TE**

Generic skills are fundamental in enabling students to learn how to learn. They are developed in the learning and teaching of different KLAs/subjects and are transferrable from one learning situation to another. More importantly, they enable students to develop lifelong learning capabilities which are necessary for their further studies and future careers. It should be noted that generic skills are not to be added to but embedded in the learning and teaching of TE subjects.

The following nine generic skills have been identified as essential for student learning for the 21st century in the school curriculum:

- Collaboration Skills
- Communication Skills
- Creativity
- Critical thinking Skills
- Information technology Skills
- Mathematical Skills*
- Problem solving Skills
- Self-learning Skills*
- Self-management Skills

**"Mathematical Skills" and "Self-learning Skills" are referred to as "Numeracy Skills" and "Study Skills" respectively in Learning to Learn: The Way Forward in Curriculum Development – Lifelong Learning and Whole-person Development (2001).*

Based on past experience of implementing the curriculum reform and in response to the dynamic changes in society and recent research, the nine generic skills are grouped in three clusters of related skills, namely Basic Skills, Thinking Skills, and Personal and Social Skills for better integrative understanding and application (see the table below for details).

Basic Skills	**Thinking Skills**	**Personal and Social Skills**
Communication Skills	Critical Thinking Skills	Self-management Skills
Mathematical Skills	Creativity	Self-learning Skills
IT Skills	Problem Solving Skills	Collaboration Skills

Problem solving skills, creativity and critical thinking skills are of particular importance in technology education and should be put at a more prominent position in the planning and evaluation of learning and teaching. However, they are closely connected with other skill groups and should not be treated in isolation.

TE KLA provides meaningful and authentic/stimulated contexts for the development of generic skills, alongside KLA/subject specific skills, through appropriate activities for the learning and teaching of specific topics. Schools should plan

technology-related activities in a holistic manner for learning and teaching whereby students could apply and develop the generic/cluster of skills effectively. Technology activities such as design and make, case studies, product investigation and other technology-related theme-based learning, which allow students to engage actively in the learning process, are effective ways to develop generic skills.

(i) Problem Solving Skills

Technological development is a problem solving process[6] through which students are provided with a rich context to gain experiences in identifying, developing, evaluating and refining ideas to solve technological problems.

Example 4 Developing Problem Solving Skills

In a Computer Literacy lesson, students are required to make use of IT skills to present their observations on the school sports day. Students have to decide on the information to collect and the equipment to use. 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 through identifying the problems, developing their own ideas, designing their own technical solutions, gathering the necessary information, selecting the best possible solution, and presenting and evaluating the results.

(ii) Creativity

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

Example 5 Developing Creativity

In a design and applications lesson, the teacher gives the class a challenging task of designing and making a concept model for a smart 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 smart phone. They could experiment with different appearances, rearrange the displays, etc. when making the prototype. From conceptualisation of initial ideas to realisation 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.

[6] Please refer to "*Strand B Process in Technology*" in Section 2.2.1 of this Guide for more information.

(iii) Critical Thinking Skills

In technology education, 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 a Design and Technology lesson, students are asked to design a physical aid for patients who have difficulty walking up the staircases. In the task, students investigate the needs of the patients and provide solutions that could help the patients walk up the staircases more easily.

In the process of developing the solutions, students' critical thinking skills are nurtured through:

- analysing 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) Communication Skills

In technology education, students learn the language of technology and how to communicate their ideas, possible solutions and reflections of their work in a variety of ways (e.g. verbal explanations, drawings, graphical representations, demonstration models and charts) to different target groups such as peers, teachers, parents and the public. Through these activities, students express or receive messages using verbal or non-verbal means and develop their communication skills.

Example 7 Developing Communication Skills

In a business project of organising 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 communicate with their 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 interactions 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.

(v) Information Technology (IT) Skills

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

Example 8 Developing Information Technology Skills

In a control and automation lesson, students could use the robotic construction kits to design a system which provides both positive and negative feedback. They design the circuitry, conduct experiments, analyse 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 facilitate students' learning in other ways. Students can work at their own pace and build up their knowledge through searching for information from different sources.

(vi) Mathematical Skills

Technology activities often involve calculation and mathematical processing, e.g. calculating the amount and the cost of materials for producing a product, making estimation and predications in a simulated personal investment. Students develop their mathematical skills through these activities in meaningful and authentic contexts.

Example 9 Developing Mathematical Skills

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

Interpretation of 3D modelling dimensions as well as calculations of unknown values according to the production drawing is always required in such a project. This may involve calculating the perimeter, understanding the relationship between radius and diameter, calculating the area, measuring angles, etc. In the process, students use mathematical skills in an authentic context.

(vii) Collaboration Skills

In technology education, students are regularly provided with the opportunities to plan, select strategies, make decisions and solve problems co-operatively to complete a task in small groups and teams. Students have the opportunities to liaise, negotiate and compromise with others in the process of accomplishing the tasks and develop collaboration skills.

Example 10 Developing Collaboration Skills

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

Through the activity, students learn how to build up 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 co-operatively in exchanging, insisting upon, defending and rethinking their views and ideas during discussions.

(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 TE activities, students develop their self-management skills which enable them to embrace challenges on a personal or a team basis.

Example 11 Developing Self-management Skills

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

During the lesson, individual students set goals, do research, make plans and initiate actions. They then liaise with other group members to implement the task. They have to manage the time, money and manpower resources as well as managing themselves to work efficiently to make sure that the House uniforms can be produced before the deadline.

(ix) Self-learning Skills

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

Example 12 Developing Self-learning Skills

In a design and applications lesson, students are asked to carry out a redesigning process for a yo-yo. Students add various accessories to their yo-yos and test the effects with reference to the expected outcomes. In this task, students study relevant information about yo-yo and practise modifying a design based on users' needs.

To develop students' knowledge of a yo-yo's operation, the Technology teachers organise yo-yo practice classes in the school hall after school, and invite some students to act as instructors. The yo-yo practice helps motivate students to take an interest in the redesigning process.

2.2.3 Developing Positive Values and Attitudes through TE

Values education is an essential and integral part of the school curriculum and is implemented through different components in KLAs, moral and civic education, cross-curricular learning opportunities and life-wide learning experiences. According to the revised Moral and Civic Education Curriculum Framework (2008), seven priority values and attitudes are identified to reflect the uniqueness of Hong Kong as an international city in which both Chinese and Western cultures and values co-exist and interact. They are **perseverance, respect for others, responsibility, national identity, commitment, integrity** and **care for others**. They are of vital importance for students' whole-person development to meet their own needs as well as those of society.

In the TE KLA, values education can be nurtured through conducting relevant topics and appropriate learning and teaching activities that help students apply and reflect on the positive values and attitudes. Another way is introducing different issues in which students are required to understand the situation from multiple perspectives, analyse them in a rational and objective manner, and adopt positive values and attitudes as the guiding principles to make judgements and decisions.

The development process in technology involves a great deal of decision making, such as:

- choice of design to meet a specific purpose;
- choice of materials for a specific design; and
- choice of process, tools and equipment to realise 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 own designs such as choosing between:

- an environmentally-friendly material versus an increased cost;
- a highly automated process versus cutting jobs; and
- globalisation versus clustering of local economies.

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.

2.2.4 **Strengthening Information Literacy (IL)**

IL refers to the ability and attitude that would lead to an effective and ethical use of information. It aims to develop students' abilities to:

- identify the need for information;
- locate, evaluate, extract, organise and present information;
- create new ideas;
- cope with the dynamic in our information world; and
- use information ethically and refrain from immoral practices such as cyber bullying, infringing intellectual property rights.

Students require the application of IL as responsible citizens and lifelong learners. IL could be developed through the application of the generic skills in the context of handling information from different sources in our information world, particularly when the popularisation of social media and network media makes communication easier. By virtue of the rapid development of IT and in view of the large quantity of digital tools and resources, schools adopting the Four Key Tasks to foster students' learning to learn capabilities can also provide opportunities for students to develop and apply IL.

The TE KLA has a role to play in developing students' IL. Infusion of IL in technology education through the primary GS curriculum, the junior secondary TE KLA curriculum and the senior secondary TE elective subjects, which provide authentic contexts for students to apply the skills and gain experience in learning technology, can better prepare students to live in the modern world as informed and responsible citizens. In particular, IL is a focus of technology education where students will learn to capture, manipulate and analyse data into meaningful information when they try to solve computational problems using IT.

Hong Kong schools are generally equipped with a good IT infrastructure and a good variety of resources is available to facilitate learning, teaching and assessment at different levels. Most schools provide opportunities for students to use digital devices to facilitate learning within and outside schools. One of the measures of the Fourth Strategy on Information Technology in Education is to help set up a robust Wi-Fi infrastructure to cover all classrooms in the campus. With Wi-Fi connection to the Internet, both teachers and students can conveniently access a wide range of

e-textbooks, e-assessment tools and e-resources. The time is ripe for schools to strengthen teachers' knowledge and repertoire for helping the students in e-learning. Teachers should explore and more widely adopt e-learning pedagogy, and also e-assessment for student learning where appropriate, to further enhance the effectiveness of learning and teaching.

During holistic planning and implementation of the TE curriculum, schools need to incorporate e-learning strategies such as the ones for promoting self-directed learning, developing IL of students, embracing learner diversity and promoting assessment conducive to student learning. Due consideration needs to be made on relevant issues such as IT equipment, e-resources, pedagogy, assessment, professional development of teachers etc. e-Learning activities on TE, where appropriate, should be arranged to help develop self-regulatory learning habits, collaborative learning skills, problem solving skills, creativity, computational thinking, etc. among students. While knowledge and skills related to e-learning are emphasised on one hand, attention should also be appropriately drawn to strengthening the values and attitudes of students in using IT, in particular about the ethical use of IT. Elements of IL need to be infused in planning and implementation of the e-learning activities where appropriate.

2.2.5 **Promoting STEM Education in Schools**

In the local curriculum context, STEM education is promoted through the Science, Technology and Mathematics Education KLAs. The aims of promoting STEM education in schools are to strengthen the science, technology and mathematics education and to nurture versatile talents with different levels of knowledge and skills for enhancing the international competitiveness of Hong Kong. The objectives of promoting STEM education in relation to student learning are:

- to develop among students a solid knowledge base and to enhance their interest in science, technology and mathematics for further studies and careers in face of the changes and challenges in the contemporary world; and
- to strengthen students' ability to integrate and apply knowledge and skills, and to nurture students' creativity, collaboration and problem solving skills, as well as to foster their innovation and entrepreneurial spirit as required in the 21st century.

Through integration and application of knowledge and skills of the KLAs of Science, Technology and Mathematics Education, students would realise that the development of science, technology and mathematics is closely related to society and the environment, and that the advancement in science and technology could help improve the life of mankind in the contemporary world.

The experiences of integrating knowledge and skills to solve authentic problems will help students develop positive values and attitudes as part of their whole-person development. These experiences will not only enhance students' interest in STEM-related fields, but also equip them with the relevant knowledge, skills and attitudes for future studies and careers in these fields.

The TE KLA contributes to the promotion of STEM education through:

- developing among students a solid knowledge base and enhancing their interest in technology for future specialisation studies and careers;
- strengthening students' ability to integrate and apply knowledge and skills (including skills related to hands-on experiences) within and across the KLAs of Science, Technology and Mathematics Education;
- fostering innovation in meeting the challenges of economic and technological development;
- strengthening the collaboration among teachers in schools and the partnerships with community stakeholders.

More information is available in the *Report on Promotion of STEM Education – Unleashing Potential in Innovation* (2016) (http://www.edb.gov.hk/renewal).

2.2.6 Language across the Curriculum (LaC)

Literacy refers to the ability to read and write effectively to achieve the desired goals or outcomes and develop one's knowledge and potential. At the school level, adequate literacy is developed in the two KLAs of Chinese and English Language Education. It is essential that literacy be also developed in different KLAs which provide contexts for students to apply their literacy skills to construct knowledge and to facilitate their development into lifelong learners.

With the rapid development of IT and the social media, literacy has taken on a new meaning. Students need to be equipped with new literacy skills to process and create multimodal texts in which messages are conveyed through different forms (e.g. images, animations and sounds).

The TE KLA provides authentic contexts for students to apply their literacy skills. The LaC approach, which integrates language learning and content learning, can be adopted for students who may learn TE subjects through Chinese or English to explore knowledge and develop language skills in a comprehensive and integrative manner. While Chinese/English teachers focus on helping students master the accurate use of the language (e.g. vocabulary and grammar) as well as recognising the importance of coherence, cohesion and appropriacy in texts, TE teachers can facilitate the transfer of the Chinese or English knowledge and skills by emphasising the use of relevant genres for presenting the subject content during the learning and teaching process, and providing opportunities for students to apply relevant Chinese/English language knowledge and skills to demonstrate their understanding of the TE content through completing the TE KLA-based assignments or tasks.

TE teachers can collaborate with the Chinese/English teachers to facilitate LaC through:

- identifying the entry points, setting realistic goals and drawing up a plan or schedule of work to facilitate transfer of Chinese/English language knowledge and relevant language skills;

- developing learning, teaching and assessment materials, and activities that connect students' learning experiences;
- identifying a common topic between the TE and English/Chinese Language subjects for students to read about and discuss, and assigning learning activities or tasks outside classroom to broaden students' learning experiences;
- exposing students to the text types commonly found in the TE KLA (e.g. procedures, instructions); and
- teaching language features and rhetorical functions specific to the TE KLA (e.g. providing reasons and explanations, stating causes and effects, comparing and contrasting, giving explanations) explicitly to facilitate the completion of technology tasks.

Students need to read, understand, analyse, evaluate as well as create written texts or materials for communication in the contexts of technology activities. Therefore, TE teachers are encouraged to collaborate with the English Language/Chinese Language teachers to promote LaC for enhancing learning effectiveness in technology as well as Chinese/English language education.

Co-ordinated planning and strong collaboration between teachers of the TE and Chinese/English Language Education KLAs can facilitate the implementation of LaC activities. The following are some examples of tasks to enhance students' reading and writing skills related to technology education.

	Tasks
Reading	• Books, magazines and websites related to technology • News on the latest technological development • Stories of inventions and technological development • Technical information of products
Writing	• Business or design proposals • Design journals with elaboration of design process • Technical reports • Creative technology stories

Collaboration between TE teachers and Chinese/English teachers is not confined to the reading and writing tasks mentioned above. A wide range of theme-based learning activities could also be organised to further enrich students' learning experiences in the TE KLA. With good literacy skills, students could convey their innovative ideas to other people more effectively or be inspired by the latest technological developments for enhancing their knowledge and skills in technology.

2.3 Learning Elements

The contents of the learning elements are grouped under the six knowledge contexts as shown in Figure 7. Teachers may rearrange or select the learning elements in consideration of their students' interest and needs.

Figure 7 **Contents of Learning Elements under the Knowledge Contexts in Technology Education**

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

Common topics	Contents
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 program ● 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 realisation 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 organising work in steps or procedures ● Co-operation and co-ordination with individuals in projects: decision-making, planning, organisation, control and evaluation procedures	**Business Environments, Operations & Organisations** ● Business environments - economic, technological, cultural & physical, social-political, legal ● Different types of business organisations ● Decision-making, planning, organisation, 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 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

2.4 Core and Extension Modules

2.4.1 TE is the entitlement of every student at the primary and junior secondary levels (P1 - S3). It is one of the eight KLAs in which students can have ample opportunities to develop and excel in areas of their interest and increase an inclination towards technology. The learning targets and objectives for students at the primary and junior secondary levels (KS1 – KS3) are provided in Sections 2.2.1 of this Guide. In addition, and the learning targets for students at the junior secondary level (KS3) with a special interest or talent in technology are also provided.

2.4.2 Modular approach is proposed for implementing the TE KLA curriculum at the junior secondary level. The three strands in the TE curriculum framework are consolidated into learning elements which are grouped into 16 core and 10 extension modules under the six knowledge contexts as set out in Figure 8.

2.4.3 Schools are recommended to offer modules selected from the core learning elements at the junior secondary level starting from Secondary 1 in the 2014/15 school year and progressively move up to the next level. Schools may however consider offering extension modules to meet the different learning needs of their students in addition to the core modules so as to offer opportunity for students to excel. Extended learning in TE may cover the following:

- 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 organisation and operation, control and automation, information processing, etc.

2.4.4 Contents of the learning elements under the knowledge contexts in TE are specified in the respective learning modules of the TE KLA curriculum. Schools are recommended to allocate at least 30% of the lesson time of the Information and Communication Technology (ICT) knowledge context at junior secondary level to teach programming.

Figure 8 **Modules of Learning Elements (Core and Extensions) under the Six Knowledge Contexts at the Junior Secondary Level**

Knowledge contexts	Modules*		Learning objectives
Information and Communication Technology (ICT)	K1	Computer Systems	Understand and apply ICT as a prime tool for learning and in our daily life
	K2	Programming Concepts	
	K16	Information Processing and Presentation	
	E1	Computer Networks	
Materials and Structures	K3	Materials and Resources	Understand the importance of materials and resources in the design process
	K4	Structures and Mechanisms	
	E2	Material Processing	
Operations and Manufacturing	K5	Tools and Equipment	Understand how to manage the resources and processes required to realise their design solutions
	K6	Production Process	
	E3	Project Management	
Strategies and Management	K7	Business Environments, Operations and Organisations	Understand the concepts of business and management
	E4	Resources Management	
	E5	Marketing	
Systems and Control	K8	Concepts of System	Understand the concepts, applications and implications of both micro and macro systems
	K9	Application of Systems	
	E6	System Integration	
	E7	Control and Automation	
Technology and Living	K10	Food and Nutrition	Understand how technology affects our lives and enhances the nurturing of quality people and quality homes
	K11	Food Preparation and Processing	
	K12	Fabric and Clothing Construction	
	K13	Fashion and Dress Sense	
	K14	Family Living	
	K15	Home Management and Technology	
	E8	Fabric and Clothing Construction	
	E9	Fashion and Dress Sense	
	E10	Home Management and Technology	

*K denotes **Core modules** and E denotes **Extension modules**.*

(A) Core Learning Elements

Secondary 1

Knowledge context	Learning element	Content
Information and Communication Technology	(K1) Computer System	<u>Hardware and software</u> • Hardware components of a computer system may include input unit, storage unit, central processing unit, and output unit • The need for and functions of different input/output devices • Advantages and disadvantages of screen and printer output in different situations • Basic ideas of different types of computer software
		<u>Properties and functions of usual components</u> • Properties and functions of the hardware components and their interrelationship • Interconnections between various units and the direction of data flow between these units • Basic units of a central processing unit (CPU) and their roles; the use of binary code in information processing and storage • Types of storage: main memory and secondary storage/backing store • Distinction between random access memory (RAM) and read only memory (ROM) • Secondary storage devices: needs, media and units • The use of operating system and application software • Basic ideas on Chinese character processing, such as characteristics of Chinese input methods, internal codes for Chinese characters, need for customised Chinese characters • The use of Chinese input methods to input Chinese characters • Types of computer systems with reference to hardware properties and the advancement of technology • Current and future development of computer technology

Knowledge context	Learning element	Content
Materials and Structures	(K3) Materials and Resources	<u>Types and nature of common materials</u> • Identification of some common materials and understand their uses in daily life • Distinction between naturally-occurring and man-made materials, such as metals, woods, and plastics • Identification of characteristics of material resources, such as synthetic, composite and biological • Classification of materials by their properties and sources • Explanation on what certain materials are useful for, and give examples
		<u>Appropriate application of resources for design work</u> • Exploration on how the choice of materials depends upon their properties and characteristics, and how they interact with other materials in a design/product
	(K4) Structures and Mechanisms	<u>Simple properties of structures and movement</u> • Basic concepts on nature of forces and types of loads acting on structures, i.e. compression, tension, bending, torsion and shearing • Elements of structure in the state of equilibrium as result of action of forces in different types of structures • Recognition of some characteristics of movement
		<u>Different structure design for various needs</u> • Understanding of different structural designs can lead to different loading capacities • Classification and identification of various types of structures according to their needs, i.e. arch, frame, beam and box
		<u>Use of mechanisms for transmission and control of movements</u> • Understanding of the simple Input-process-output mode in mechanical design - “Black Box” Method

Knowledge context	Learning element	Content
Operations and Manufacturing	(K5) Tools and Equipment	<u>Protective Clothing</u> • Importance in wearing appropriate protective dress and clothing in workshops/special rooms for TE learning
		<u>Choice, use and care of tools equipment and chemicals</u> • Health and safety issues in working environment - proper use and storage of tools & equipment, machine operation, electrical safety, and handling of chemical & chemical waste
		<u>Working attitude</u> • Health and safety issues in working environment
		<u>Good housekeeping of work area</u> • Safety measures (i.e. safety, rules and regulation, and code of practice) within the working environment
		<u>Safe use of tools and equipment</u> • Explanation and demonstration on how basic hand tools are used to process materials (e.g. cutter, screwdriver, and saw)
		<u>Appropriate choice and use of tools, equipment and machines for realisation of design solution</u> • Application of a range of tools to implement solutions to design problems - Measuring tools - Marking tools - Holding tools - Cutting tools
	(K6) Production Process	<u>Basic elements of Design</u> • Design fundamentals • Aesthetic, Visual language and ergonomics • Drawing instruments, basic drawing techniques and conventions of drawing

Knowledge context	Learning element	Content
		<u>Design consideration</u> • Examples on design & make of daily products • The nature and concept of design • Disassembly & critics of simple technological product parts, materials, and working principles • Basic consideration factors in design: material used, colour & shape, size & weight, function and aesthetic • Introduction of humans factors in design: ease of use, safety and ergonomics • Explanation on how technologies may have positive & negative impacts on ethical issues related to people • Examples on how technology influences business & daily life, in respect of environmental issues and possible ways of protection • Environmental issues related to design, production and sales of product
		<u>Production process in various fields</u> • Appropriate processing methods on a range of materials in a safe and correct manner for making products and systems • Examples on a range of equipment that is used in production process, e.g. laser cutter and 3D printer
Systems and Control	(K8) Concepts of System	<u>Input, process and output</u> • Various forms of systems: mechanical, electrical, electronic, pneumatic, and computing as well as their principles of operation • Analysis and identification of control systems as input, process and output elements and feedback
	(K9) Application of Systems	<u>Mechanical, electrical, electronic and pneumatic control systems</u> • Advantages and limitations of using mechanical, electrical, electronic and pneumatic control systems • Applications of different control systems in everyday life

Knowledge context	Learning element	Content
Technology and Living	(K10) Food and Nutrition	<u>Dietary goals and eating habits</u> • Importance of health to personal physical, mental and social well-being • Dietary goals and food pyramid for teenagers • Importance of balanced diet • Basic idea and application of good eating habit and balanced diet in daily life
		<u>Food groups</u> • Functions and sources of body-building food, energy-giving food, protective food, water and dietary fibre • Types, nutritive value, choice and storage of food commodities (e.g. milk, eggs, meat, fish, soya bean products, vegetables, fruits, cereals) • Food labelling requirements of pre-packaged food
		<u>Meal planning</u> • Meal planning and meal pattern for Chinese and Western breakfasts, one-course meal for lunch/dinner • Types of dishes for meals (e.g. beverage, soup, main dish, snacks, desserts, accompaniment) • Way of serving meals and meal presentation using simple garnishes and decoration • Table setting and appropriate table manner
	(K11) Food Preparation and Processing	<u>Hygiene and safety</u> • Importance of hygienic and safe practices in food preparation and processing • Basic principles and adaptation of safety and hygienic practices (e.g. personal hygiene, proper use of utensils and equipment)

Knowledge context	Learning element	Content
		<u>Principles of food preparation and processing</u> • Basic principles and purposes of food preservation including causes, effects and prevention of food spoilage, and preservation methods (e.g. pasteurisation, refrigeration) • Basic principles of heat transference including conduction and convection • Types and basic cooking methods including boiling, steaming, stewing, grilling, stir-frying and microwave cooking • Use, care and cleaning of basic and labour saving kitchen equipment including utensils, kitchen gadgets, saucepans, cooking stoves and microwave oven • Importance and design of protective clothing, care and cleaning of aprons for kitchen safety and food hygiene
		<u>Skills in food preparation and processing</u> • Basic terminologies used in recipes, methods of weighing and measuring ingredients • Time plan for preparing, cooking and serving a dish • Basic food preparation techniques including peeling, slicing, shredding, dicing, chopping and dough making • Safe practices in cooking using moist heat and dry heat methods • Proper ways for food tasting • Working habits and organisation of work in food preparation
	(K12) Fabric and Clothing Construction	<u>Choice of fabric in relation to the design and construction</u> • Basic design process • Classification of fibres and properties (e.g. natural, man-made and synthetic fibres) • Types, use and care of fabrics including cotton and linen • Identification of fibres and fabrics using simple apparatus and experiments (e.g. magnifying glass, burning tests, tensile strength)

Knowledge context	Learning element	Content
		<u>Pattern and garment construction</u> • Importance and basic principles of pattern drafting for articles/garments • Pattern drafting including basic body measurement, drafting of basic blocks (e.g. skirt/shorts), pattern styling/adaptation (e.g. skirts/shorts) and pattern specifications • Basic sewing techniques including the use of sewing machines (threading, straight stitching), basic sewing stitches (e.g. tacking, running, back, hemming/slip hemming) and simple embroidery stitches (e.g. chain, blanket) • Basic garment construction technology to meet specific purposes including seam and seam neatening (e.g. open seam), disposal of fullness (e.g. darts, gathers), treatment of raw edges (e.g. hem), fastenings (e.g. button, hook and eye/bar), opening (e.g. semi-concealed zip), pocket (e.g. patch), trimmings and decoration (e.g. lace, appliqué) • Working habits and systematic work practices for garment construction
	(K13) Fashion and Dress Sense	<u>Fashion trend and development</u> • Basic elements of fashion trend and examples • Principles of fashion design including design concepts (e.g. use of forms and shapes) and design elements (e.g. primary and secondary colour) • Design presentation including drawing design sketch/figure drawing with front and back view of the garments • Appreciation of a design by studying the use of forms and shapes on figure • Application of the design cycle in textile product development and fashion design by considering different needs (e.g. cultural and social, functional, aesthetic, economic, health and safety, ergonomic)

Knowledge context	Learning element	Content
		<u>Choice of clothing for different considerations</u> • Dress sense including the use of colours and styles in relation to one's personality • Wardrobe planning including the appreciation of forms and shapes on figure • Planning for family activities • Technological developments related to apparel and their implications when making personal choices (e.g. recycled textile materials and products)
	(K14) Family Living	<u>Family relationship</u> • Different types of family including nuclear, extended and single parent • Roles and duties in the family • Healthy lifestyle/sedentary lifestyle/unhealthy lifestyle • Community health including health promotion and disease prevention
	(K15) Home Management and Technology	<u>Management of family resources and budgeting</u> • Planning a personal budget • Wise shopping for household products and services • Standards to protect the safety of consumers, rights for correct information including information on labels and descriptions (e.g. food labels, care labels, different ways to present weights and measures) • Utilisation of resources in the family (e.g. use and care of equipment and appliances for cleaning personal clothing) • Health concepts and safety precautions may include common causes and prevention of accidents at home • Risk assessment, emergency and care, simple risk and emergency management, safety precautions in different settings including precautions and rules in handling equipment, household appliances and simple first aid • Current issues concerning health and environmental hygiene including its problems and solutions (e.g. application of 3R (reduce, reuse and recycle) at home and in school)

Knowledge context	Learning element	Content
		<u>Food technology</u> • Impact of processed food on daily life (e.g. pros and cons of processed food, health issues and concerns)
		<u>Energy saving device</u> • Use of energy saving devices (e.g. rice cooker)

Knowledge context	Learning element	Content
Information and Communication Technology/ Common Topic	(K16) Information Processing and Presentation	<u>Computer and computer operation</u> • Computer is a machine which operates according to the following sequence: - "input → process → output"
		<u>Application of information technology (IT)</u> • Different applications of IT in daily life, such as e-learning, e-commerce, e-banking, e-government, recreation, and industrial and scientific applications • Use of office automation software to prepare daily routine tasks and the advantages of using them
		<u>Information processing and information processing tools</u> • Search and download useful information through the Internet by choosing different search engines for different purposes • Skills in searching for specific information as well as the use of advanced search features to refine the search results • The need of safe web browsing and good practices • Information processing concepts may include: - information is data which has been given specific meaning - data processing involves the transformation of data by means of a set of predefined rules - computers process data by performing calculation, searching, sorting, deleting, inserting, updating, etc. - the correctness of data is essential in data processing - the idea of "garbage-in garbage-out" - output of data processing should be useful information

Knowledge context	Learning element	Content
		• Basics of business communication include: - basic communication model - situations of failures in communication that lead to misunderstanding - verbal communication (situational dialogue, phone conversation and oral presentation) • Different types of data such as text, image, audio and video • Error detection by verification and validation • Word processing features may include: - formatting (tables and text frames) - hyperlink - checkers (e.g. spelling checker and word count) • Spreadsheet features may include: - cell references, simple functions, basic mathematical operators, formatting features, multiple worksheets - error values associated with the use of formulae - data manipulation: simple filtering and sorting - charts with two or more sets of data • Multimedia elements may include: - graphics, animation, audio and video and their nature, benefits, applications and properties such as pixel, resolution, compression, format, colour models, layers, transparency, effects, filters, tweening, HTML and hyperlinks

Secondary 2

Knowledge context	Learning element	Content
Information and Communication Technology	(K2) Programming Concepts	<u>Problem solving procedures and techniques</u> • Major stages (problem definition, problem analysis, algorithm design, program coding, program debugging/testing, and program documentation) in problem solving and the needs of each stage • Real-life examples of the various stages in problem solving procedures • Break down a problem into sub-problems or modules (e.g. input, process and output of the solution of the problem) • State the inputs and outputs when analysing a problem <u>Ideas of a stored program</u> • Importance of the stored program in an automated processing task and using programs to control the computer • Input simple programs into the computer, execute and modify the programs, observe results of the programs, and save the programs for retrieval at a later stage

Knowledge context	Learning element	Content
Materials and Structures	(K3) Materials and Resources	<u>Material properties and testing</u> • Exploration of properties such as hardness, tensile strength and conductivity of common materials (i.e. wood, metal, plastic & fabric) • Application of materials tests results to suggest appropriate uses for materials
	(K4) Structures and Mechanisms	<u>Simple properties of structures and movement</u> • Classification of motions, such as linear, rotary, oscillatory and reciprocator <u>Different structure design for various needs</u> • Awareness of different structures and mechanisms can enhance the functionality of various designs to suit different needs • Application of appropriate structures in design with considering the state of equilibrium and weak points <u>Use of mechanisms for transmission and control of movements</u> • Application of common mechanical components to convert and control motion, such as drive systems and rotating shafts, belts and pulleys

Knowledge context	Learning element	Content
		<u>Change in lifestyles</u> • Identification of daily activities that involve the use of technology (e.g. communication and transportation) • Application of tools, equipment, resources and human intelligence to make changes in the natural worlds in fulfilling needs • Understanding that most developments of technology are market and profit driven which are needs to be scrutinised when necessary • Understanding that technological decisions are affected by economic, political and cultural considerations and in return, economic, political and cultural issues are influenced by development and use of technology • Examples on innovative technological devices that have improved the quality of life for individuals; choosing an example of an invention that informs the bases for a major change in the way we live • Prediction on how innovative technology will change in the future and have an impact on individual, careers, family & society
Operations and Manufacturing	(K5) Tools and Equipment	<u>Safe use of tools and equipment</u> • Explanation and demonstration on how bench type machines are used to process materials (e.g. jig saw and drilling machine) <u>Appropriate choice and use of tools, equipment and machines for realisation of design solution</u> • Appropriate ways to select, operate, maintain & dispose of technological devices
	(K6) Production Process	<u>Basic elements of design</u> • Presentation of design ideas in 2D and 3D using free-hand sketching and projection views (e.g. sketching, perspective and isometric drawing, 3D modeling) • Design movements (e.g. Arts and Craft, Art Nouveau, Art Deco, De Stijl, Bauhaus, Modernism, Pop Art, Cubism, Memphis, Post-modernism, etc.)

Knowledge context	Learning element	Content
		Design process • Identification of a simple current technological problem • Application of various design methods in problem solving (e.g. factor analysis, lateral thinking, mind map, brain-storming) • Communicating a problem, design or solution using drawings and words • Investigation on different areas & proposing solutions to the problem • Designing and building models by using different materials and test the selected functional characteristics of the models built • Implementation of a solution by constructing a device using materials provided • Evaluation of solution on whether it meets the goals • Suggestion of improvement to the solution • Recognition of the concepts used in the design cycle and apply them in solving problems Design consideration • Ethical issues related to design, production and sales of product

Knowledge context	Learning element	Content
		<u>Factors and constraints in choosing production process</u> • Selection of the appropriate hand tools, machines and equipment for use with a variety of materials and a range of technological components in a safe and correct manner • Basic concepts of product-design for manufactured products or systems • Functions and application of simple manufactured products or systems in domestic, leisure, business and industrial contexts (e.g. hair dryers, vacuum cleaners and electric irons) • Materials and processes used to produce such products or systems • Basic scientific principles and technologies involved in such products or systems • Disposal of product or system
Systems and Control	(K8) Concepts of System	<u>Open loop and closed loop control system</u> • Understanding the concept of two types of control systems, namely open loop system and closed loop system
	(K9) Application of Systems	<u>Mechanical, electrical, electronic and pneumatic control systems</u> • Functions of basic electronic and electrical components, devices and simple theories <u>Model control systems</u> • Safety measures and precautions associated with construction of the electronic, pneumatic and computer control systems and with the equipment used in the construction
Technology and Living	(K10) Food and Nutrition	<u>Dietary goals and eating habits</u> • Dietary goals and food pyramid for different age groups (e.g. children, adult, elderly) • Balanced intake of nutrients, causes of nutritional disorders (e.g. malnutrition) and the relationship between diet and health • Nutrition labels for pre-packaged food

Knowledge context	Learning element	Content
		<u>Food groups</u> • Classification, functions and sources of macro nutrients, including protein (animal and plant protein), carbohydrates (sugars, starch and cellulose) and fats (animal and vegetable fats, oils) • Types, nutritive value, choice and storage of food commodities (e.g. eggs, dairy products, meat, poultry, fish, soya bean products, vegetables (including pulses and nuts), fruits, cereals, cereal products, fats and oils, convenience foods) <u>Meal planning</u> • Principles in planning Chinese and Western meals, and the meal pattern of a two-course meal • Planning meals for adults with different needs (e.g. manual worker, sedentary worker, vegetarian), special occasions (e.g. packed meal) • Meal presentation including use of accompaniments • Use of convenience foods and left-over foods
	(K11) Food Preparation and Processing	<u>Hygiene and safety</u> • Types of high risk food, potential hazards and control measures • Causes and prevention of food poisoning • Principles and adaptation of safety and hygienic practices (e.g. kitchen safety, good organisation of work, proper use of equipment and appliances)

Knowledge context	Learning element	Content
		<u>Principles of food preparation and processing</u> • Principles and purposes of food preservation including causes, effects and prevention of food spoilage, and preservation methods (e.g. freezing, canning) • Different ways of heat transference including radiation and microwave • The choice, use and care of kitchen equipment and appliances (e.g. gas and electric cookers, refrigerator) and time-labour saving equipment (e.g. mixer, liquidiser, microwave oven, rice cooker) <u>Skills in food preparation and processing</u> • Planning and organising time and resources in preparing a two-course meal • Food preparation techniques including blending, wrapping, roux, cake making (rubbing-in, creaming), dough making, coatings and use of raising agents (mechanical and chemical sources) • Cooking methods for different foods and dishes including moist method (e.g. braising, stewing), and dry method (e.g. deep frying, baking, roasting) • The use of sensory tasting for food tasting and evaluation • Working habits and organisation of work in food preparation
	(K12) Fabric and Clothing Construction	<u>Choice of fabric in relation to the design and construction</u> • Animal fibres (wool and silk) including properties and types • Basic fabric construction, including weaving and knitting • Choice and care of different kinds of fabrics (e.g. silk, woollen, woven and knitted fabric) • Fibre and fabric experiments (e.g. tensile strength)

Knowledge context	Learning element	Content
		<u>Pattern and garment construction</u> • Pattern drafting including basic body measurement, drafting of basic blocks (e.g. bodice), pattern styling/adaptation (e.g. simple top) and pattern specifications • Sewing techniques including the use of sewing machine (e.g. zigzag stitching), basic sewing stitches (e.g. herringbone) and simple embroidery stitches (e.g. cross) • Various garment construction technology to meet specific purposes including seam and seam neatening (e.g. French seam), disposal of fullness (e.g. pleats), treatment of raw edges (e.g. facing, binding), fastenings (e.g. press fasteners, hook and loop), opening (e.g. concealed zip, slit), pocket (e.g. patch with flap), trimmings and decoration (e.g. patchwork) • Working habits and systematic work practices in garment construction
	(K13) Fashion and Dress Sense	<u>Fashion trend and development</u> • Current fashion trend with its specific features and elements • The principle of fashion design including design concepts (e.g. style features, silhouette) and design elements (e.g. lines, colour combinations, textures, patterns) • Design presentation including design sketch/figure drawing (i.e. front and back view of the garment with style features and colour) and the use of mood/theme board • Appreciation of a design by studying different figure types • Application of the design cycle in textile product development and fashion design by considering different needs (e.g. cultural and social, functional, aesthetic, economic, health and safety, ergonomic)

Knowledge context	Learning element	Content
		<u>Choice of clothing for different considerations</u> • Dress sense including the use of colours and styles in relation to different occasions • Wardrobe planning including the understanding of different figure types, types of accessories and to review one's clothing and plan according to one's needs • Planning for social occasions (e.g. social gathering) • Technological developments related to apparel and their implications when making personal choices (e.g. fair trade)
	(K14) Family Living	<u>Family relationship</u> • Roles and responsibilities of family members • Ways to maintain a harmonious relationships in the family (e.g. sharing of common vision, ways to deal with conflict, understanding and consideration of others, proper social habits and manners) • Healthy lifestyle/sedentary lifestyle/unhealthy lifestyle • Community health including health promotion and disease prevention

Knowledge context	Learning element	Content
	(K15) Home Management and Technology	<u>Management of family resources and budgeting</u> • Planning family budget including value of money and keeping accounts • Different modes of shopping, comparing shops and products, online shopping and security issues • Roles and functions of the Hong Kong Consumer Council • Understanding of consumers' rights including product verification, product safety, product selection, product information and complaining to related authorities • Awareness on consumer protection including legislation, product testing and monitoring product prices • Principles and proper attitude towards managing personal finance for youths (e.g. a holistic view of life instead of a desire for wealth and money) • Utilisation of resources in the family (e.g. effective use of space in the kitchen), use and care of equipment and appliances for food preparation and laundry work • 'Health by Design' including ergonomics in the home setting (e.g. work triangle) • Choice of furniture, equipment, floor and wall coverings, different ways of refuse disposal and pest control • Current issues concerning health and environmental hygiene including its problems and solutions <u>Food technology</u> • Technology in food processing including functional properties of foods (e.g. gelatinisation and dextrinisation of starch, denaturation and coagulation protein) • Use of food additives (e.g. preservatives, colourings and flavorings in food production) <u>Energy saving device</u> • Choice and care of energy saving devices (e.g. microwave oven, mixer, liquidiser)

Knowledge context	Learning element	Content
Information and Communication Technology/ Common Topic	(K16) Information Processing and Presentation	<u>Information processing and information processing tools</u> • Features on office automation software to facilitate collaborative work (e.g. track-changes) • Web (office) application platforms that facilitate co-authoring (e.g. Google Docs, SharePoint) • Social tools to facilitate discussion or exchange of ideas • Basics of business communication include: - written communication (introduction to common forms of business writing) • Learning portal and learning management system to learn independently and collaboratively • Multimedia production may include: - creating or capturing image, audio and/or video with simple tools(e.g. paint brush and sound recorder) or devices(e.g. digital camera, microphone, digital recorder) - basic editing skills for multimedia elements such as resizing and rotating image, adjusting the volume of audio and trimming video clip - incorporating multimedia elements into a product • Simple design factors and considerations in production and presentation

Secondary 3

Knowledge context	Learning element	Content
Information and Communication Technology	(K2) Programming Concepts	<u>Data manipulation</u> • Input and output features of a program: to accept input from keyboard and output information to the screen • Variables and simple arithmetic operations in assignment tasks • Simple commands to manipulate text strings, display text with interesting effects and generate sound in the programming environment • Relational operators (>, >=, <, <=, = and <>) and logical operators (AND, OR and NOT) • Daily life examples of the use of looping • Simple programs with flow control statements and loops • Generate and print a set of integers using random number generator to observe randomness of the pattern • Simple programs to simulate a dice, and generate arithmetic quiz • A variety of simple programming projects
Materials and Structures	(K3) Materials and Resources	<u>Appropriate application of resources for design work</u> • Application of a variety of common materials, such as wood, metal, plastic & fabric, to design and make simple products <u>Reuse and recycle of resources</u> • Awareness of the use and disposal of materials may affect the natural environment • Understanding of the importance of reusing and recycling resources for the sustainable development of our society • Identification of materials that can or cannot be recycled; providing evidence that recycling rules and laws reflect them
	(K4) Structures and Mechanisms	<u>Simple properties of structures and movement</u> • General concepts of input energy, controlled motion, friction and output work done

Knowledge context	Learning element	Content
		<u>Use of mechanisms for transmission and control of movements</u> • Application of the common mechanical components to convert and control motion (e.g. gears, screw mechanisms, lever and linkage, cam and follower, rack and pinion) • Selection of an efficient and/or appropriate simple mechanism for a product or system involves movement
Operations and Manufacturing	(K5) Tools and Equipment	<u>Safe use of tools and equipment</u> • Introduction of measuring instruments (e.g. multi-meter & data-capturing devices) <u>Appropriate choice and use of tools, equipment and machines for realisation of design solution</u> • Application of a range of machines to realize solutions to design problems - Lathe - Vacuum former - Laser cutter - 3D printer
	(K6) Production Process	<u>Basic elements of design</u> • Basic concepts of CAD and 3D modeling • Application of IT tools such as CAD software to present design ideas • Animating of design ideas in computer animation or video clips • Design critique and appreciation in design • Contemporary design movement <u>Design consideration</u> • Ergonomic concerns and industrial standards in making appropriate solutions • Critical assessment on products and system design • Technological advancements that may be accompanied by negative side effects, in respect of legal issues • Value of intellectual property and possible ways of protection

Knowledge context	Learning element	Content
		Product design • Roles of designers and engineers at work • Organisation of resources and processes for making simple products or models of proposed solutions • Comparison of appropriate processes, instruments and materials to be used for the making processes • Evaluation of the quality of production system, products or environments against various essential factors • Product Maintenance (e.g. techniques, parts replacement and disposal, maintainable design) • Safety measures, precautions and standards required for making the products Skills, procedures and resources for production process • Know how to apply cost-benefit principles to technological processes • Selection of appropriate tools and equipment and apply proper skills to implement solutions to design problems • Selection and application of appropriate methods of material removal processes • Selection and application of appropriate methods of material forming processes • Selection and application of appropriate methods of joining materials or assembling components • Selection and application of appropriate surface-finishing methods for aesthetic purposes to prevent corrosion and to prolong working life • Proper use of a range of appropriate machines to implement solutions to design problems

Knowledge context	Learning element	Content
Strategies and Management	(K7) Business Environments, Operations and Organisations	<u>Business environments: economic, technological, cultural & physical, social-political-legal</u> • Main industries in Hong Kong • Characteristics of business environment of Hong Kong - Economic – a separate free market economy - Technological – sophisticated telecommunication systems and transportation infrastructure - Physical – close to Mainland, serving as the bridge between China and other parts of the world - Cultural and Social –a skilled and high quality workforce - Political-legal –Types of intellectual property rights include copyright, trademark, patent and registered design; and understand the value of intellectual property and possible ways of protection • Impact of globalisation on business in Hong Kong <u>Different types of business organisations</u> • Major forms of business organisations: sole proprietorship, partnership and limited company • Characteristics of an entrepreneur <u>Decision making, planning, organisation, control, evaluation, and quality assurance in business operations and projects</u> • Functions of planning, organising, leading and controlling in management • Responsibilities of a business in providing a safe environment

Knowledge context	Learning element	Content
Systems and Control	(K8) Concepts of System	<u>System components</u> • Distinction between manual and automation systems • Examples on the application of control system in domestic and community contexts • Functions of system components • Examples of simple system-designs and analyse in terms of sub-systems
	(K9) Application of Systems	<u>Mechanical, electrical, electronic and pneumatic control systems</u> • Identification and application of building blocks/modules of the electronic systems including the input, processing and output devices • Functions of common components in a pneumatic system and recognise the related symbols <u>Model control systems</u> • Construction kits for model and simulate technological solutions • Design of simple systems to meet specified problems
Technology and Living	(K10) Food and Nutrition	<u>Dietary goals and eating habits</u> • Recommended daily intake, dietary guidelines, dietary goals for different age groups (e.g. children, teenagers, adult, elderly) and people with different needs and dietary requirements • Causes of eating disorder and influences on food choices (e.g. health concerns, cultural, social, economic and technological influences, facts and myths in health messages) • Legislation and guidelines on food labeling (e.g. Food and Drug Regulation Guidelines on Voluntary Labelling of Genetically Modified Food, Labelling Guidelines on Food Allergens, Food Additives and Date Format)

Knowledge context	Learning element	Content
		<u>Food groups</u> • Sources, functions and deficiencies of micro nutrients, including vitamins (vitamins A, B-complex, C and D) and minerals (iron, calcium, iodine and sodium) • Local and global supply, safety issues, retention of food value of different food commodities • Basic ideas of the use of functional food in enhancing health <u>Meal planning</u> • Principles in food costing and budgeting, meal pattern of a three-course meal • Planning meals for different age groups (e.g. children, adolescents, elderly), people with special needs (e.g. weight management) and celebration (e.g. party, festive) • Meal presentation for different occasions • Development of creative recipes for meeting different needs
	(K11) Food Preparation and Processing	<u>Hygiene and safety</u> • Principles underlying the causes of food spoilage and preventive measures • Causes and prevention of different types of food contamination and related food-borne disease (e.g. diarrhoea, typhoid fever, vomiting, Ciguatera Fish Poisoning) • Principles and adaptation of safety and hygienic practices (e.g. proper use of labour saving equipment and appliances) <u>Principles of food preparation and processing</u> • Principles and purposes of food preservation including causes, effects and prevention of food spoilage, and preservation methods (e.g. dehydration, radiation) • Principles underlying heat transference in cooking • The choice, use and care of kitchen equipment and appliances (e.g. induction cooker) and time-or labour-saving equipment (e.g. blender, mincer)

Knowledge context	Learning element	Content
		<u>Skills in food preparation and processing</u> • Planning and organising time and resources in preparing a three-course meal and meals for special occasion and celebrations • Food preparation techniques including shaping, stuffing, cake making (whisking and melting), dough making, batter making, use of raising agents (biological source), pastry making (short crust pastry, Chinese pastry) • Choosing and combining appropriate cooking methods for different foods and dishes • Tools for sensory tasting and evaluation • Working habits and organisation of work in food preparation
	(K12) Fabric and Clothing Construction	<u>Choice of fabric in relation to the design and construction</u> • Man-made fibres (rayon, acrylic, polyester, nylon) including properties and types • Fabric construction, including non-woven (bonding and felting) fabrics and fabric finishes (e.g. flame resistance, wrinkle free, stain resistance, easy care) • Choice and care of different kinds of fabrics (e.g. made-made, woven and non-woven fabric) • Fibre and fabric experiments (e.g. abrasion, insulation, absorbency)

Knowledge context	Learning element	Content
		<u>Pattern and garment construction</u> • Pattern drafting including basic body measurement, drafting of basic blocks (e.g. collar, sleeve), pattern styling/adaptation (e.g. blouse/shirt) and pattern specifications • Sewing techniques including the use of sewing machine (embroidery stitching) and basic sewing stitches (e.g. tailor's tack, button stitch) • Various garment construction technology to meet specific purposes including seam and seam neatening (e.g. overlaid seam), disposal of fullness (e.g. tucks), neckline finishes (e.g. flat collar, shaped facing), fastenings (e.g. rouleau loop), opening (e.g. fly-front), pocket (e.g. patch), trimmings and decoration (e.g. quilting) • Working habits and systematic work practices in garment construction
	(K13) Fashion and Dress Sense	<u>Fashion trend and development</u> • Cultural, social, economic and technical influences on the development of fashion • The principle of fashion design including design concepts (e.g. balance, harmony) and design elements (e.g. colour value) • Application of the design cycle in textile product development and fashion design by considering different needs (e.g. cultural and social, functional, aesthetic, economic, health and safety, ergonomic) • Life cycle of a product, ways to evaluate and appreciate different products, development of mock-ups/working models/prototypes • Basic ideas of evaluating a product in relation to cost (e.g. life span, function, breakeven analysis)

Knowledge context	Learning element	Content
		<u>Choice of clothing for different considerations</u> • Dress sense including the use of colours and styles in relation to effects of colour on individual figures • Wardrobe planning including the understanding of the effects of fabric texture, colour and style lines in relation to individual figures, choice of accessories to complement one's outfit and to plan a clothing budget • Planning for social occasions (e.g. interview) • Technological developments related to apparel and their implications when making personal choices (e.g. bio-engineering)
	(K14) Family Living	<u>Family relationship</u> • Impact of technology on family life (e.g. values and beliefs on the quality of life, structure of the family and roles of family members) • Healthy lifestyle/sedentary lifestyle/unhealthy lifestyle • Community health including health promotion and disease prevention

Knowledge context	Learning element	Content
	(K15) Home Management and Technology	<u>Management of family resources and budgeting</u> • Planning of family budget including income and fixed expenditure and ways of payment • Influence on shopping (e.g. peer group) • Impact of consumers' choices including environmental, technological, social and economic factors • Utilisation of resources in the family (e.g. effective use of space in the home), 3Rs (reduce, reuse and recycling), use and care of equipment and appliances for food preparation, laundry and cleaning in relation to environmental protection, conservation of resources (e.g. energy, water), waste management, environmentally friendly products • Principles in developing strategies for sustainable development (e.g. use of clean and alternative technologies, managing resources and reserves, implementation of eco-labelling and energy-labelling schemes) • 'Health by Design' including addressing people with special needs (e.g. elderly, disabled) • Choice of floor and wall coverings, lighting, ventilation • Current issues concerning health and environmental hygiene including its problems and solutions <u>Food technology</u> • Technology in food processing including functional properties of foods (e.g. foaming of protein, emulsification of fats) • Food product development including idea generation, development of prototype, trial and sensory evaluation and consumer costing • Basic idea of evaluating a food product in relation to cost (e.g. life span, function and breakeven analysis)

Knowledge context	Learning element	Content
		Energy saving device • Cost, benefit and impact of using energy saving devices (e.g. mincer, pressure cooker, food processor)

Knowledge context	Learning element	Content
Information and Communication Technology/ Common Topic	(K16) Information Processing and Presentation	Information processing& information processing tools • Databases features may include: - save and retrieve a database file - display and edit records - add and delete records - sort and search records - list records with selected data - forms, labels and reports • Simple concept of database: database, file, record, field, primary key and queries Issues related to the use of IT • Issues may include: - digital signature - data privacy, data security - recycling - ergonomics, potential health hazards - employment trends, telecommuting, cashless society, virtual communities

(B) Extension Learning Elements

Secondary 1

Knowledge context	Learning element	Content
Materials and Structures	(E2) Material Processing	Processing of materials – removal, forming, joining and finishing • Understanding of materials and resources could be processed to suit various needs • Common materials processing methods, such as forming, bending, pressing, vacuum forming, casting and laminating of materials • Application of common materials processing methods to implement design solutions in school settings
Systems and Control	(E6) System Integration	Interconnection of systems and sub-systems • Simple electronic and electrical systems: - Introduction to systems - Simple electrical systems - Simple electronic systems using function modules - Introduction to micro-controller based system
	(E7) Control and Automation	Contemporary products • Applications of control and automation technologies in existing products (e.g. robotics, pollution monitoring systems, automation, remote sensing)
Technology and Living	(E8) Fabric and Clothing Construction	Choice of fabric in relation to the design and construction • Fabric construction processes in apparel sector (e.g. spinning of fibres)
	(E9) Fashion and Dress Sense	Fashion trend and development • Factors affecting the development of the current fashion trend
	(E10) Home Management and Technology	Management of family resources and budgeting • Different means of money transactions for household goods and services (e.g. cash, cheques, credit cards)

Secondary 2

Knowledge context	Learning element	Content
Information and Communication Technology	(E1) Computer Networks	<u>Usual components of a computer network</u> • Simple description of various components of a computer network (such as workstation, network interface card, cabling, switch, server, router, access point and modem) and their interrelationship • Basic ideas and examples of two types of computer networks, local area network (LAN) and wide area network (WAN) • Different transmission media including wired and wireless media commonly used for Internet access <u>Internet activities</u> • Discussion forum, online chat, video-conferencing, exchange information through electronic mails and file transfer, e-commerce, e-learning and web hosting • Basic concepts of common standards used on the Internet such as Uniform Resource Locator (URL), Internet Protocol (IP) addresses, Domain Name System (DNS) and Hypertext Transfer Protocol (HTTP)

Knowledge context	Learning element	Content
Materials and Structures	(E2) Material Processing	<u>Processing of materials – removal, forming, joining and finishing</u> • Understanding of materials processing methods to implement design solutions, including: removal, cutting with hand tools, machining with lathe turning, drilling and sawing <u>Appropriate choice and use of materials process</u> • Selection of appropriate materials processing methods according to requirements, such as material properties, safety and quantity
Operations and Manufacturing	(E3) Project Management	<u>Planning and organising work in steps or procedures</u> • Setting of overall project goals, such as setting tasks, sequencing activities, developing schedules, prioritising actions in evaluation of design proposals (such as selecting suitable production process, testing of materials, making and testing of prototypes, evaluating product performance), investigating and reconciling conflicting requirements, assessing the quality and organising the ways forward • Development of cost estimates and budgets to plan project expenditures • Analysis of resources allocation and labour utilisation for cost effectiveness
Systems and Control	(E6) System Integration	<u>Interconnection of systems and sub-systems</u> • Electronic and electrical components, devices, circuits and simple theories - Introduction to basic electrical and electronic components - Classic electronic and electrical circuits - Circuit diagram and printed circuit board

Knowledge context	Learning element	Content
	(E7) Control and Automation	<u>Control for automation</u> • Use of electronics, microprocessors and computers for control automation • Select and assemble electronic-control systems to solve electronic-control problems • Recognise the common symbols for representing electronics components and draw simple electronic circuit diagrams • Use construction kits to model pneumatic-control systems to achieve specified functions • Exercise control of motion in terms of magnitude, speed, time delay and sequence by using pneumatic systems
Technology and Living	(E8) Fabric and Clothing Construction	<u>Choice of fabric in relation to the design and construction</u> • Fabric construction processes in apparel sector (e.g. weaving, knitting, felting)
	(E9) Fashion and Dress Sense	<u>Fashion trend and development</u> • Renowned fashion designers and their signature work pieces
	(E10) Home Management and Technology	<u>Management of family resources and budgeting</u> • Different means of money transactions for housing, household goods and services (e.g. on-line shopping, hire purchase, mortgages and loans)

Secondary 3

Knowledge context	Learning element	Content
Information and Communication Technology	(E1) Computer Networks	<u>Use of computer networks</u> • Applications of computer communications (such as electronic payment system, electronic money, and e-commerce), the use of server in such setting, and the impact of Internet to these applications • The needs of using computer networking and the way to connect various components to build simple SOHO network (both wired and wireless) that is able to be connected to the Internet • The advantages of computer networks (such as sharing of resources and exchanging of information on the Internet)
Materials and Structures	(E2) Material Processing	<u>Processing of materials – removal, forming, joining and finishing</u> • Understanding of materials processing methods to implement design solutions, including: - Joining (permanent): soft and hard soldering, riveting, different types of adhesives - Joining (semi-permanent): fastening, knock-down fixtures • Common materials processing methods used in industrial production (e.g. injection moulding, blow moulding, pressing) • The idea of surface finishing (e.g. preparation, coating and polishing) • A range of coating methods (e.g. electroplating, painting, protective films, veneering, enameling)

Knowledge context	Learning element	Content
Operations and Manufacturing	(E3) Project Management	<u>Co-operation and co-ordination with individuals in projects: decision making, planning, organisation and evaluation procedures</u> • Roles and responsibilities of project leaders and team members • The importance in managing groups and individuals in order to increase the effectiveness of the team • Evaluation and control planned cost • Monitoring of schedule implementation • Evaluation of overall project performance
Strategies and Management	(E4) Resources Management	<u>Financial budgeting (personal & company) and reporting</u> • Users of financial statements • Concepts of assets, capitals, liabilities and the accounting equation: Capital = Assets – Liabilities • Presentation of company's financial position by using a balance sheet • Concepts of incomes, expenditures and the equation: Income – Expenditures = Surplus • Presentation of students' consumption patterns by using a personal financial budget • Calculation of discount, gross profit, mark-up and margin <u>Scheduling of resources</u> • Nature of money • Features of different finance products • Calculation of simple and compound interests; and present value • Sources of financing • Concepts of shares and dividends <u>Human resources</u> • Human resource management process • Importance of putting the right number and kinds of people to the right places at the right time for achieving company goals

Knowledge context	Learning element	Content
	(E5) Marketing	<u>Market Research</u> • Simple method to conduct market research <u>Promotion campaigns</u> • Introduction to 4 Ps – Product, Price, Place and Promotion • Advantages and Drawbacks of advertising • Implications of advertisement: awareness of the negative impacts of advertisement despite its positive impacts <u>Customer services</u> • Effect of customer needs to product development and promotion <u>Quality assurance</u> • Collection of feedback from customers to ensure quality of goods and services
Systems and Control	(E6) System Integration	<u>Interconnection of systems and sub-systems</u> • Appropriate application of equipment and instruments - Operation of basic electronic and electrical equipment and measuring instruments - Common tools and machines in doing electronic and electrical projects • Application of different types of systems (mechanical, electronic, pneumatic, and computing) and sub-systems that can be interconnected to achieve a particular function • Analysis of simple system-designs by using block diagrams • Simple systems design in order to meet specified problems • Combination of interrelated systems (software applications, structures and/or mechanisms) in order to create a new system which could be connected with other systems

Knowledge context	Learning element	Content
	(E7) Control and Automation	<u>Control for automation</u> • Fundamental principles and basic physical architecture of the PC based computer system to exercise control • Advantages and limitations of a computer-control system • Application of simple devices for input and output • Design of simple control program using flow-chart • Use of control software and interface to exercise control • Application of construction kits to model computer-control systems to achieve specified functions <u>Computer-aided manufacturing (CAM)</u> • Advantages and limitations of computer-aided manufacturing (CAM) • Advantages and limitations of using Computer Aided Design & Drafting (CADD) • Advantages and limitations of 3D printing • Advantages and limitations of robots • Use of robots in industry and the basic concepts of robotics
Technology and Living	(E8) Fabric and Clothing Construction	<u>Choice of fabric in relation to the design and construction</u> • Specific features of blended fibres
	(E9) Fashion and Dress Sense	<u>Fashion trend and development</u> • Current trend in fashion design and fashion illustrations
	(E10) Home Management and Technology	<u>Management of family resources and budgeting</u> • Financial planning for different stages of family life cycle (e.g. savings, fixed deposit, insurances)

2.5 Curriculum and Subject Organisation

2.5.1 Technology education at the primary level is provided through the General Studies curriculum[7]. The existing subjects of the TE KLA for the junior and senior secondary levels are given in Figure 1 in Section 1.3 of this Guide.

2.5.2 At present, many schools are adopting a subject-based learning approach to providing technology education through Computer Literacy, Design and Technology, and Home Economics/Technology and Living at the junior secondary level. The learning elements in the TE curriculum at the junior secondary level have been reviewed and enriched. In order to provide a broad and balanced TE curriculum at the junior secondary level, schools are recommended to adopt a modular approach to implementing the curriculum with its core modules of learning element offered to all students. Some schools may consider offering extension modules of learning element to meet the needs of their students in addition to the core modules of learning element so as to offer opportunities for students to excel.

2.6 Smooth Transition from Kindergarten to Primary, and from Primary to Junior Secondary

2.6.1 Children at the kindergarten level are curious about the nature and phenomena in daily life. Through daily contacts with modern inventions, children can develop their awareness of the connections of science and technology with the environment and everyday life.

2.6.2 At the primary level, the emphasis of technology education is on "Awareness and Exploration". It aims to develop students' innovativeness and their sensitivity to the effects of scientific and technological development. Teachers are encouraged to engage students in hands-on and minds-on activities by adopting the enquiry-based learning approach in the learning and teaching of science and technology.

2.6.3 GS teachers need to understand how children learn in kindergartens, and provide a supportive learning environment to ignite primary students' curiosity and sustain their interest in science and technology. More information about the kindergarten education curriculum is available at the *Kindergarten Education Curriculum Guide* (2017).

2.6.4 The GS curriculum provides opportunities for students to integrate knowledge, skills, values and attitudes across three KLAs, i.e. Science Education, Personal, Social and Humanities Education and Technology Education. The curriculum development of the TE KLA at the junior secondary level is a progressive continuation of the primary GS curriculum, with the six strands in the GS curriculum closely linked to the various knowledge contexts in the TE curriculum. Teachers need to ensure vertical continuity when planning the school TE curriculum. Gradual development based on

[7] 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 are available in the *General Studies Curriculum Guide (Primary 1 - 6)* (2017).

students' prior knowledge and experience is necessary and recommended. Teachers of primary and secondary levels are advised to gain an understanding of the curricular contents at different key stages, the learning environment and teaching practices of their counterparts, and where appropriate, to share their views and experiences.

2.6.5 At the junior secondary level, the emphasis of technology education is on "Experiencing and Application". TE teachers should build upon students' prior knowledge acquired at the primary level and design learning activities to enrich students' technology learning experiences to solve the identified problems through an innovative design and realisation of their design. They should be provided with ample opportunities to develop their creativity, critical thinking and problem solving skills through a broad and balanced study of the learning elements in the TE curriculum.

2.7 Smooth Transition from Junior Secondary to Senior Secondary

2.7.1 After completing technology education at the junior secondary level, students should have acquired a solid foundation of technological knowledge and skills. They should have an awareness of the development in technology and its impact on the individual, family and society; the capability to understand various technologies; and the relevant knowledge, skills and attitudes to make informed decisions on their choice of subjects in their senior secondary studies in consideration of their interest, inclination and career orientations towards technology.

2.7.2 Schools should provide opportunities for students to understand more about their own interest and abilities to facilitate their choice of senior secondary subjects through talks, visits, simulation activities or taster programmes. Besides, the learning of technology at the junior secondary level should have laid a solid foundation for students to study the core subjects at the senior secondary level.

2.7.3 In progressing to senior secondary, the emphasis of technology education is on "*Orientation for Lifelong Learning and Specialisation*". The senior secondary TE curriculum provides five elective subjects to accommodate students with different orientations. TE elective subjects could prepare students for further studies of a wide range of academic, professional and vocational programmes in the tertiary institutions, or lifelong learning in the broad contexts of design, business, technology and engineering according to their interest, and at the same time equip them better for their careers and future life.

Chapter 3
Curriculum Planning

Chapter 3 Curriculum Planning

In planning the TE curriculum, schools may make reference to the following booklets of the *SECG (Secondary 1 – 6)* (2017) which provide more information and suggestions on incorporating the TE KLA into the whole-school curriculum, enhancing smooth interfaces between different key stages and identifying quality learning and teaching resources to enhance the implementation of the TE KLA:

- Booklet 2 Learning Goals, School curriculum Framework and Planning
- Booklet 8 Interfaces between Key Stages 2 and 3, and Key Stages 3 and 4
- Booklet 10 Quality Learning and Teaching Resources

3.1 A Balanced Curriculum

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

- have a balanced focus on the three strands of Technology Education: Knowledge Contexts in Technology, Process in Technology and Impact of Technology;
- include a wide spectrum of knowledge contexts so as to give students more exposure to various technologies;
- nurture students' generic skills as well as their positive values and attitudes, with special emphasis on problem solving, creativity, critical thinking skills, and communication skills.

3.2 Central Curriculum and School Curriculum Development

3.2.1 This Guide sets the direction for the development of the TE curriculum from Primary 1 to Secondary 6. It provides a central curriculum for the TE KLA in the form of a curriculum framework and sets out what students are expected to achieve, i.e.:

- subject knowledge and skills as expressed in the form of learning targets under the three strands as well as the learning objectives;
- generic skills; and
- positive values and attitudes.

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

- vision and mission of the school and its sponsoring body;
- strengths of the school and its teaching force;
- background and learning needs of students;
- provision of a broad and balanced curriculum for students; and
- resources of the school that can support learning and teaching.

3.2.2 Chapter 2 of this Guide provides the TE learning targets for students from Primary 1 to Secondary 6 as well as the learning objectives for students from Primary 1 to Secondary 3 (see Section 2.2.1 for details). For the learning objectives for KS4, reference should be made to the Curriculum and Assessment Guides of the five elective subjects of the senior secondary TE curriculum. This Guide also provides the learning elements of the TE curriculum (see Section 2.3 for details), which are the entitlement of every student and should be included in the curriculum of every school.

3.2.3 Curriculum development is an ongoing process. Schools could develop their own TE curriculum in consideration of the school contexts and students' needs. 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.

3.2.4 Schools should address the following major aspects in developing their TE curriculum:

- **TE KLA as one of the eight KLAs of the school curriculum**

  Technology education is the entitlement of every student. Students develop technological literacy through studying the three strands of the TE curriculum, namely knowledge contexts in technology, process in technology and impact of technology. In order to provide students with a solid foundation of technological knowledge and skills, schools should allocate sufficient curriculum time to the TE KLA. The core learning elements set out in this Guide should be covered so as to ensure the provision of a broad and balanced TE curriculum for students.

  This Guide provides a central curriculum in the form of an open and flexible framework. At the primary level, learning elements of the TE curriculum are delivered through General Studies. At the junior secondary level, schools are recommended to adopt a modular approach for managing the TE KLA curriculum. Technology learning elements are grouped into core and extension learning elements under each of the six knowledge contexts. The core learning elements are intended for all students, while extension learning elements are intended for students with special interests or aptitude. In order to provide a smooth progression to and interface with senior secondary, core learning elements should be covered in the school's TE curriculum so as to ensure the provision of a broad and balanced TE curriculum for students. Schools can base on their schools' contexts and students' learning needs, adapt the central curriculum and plan their school TE curriculum, adopting different modes of curriculum implementation.

  At the senior secondary level, five TE elective subjects are offered to accommodate students with different orientations. TE subjects could prepare students for further studies for further studies or lifelong learning in different contexts, such as business, information technology and engineering, design, health, food science and fashion design. Schools should offer a diversified

choice of elective subjects to cater for different students' interests, abilities and needs.

- This Guide is one of the eight KLA Curriculum Guides prepared by the CDC. It sets the direction for the learning, teaching and assessment of the TE curriculum from Primary 1 to Secondary 6. Schools are expected to fulfil the requirements spelt out in this Guide to ensure that students receive their entitlement to the same opportunities for technology education. This Guide, however, should not be regarded as a prescribed uniform syllabus for all schools and students.
- Schools can base on their own contexts and students' learning needs, and adapt the central TE curriculum by varying the organisation of curriculum contents, learning and teaching strategies, and criteria and modes of assessment to help their students achieve the learning targets and objectives.
- It should be noted that a school TE curriculum should be the outcome of the balance between guidance from the CDC and the autonomy of the school. The balance is subject to updating over time in face of the continual changing social context and students' needs which lead to renewed school curriculum emphases.

- **Holistic curriculum development**

Holistic curriculum planning is recommended to ensure vertical continuity and lateral coherence in the planning of a school TE curriculum. Schools are advised to take into consideration the interests and abilities of their students and the expertise of their teachers when setting the goals and plans for the school curriculum development. During the planning process, schools need to consider flexible use of time, and also the resources available according to individual contexts. Due attention should be drawn to the curriculum emphases when devising STEM-related activities for students. The process of Planning-Implementation-Evaluation (P-I-E) that schools are familiar with can be adopted for the development of the school curriculum.

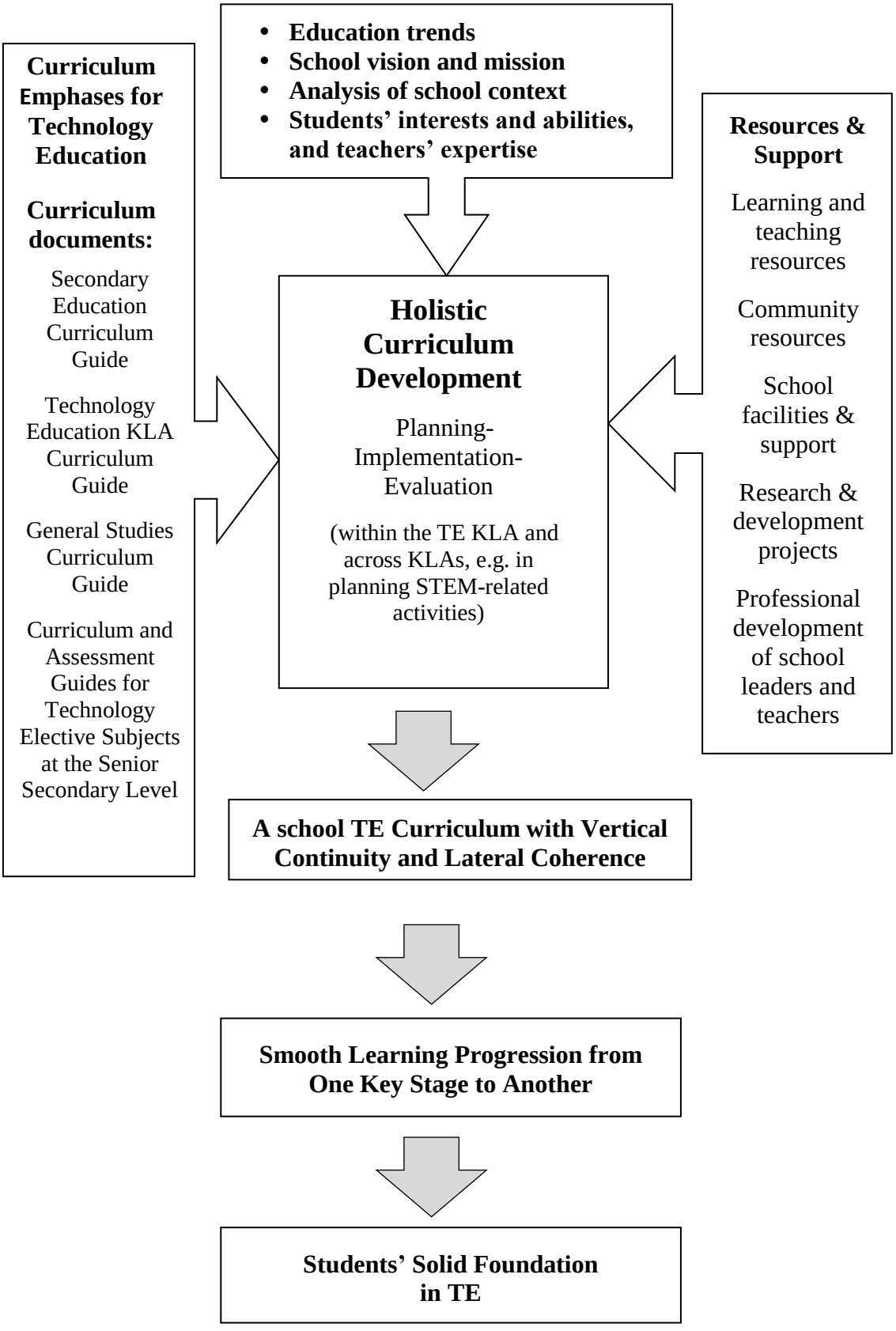
All TE teachers should get involved in the development of the school TE curriculum. While the TE KLA co-ordinators or panel chairpersons take the lead in co-ordinating the development process, all TE teachers have roles to play in planning, implementing and evaluating the TE curriculum. For cross-KLA activities, TE teachers need to collaborate with their counterparts of other related KLAs in planning and organising relevant activities. In the process, a collaborative culture could be developed within and across KLAs. Close collaboration among teachers of the STEM-related disciplines can enhance professionalism, thus producing a synergy effect and maximising the benefit to students.

Curriculum decisions derived from holistic curriculum development and extensive involvement of teachers can facilitate the development of a school curriculum with vertical continuity and lateral coherence. A coherent school

curriculum will enable students to establish a strong foundation in learning technology and to proceed smoothly from one key stage to another.

Figure 9 illustrates how to develop a school TE curriculum with full consideration of the major factors, and eventually arrive at a curriculum decision that can benefit student learning.

Figure 9 **Holistic Curriculum Development in the Technology Education KLA**



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

  Some schools may want to strengthen the overall technology education, i.e. the development of students' technological literacy. Some may use technology education as a vehicle to nurture students' development of generic skills such as creativity, collaboration skills and self-management skills, and positive values and attitudes. There are also schools which would like to develop their own specialisation with a strong inclination towards certain chosen areas in technology education (e.g. design and business).

- **Building on the strengths of schools**

  Schools should assess their strengths in providing technology education, and continue to build on them and develop a 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 curriculum aims?***

  The school TE curriculum at different key stages should be designed in accordance with the TE curriculum aims. Schools should refer to the learning elements and learning objectives under the six knowledge contexts as outlined in Chapter 2 when choosing the learning contents for the school TE curriculum to meet the learning needs of their students.

  There should be a gradual progression of the learning elements/topics which are not to be taught in isolation. Appropriate integration of curriculum content is encouraged. An integrative approach involving cognitive development of a broad knowledge base and skills should be adopted.

  With an aim to providing students with an appropriate coverage of learning elements, schools are recommended to adopt different modes of curriculum implementation in order to help students build up a solid foundation of technological knowledge and skills on completion of the junior secondary education (refer to Example 13 of this Guide for an activity to help Secondary 2 students establish links between the two knowledge contexts of "Operation & Manufacturing" and "Strategies & Management").

- **Cross-curricular learning**

  Learning of technology through design activities can encourage students to apply knowledge, skills and values in using resources to create products, services or systems to meet their needs and wants. Technology learning activities involve the development of innovative ideas and problem solving process which provides opportunities for students to integrate knowledge and transfer skills across disciplines to improve the well-being of human in daily life. For instance, project learning and task-based activities related to STEM can

enhance cross-curricular learning and promote the development of entrepreneurial spirit.

- **Strategies in planning students' learning experiences**

  A variety of learning experiences that are congruent with the learning targets and conducive to the learning elements and objectives from the TE curriculum should be selected. The learning experiences (details to be dealt with in Chapter 4) could include activities such as:

  - Classroom teaching;
  - Practical/laboratory sessions;
  - Exploratory learning;
  - Reading to learn;
  - Case studies;
  - Project learning; and
  - Job attachment.

- **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 students' learning progress. Effective assessment practices should have appropriate answers to the following questions:

  - What is the purpose of assessment?
  - How is information collected? (i.e. the modes of assessment)
  - Who conducts the assessment? (by teachers, students, parents, etc.)
  - How are the results of assessment communicated to the relevant stakeholders so as to inform the planning of subsequent learning?

3.2.5 Curriculum Planning at Key Stages 1 and 2

The GS curriculum for Key Stages 1 and 2 integrates the learning contents of the Technology Education, Personal, Social and Humanities Education, and Science Education KLAs. The open curriculum framework of GS allows a high degree of flexibility for integration and adaptation in curriculum planning. In order to provide different learning experiences for students, schools are encouraged to consider their own mission and background, and to build on their strengths in designing a quality GS curriculum to suit the needs and interests of their students. Different approaches may be adopted for organising the learning elements of the six strands in the GS curriculum as well as integrating them with other KLAs.

For details, please refer to Chapter 3 of the updated *General Studies for Primary Schools Curriculum Guide (Primary 1 – 6)* (2017).

3.2.6 Curriculum Planning at Key Stage 3

Schools' existing modes for the implementation of the TE curriculum constitute a wide spectrum: ranging from subject-based learning to a curriculum on life experiences. Schools could use different modes to implement their TE curriculum to meet the learning needs of their students.

3.2.7 The characteristics and facilitating conditions of the different modes for the implementation of the TE curriculum in schools are given in Figure 10. TE teachers should also note the following:

- Home Economics and Computer Literacy teachers could rearrange the learning elements to establish links between the two subjects. As teachers become more experienced in collaboration, they could attempt teaching a common element to connect knowledge and skills of different subjects.
- Teachers of Computer Literacy and Design and Technology could teach as a team to create more space for student learning. Schools may also organise the TE curriculum around some essential themes drawing upon the knowledge of different TE subjects.
- Teachers could also use experiences relevant to students' daily life as the focus of learning in technology education.

3.2.8 Selected Modes of TE Curriculum Implementation at Key Stage 3

Descriptions of selected modes of TE curriculum implementation (Figure 10) are given below:

Figure 10 **Modes for Implementation of Technology Education Curriculum in Schools**

Modes of Curriculum Implementation	Characteristics and Facilitating Conditions	Examples
Subject-based learning, e.g. • Computer Literacy • Design & Technology • Home Economics/ Technology and Living	Existing subjects used as organisers of student learning	
Aligning subjects/knowledge contexts, e.g. • Home Economics, Design & Technology, Computer Literacy • Home Economics/Technology and Living, Design & Technology	Learning elements of subjects rearranged to establish links Projects or coursework Cross-KLA studies	Example 13: Establishing Links between knowledge contexts – Operations & Manufacturing and Strategies & management Example 32: Technology Education Curriculum in ABC Secondary School Example 33: Technology Education Curriculum in LCM Secondary School Example 34: Technology Education Curriculum in DEF Primary School
Collaborative teaching of subjects/knowledge contexts	Team teaching to create more space for student learning Learning elements of different subjects clustered to form modules Cross-KLA studies	Example 13: Establishing Links between knowledge contexts – Operations & Manufacturing and Strategies & management Example 32: Technology Education Curriculum in ABC Secondary School Example 33: Technology Education Curriculum in LCM Secondary School

Modes of Curriculum Implementation	Characteristics and Facilitating Conditions	Examples
		Example 34: Technology Education Curriculum in DEF Primary School
Theme-based Learning	Themes used as platforms for organising learning experiences Cross-KLA studies Life-wide learning Projects or coursework	Example 14: Establishing Links between Subjects – Computer Literacy , Design & Technology, and Home Economics/Technology & Living Example 16: Theme-based Learning (2) - Quality Living Example 24: Technology Education through Life-wide Learning – The Hong Kong Olympiad in Informatics (HKOI) and International Olympiad in Informatics (IOI) Example 34: Technology Education Curriculum in DEF Primary School
Life experiences of students	Learning elements organised by life experiences Cross-KLA studies Life-wide learning Projects or coursework	Example 1: Emphasis on Awareness and Exploration Example 2: Emphasis on Experiencing and Application Example 3: Emphasis on Exploring Orientation for Lifelong Learning and Specialisation Example 39: Meal Planning

Orientations[8]	Characteristics and Facilitating Conditions	Examples
Hands-on studies	Aptitude of students	Example 38: Building a Tower Example 49: Learning Technology through Project Learning at the Primary Level
Community needs	Mission of schools, connection with community leaders	Example 35: A Multimedia Presentation for Promoting "Discover Hong Kong"
Vocational needs	Mission of sponsoring body Networking with other organisations	Example 25: Technology Education through Life-wide Learning – Career-related Experiences
Academic needs	Mission and tradition of schools Ability and aptitude of students	Example 32: Technology Education Curriculum in ABC Secondary School

- **Aligning Existing Subjects/Knowledge Contexts**

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

[8] Schools, regardless of the mode of curriculum implementation adopted, may consider different orientations to build on their strengths and resources as well as the needs and interests of their students.

Example 13	**Establishing Links between Knowledge Contexts**
Knowledge Contexts:	**Operations & Manufacturing and Strategies & Management**
Level:	**Secondary 2**

Students are asked to develop and produce a device for meeting the needs of a target group. They have to study and then select an appropriate form of business ownership (e.g. sole proprietorship and chain store) for selling the developed device.

Example 14	**Establishing Links between Subjects**
Subjects:	**Computer Literacy, Design & Technology, and Home Economics/Technology & Living**
Level:	**Secondary 3**

Students are asked to explore issues of green design, green technology and green enterprise in response to related environmental concerns with examples provided by different subjects.

- **Collaborative Teaching of Subjects/Knowledge Contexts**

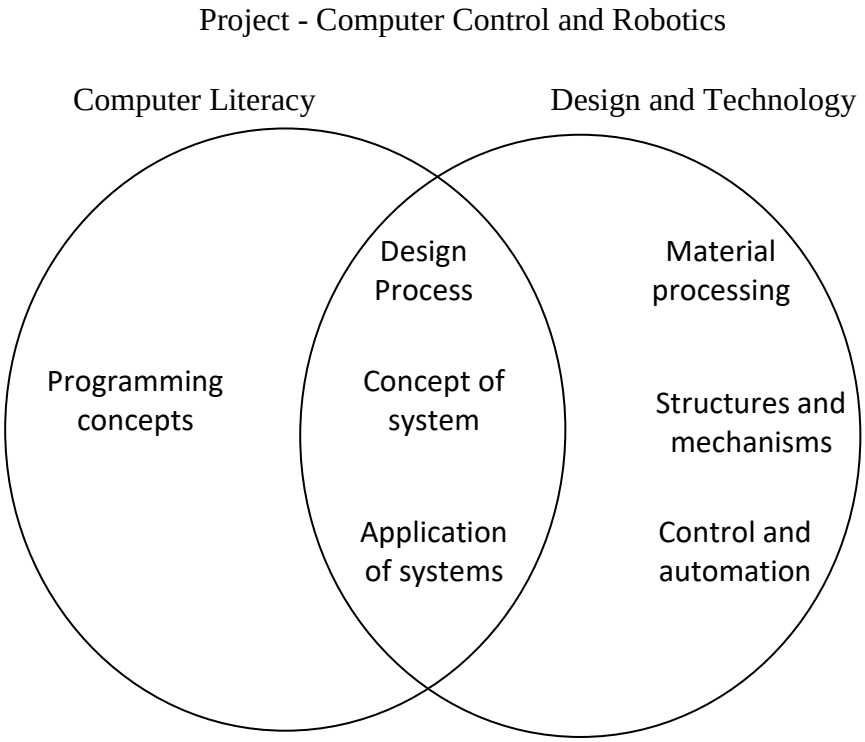
  Teachers of two or more subjects can teach as a team. Some learning elements could be integrated to create more space for student learning.

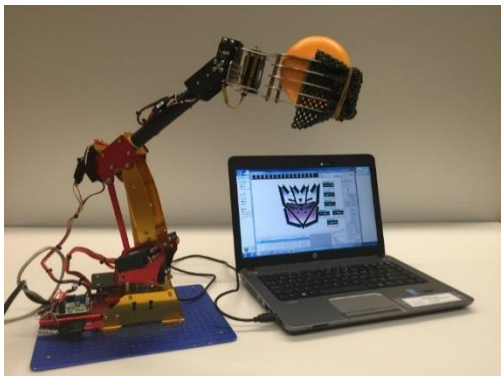
  Alternatively, clusters of learning elements in different subjects could be taken as a basis for developing modules to be used as building blocks for the curriculum at different levels. This approach facilitates the flexible sequencing of learning experiences.

  Through the collaborative effort of subject teachers in designing the modules, students learn some common elements of the subjects more effectively (see Figure 11 for an example for illustration).

Figure 11 **Integrated Learning Elements in Technology Education Subjects**

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





Design and make of robots provides good opportunities for students to integrate the learning elements under different TE subjects or knowledge contexts. Students should apply the knowledge acquired in "Programming Concepts" for designing the robots to perform different operations. They also need to apply the knowledge and skills of "Materials and Structures" and "Control for Automation" for working out the robot models.

- **Theme-based Learning**

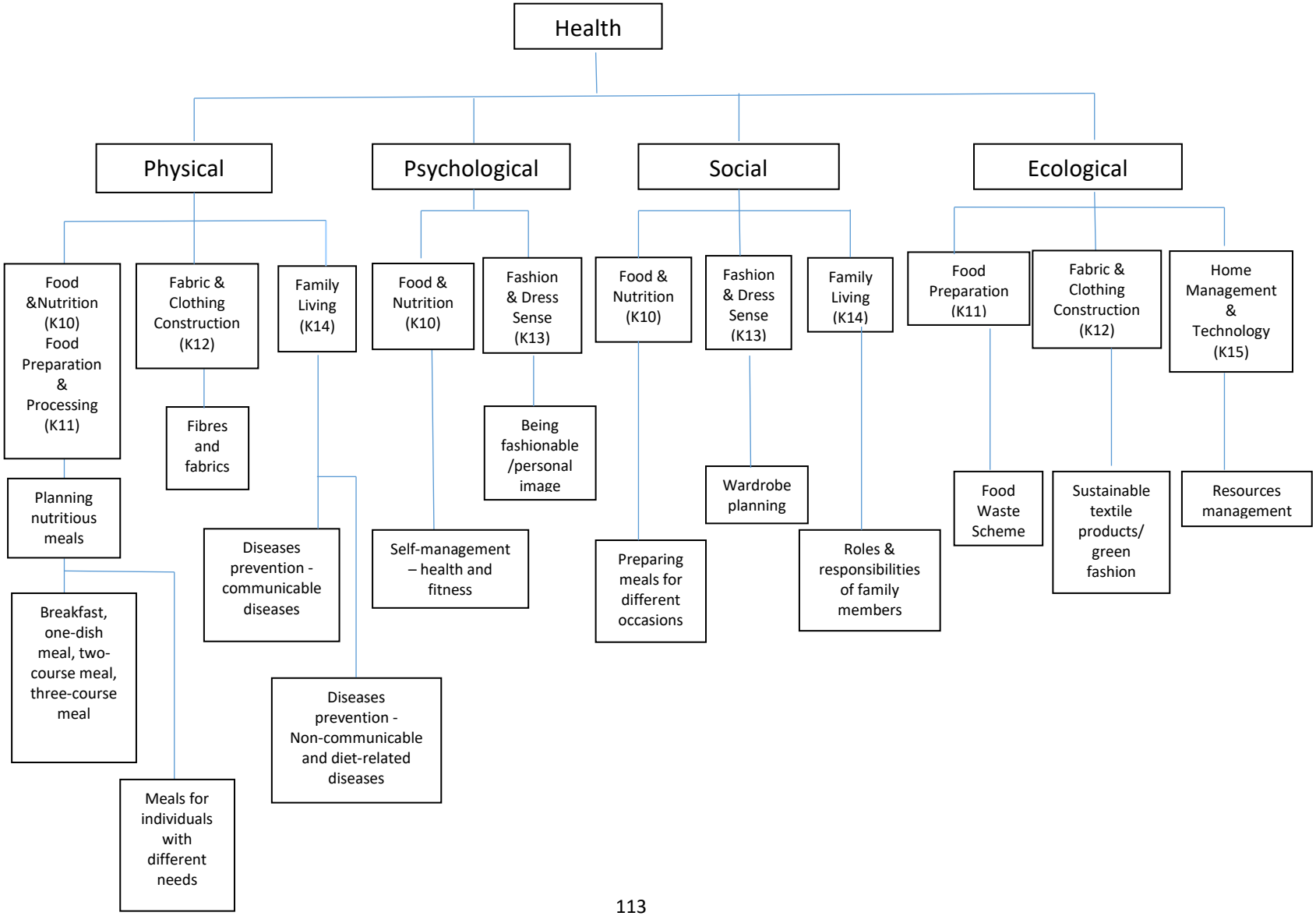
  In this mode, a selected theme, which covers the learning elements from various TE subjects, is used as the platform for organising learning experiences related to daily life. Below are some examples of themes:

  - Health
  - Quality Living
  - Smart Living in the 21st Century
  - Do I Need Brand Name Products?
  - Fair Competition
  - Robotics
  - Chocolate Egg Packaging Design
  - Poster Design
  - Fashion Design and Fashion Show
  - Greenhouse

  In the process of learning, students are provided with a selection of themes with project brief and common enabling skills such as survey design and interviewing skills. Students then form groups and choose themes of their own interest to develop their technological literacy as well as nurturing 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 15	**Theme-based Learning (1)**
Theme:	**Health**
Level:	**Secondary 1 – 3**

The theme aims to provide a holistic concept of health. Learning elements of Technology and Living are grouped under the four perspectives of health.


Health
Physical
Psychological
Social
Ecological
Food &Nutrition (K10) Food Preparation & Processing (K11)
Fabric & Clothing Construction (K12)
Family Living (K14)
Food & Nutrition (K10)
Fashion & Dress Sense (K13)
Food & Nutrition (K10)
Fashion & Dress Sense (K13)
Family Living (K14)
Food Preparation (K11)
Fabric & Clothing Construction (K12)
Home Management & Technology (K15)
Planning nutritious meals
Fibres and fabrics
Diseases prevention - communicable diseases
Self-management – health and fitness
Being fashionable /personal image
Preparing meals for different occasions
Wardrobe planning
Roles & responsibilities of family members
Food Waste Scheme
Sustainable textile products/ green fashion
Resources management
Breakfast, one-dish meal, two-course meal, three-course meal
Meals for individuals with different needs
Diseases prevention - Non-communicable and diet-related diseases

Example 16 Theme-based Learning (2)

Theme: Quality Living

Level: Secondary 3

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

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 technology topic. In the process, students are highly motivated since the topics are closely related to their everyday life. Group work 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 example.

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 Secondary 1 in September of Year 1, Secondary 1 to Secondary 2 in September of Year 2 and Secondary 1 to Secondary 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 for their learning.

Commencing in Secondary 1, the students will experience about four 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 the TE curriculum
- nurturing in students the basic skills, attitudes and the ability for lifelong learning
- ensuring basic competence for core elements and encouraging the pursuit of excellence in specialised fields.

- **Life Experiences of Students**

  Schools may wish to consider organising 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 & Organisations • 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 organise the learning experience of the TE curriculum around "Family" in Secondary 1, "Social" in Secondary 2 and "Economics and Work" in Secondary 3. Alternatively, a school can choose to organise technology learning around "Family" and the theme will run for 20 weeks, "Social" and "Economics and Work" for 10 weeks each in Secondary 1, while the duration of the three life experiences in Secondary 2 and Secondary 3 can be varied according to the students' learning needs.

3.2.9 Curriculum Planning at Key Stage 4

There are five elective subjects under the TE KLA at Key Stage 4, namely Business, Accounting and Financial Studies, Design and Applied Technology, Health Management and Social Care, Information and Communication Technology, and Technology and Living. For details of the curriculum planning of these five Technology elective subjects, please refer to Chapter 3 of the respective Curriculum and Assessment Guides.

For the curriculum planning at Key Stage 4, schools have to ensure:

- a diversified choice of elective subjects to cater for students' interest, abilities and needs;
- the development of a sufficient knowledge base for further studies;
- the promotion of lifelong learning skills, values and attitudes to meet contemporary needs;
- the promotion of assessment for learning to achieve the lifelong learning goals for education; and
- a strong interface between the junior and senior secondary curricula.

3.3 Cross Key Learning Area Linkage

As technology learning is not compartmentalised, it can contribute to and gain from the learning of other KLAs. Technology learning activities may provide opportunities, which are generally complementary in nature, for students to demonstrate their learning in more than one KLA. Some examples of the linkage between TE and other KLAs and Liberal Studies are given below:

3.3.1 With Chinese Language and English Language Education

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

3.3.2 With Mathematics Education

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

3.3.3 With Personal, Social and Humanities Education

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

3.3.4 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.

3.3.5 With Arts Education

The aesthetic sense developed in arts education helps students improve their visual presentations, select the appropriate media to present their ideas and evaluate the aesthetic value of new technology designs.

3.3.6 With Physical Education

Technology education and physical education share 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.

3.3.7 With Liberal Studies (LS)

Learning experiences in TE classes at the junior secondary level provide a solid knowledge foundation and sound development of generic skills and positive values and attitudes for the study of LS at the senior secondary level. For example, through studying the learning elements under "Production Process" and "Materials and Resources", students acquire relevant learning experience for their studies in the LS module of "Energy Technology and the Environment".

3.4 **Multiple Pathways**

3.4.1 Through studying subjects of the TE KLA, students will develop essential knowledge and lifelong skills for further studies and work in related fields, e.g.

- *Business, Accounting and Financial Studies*: Business knowledge and skills for strategic planning and business development as well as positive values and attitudes acquired through this subject can help students fulfil their roles competently and confidently as consumers, investors, employees and/or entrepreneurs.
- *Design and Applied Technology*: Knowledge of design, engineering and media communication for the engineering and design/creative industries can be acquired through this subject.
- *Health Management and Social Care*: Knowledge related to health promotion, health care and social welfare acquired through this subject can help students serve in the health and social service professions.
- *Information and Communication Technology*: This subject provides students with knowledge, skills and understanding of the processes involved in problem solving in the information technology industry.

- *Technology and Living:* Knowledge related to nature and properties of food, food/clothing and textile technology, factors affecting the development of fashion design acquired through this subject can prepare students for the food and fashion professions.

3.5 Time Allocation

In order to help students develop a solid foundation of technological knowledge and skills, schools should allocate sufficient curriculum time to the TE KLA at different key stages of schooling. Schools should refer to the *Basic Education Curriculum Guide (BECG) (Primary 1 – 6)* (2014) and the *SECG (Secondary 1 – 6)* (2017) in planning the lesson time allocated to the General Studies curriculum at the primary level and the different TE subject curricula at the junior and senior secondary levels.

A summary of the suggested allocation of time is provided below:

- At the primary level, schools can allocate 12% to 15% of the total lesson time to General Studies for each key stage from Primary 1 to 6 (KS1 – 2).
- At the junior secondary level, the TE KLA Curriculum (S1 – 3) accounts for 8% – 15% of the total lesson time over a course of three years in KS3.
- At the senior secondary level, each of the TE elective subjects of the senior secondary curriculum accounts for 10% to 15% of the total lesson time over a course of three years in KS4.

Schools may vary the percentage of time allocation for different year levels of a key stage as long as the total lesson time falls within the recommended range.

Schools are also reminded that 19% and 8% of the total lesson time is reserved for schools' flexible use at the primary and junior secondary level respectively. Flexibility is provided for schools to deploy the flexible time to conduct cross-curricular learning activities such as those for STEM, values education, Basic Law education, Reading across the Curriculum for whole-person development. As for the senior secondary level, 10% to15% of the time allocation is set aside for Other Learning Experiences (OLE). Schools should give due consideration to the overall planning and co-ordination among different KLAs and subjects with flexibility to organise OLE during and outside school hours.

Teachers are encouraged to use the time flexibly to help students attain the learning targets and objectives for the TE curriculum through various learning experiences inside and outside the classroom.

At present, many schools are adopting a subject-based learning approach at the junior secondary through Computer Literacy, Design and Technology, and Home Economics/Technology and Living. Examples of how the lesson time allocated for the TE KLA for KS3 is used for the learning and teaching of these three subjects are provided in Figures 12 - 16.

Figure 12 **8% of the Total Lesson Time for KS3 (220 hours)**

Level	Information and Communication Technology	Materials and Structures	Operations and Manufacturing	Strategies and Management	Systems and Control	Technology and Living
Secondary 1 (minutes)	• K1 Computer Systems (310) • K16 Information Processing and Presentation (730)	• K4 Structures & Mechanisms (320)	• K5 Tools and Equipment (160) • K6 Production Process (920)		• K8 Concepts of System (80) • K9 Application of Systems (80)	• K10 Food and Nutrition (300) • K11 Food Preparation and Processing (410) • K12 Fabric and Clothing Construction (410) • K13 Fashion and Dress Sense (120) • K14 Family Living (120) • K15 Home Management and Technology (200)
Secondary 2 (minutes)	• K2 Programming Concepts (310) • K16 Information Processing and Presentation (730)	• K4 Structures and Mechanisms (600)	• K6 Production Process (600)		• K8 Concepts of System (40) • K9 Application of Systems (320)	• K10 Food and Nutrition (340) • K11 Food Preparation and Processing (310) • K12 Fabric and Clothing Construction (350) • K13 Fashion and Dress Sense (140) • K14 Family Living (120) • K15 Home Management and Technology (300)
Secondary 3 (minutes)	• K2 Programming Concepts (620) • K16 Information Processing and Presentation (420)	• K4 Structures and Mechanisms (200)	• K6 Production Process (1080)	• K7 Business Environments, Operations and Organisations (720)	• K8 Concepts of System (40) • K9 Application of Systems (240)	• K10 Food and Nutrition (300) • K11 Food Preparation and Processing (340) • K12 Fabric and Clothing Construction (360) • K13 Fashion and Dress Sense (140) • K14 Family Living (120) • K15 Home Management and Technology (300)
Total lesson time for Secondary 1 - 3: 220 hours (13200)						

Figure 13 15% of the Total Lesson Time for KS3 (413 hours)

Level	Information and Communication Technology	Materials and Structures	Operations and Manufacturing	Strategies and Management	Systems and Control	Technology and Living
Secondary 1 (minutes)	• K1 Computer Systems (600) • K16 Information Processing and Presentation (1380)	• K3 Materials and Resources (320) • K4 Structures and Mechanism (320) • E2 Material Processing (320)	• K5 Tools and Equipment (320) • K6 Production Process (1520)		• K8 Concepts of System (80) • K9 Application of Systems (80)	• K10 Food and Nutrition (500) • K11 Food Preparation and Processing (660) • K12 Fabric and Clothing Construction (620) • K13 Fashion and Dress Sense (260) • K14 Family Living (120) • K15 Home Management and Technology (560) • E8 Fabric and Clothing Construction (80) • E 9 Fashion and Dress Sense (80) • E10 Home Management and Technology (80)

Level	Information and Communication Technology	Materials and Structures	Operations and Manufacturing	Strategies and Management	Systems and Control	Technology and Living
Secondary 2 (minutes)	• K2 Programming Concepts (480) • K16 Information Processing and Presentation (1200) • E1 Computer Networks (300)	• K3 Materials and Resources (200) • K4 Structures and Mechanism (600) • E2 Material Processing (320)	• K5 Tools and Equipment (280) • K6 Production Process (1200)		• K8 Concepts of System (40) • K9 Application of Systems (320)	• K10 Food and Nutrition (500) • K11 Food Preparation and Processing (660) • K12 Fabric and Clothing Construction (600) • K13 Fashion and Dress Sense (260) • K14 Family Living (120) • K15 Home Management and Technology (580) • E8 Fabric and Clothing Construction (80) • E 9 Fashion and Dress Sense (80) • E10 Home Management and Technology (80)

Level	Information and Communication Technology	Materials and Structures	Operations and Manufacturing	Strategies and Management	Systems and Control	Technology and Living
Secondary 3 (minutes)	• K2 Programming Concepts (1000) • K16 Information Processing and Presentation (680) • E1 Computer Networks (300)	• K3 Materials and Resources (120) • K4 Structures and Mechanism (200)	• K5 Tools and Equipment (320) • K6 Production Process (1720) • E3 Project Management (320)	• K7 Business Environments , Operations and Organisations (720) • E4 Resources Management (210) • E5 Marketing (150)	• K8 Concepts of System (40) • K9 Application of Systems (240)	• K10 Food and Nutrition (500) • K11 Food Preparation and Processing (660) • K12 Fabric and Clothing Construction (600) • K13 Fashion and Dress Sense (260) • K14 Family Living (120) • K15 Home Management and Technology (580) • E8 Fabric and Clothing Construction (80) • E 9 Fashion and Dress Sense (80) • E10 Home Management and Technology (80)
Total Lesson Time for Secondary 1 - 3: 413 hours (24780)						

Figure 14 Selection of Modules under Computer Literacy and Allocation of Lesson Time

Level	1 period per week/cycle (about 2.5% of the total curriculum time) (assumes 100 units of lesson time per year)	2 periods per week/cycle (about 5% of the total curriculum time) (assumes 200 units of lesson time per year)
Secondary 1	K1* Computer Systems (30 units) K16 Information Processing and Presentation (70 units)	K1* Computer Systems (30 units) K16 Information Processing and Presentation (170 units)
Secondary 2	K2 Programming Concepts (30 units) K16 Information Processing and Presentation (70 units)	K2 Programming Concepts (50 units) K16 Information Processing and Presentation (120 units) E1# Computer Networks (30 units)
Secondary 3	K2: Programming Concepts (60 units) K16* Information Processing and Presentation (40 units)	K2 Programming Concepts (130 units) K16* Information Processing and Presentation (40 units) E1# Computer Networks (30 units)

Notes:

- Contents of learning elements marked with * such as "properties and functions of usual components" in K1 and "concepts of database" in K16 are rarely taught at the primary level. Students' prior knowledge in these modules is presumed to be very similar.
- The learning element marked with # is an extension module which focuses on computer networks for schools that wish to provide additional learning elements in their Computer Literacy lessons.
- Other contents such as "ideas of a stored program" in K2, and "applications of IT" in K16 are often taught in some primary schools with computer lessons. Hence students' abilities may vary a lot. Teachers may need to spend more time on (i) catching up with the fundamentals for those who have less learning experience; or (ii) providing more challenging tasks to stretch the talented students' potential.
- Schools are recommended to allocate at least 30% of the lesson time of the Information and Communication Technology (ICT) knowledge context at junior secondary level to teach programming.

Figure 15 Selection of Modules under Design and Technology and Allocation of Lesson Time

<table>
<tr><th>Level</th><th colspan="2">1 period per week/cycle
(about 2.5% of the total lesson time)
(assuming that there are 100 units of lesson time per year)</th><th>2 periods per week/cycle
(about 5% of the total lesson time)
(assuming that there are 200 units of lesson time per year)</th><th colspan="2">3 periods per week/cycle
(about 7.5% of the total lesson time)
(assuming that there are 300 units of lesson time per year)</th></tr>
<tr><td rowspan="4">Secondary 1</td><td colspan="2">Choose one of the following combinations</td><td rowspan="4">K3Materials and Resources (24.2 units)
K4 Structures and Mechanism (24.2 units)
K5 Tools and Equipment (24.2 units)

K6 Production Process (115.4 units)
K8 Concepts of System (6 units)
K9Application of Systems (6 units)</td><td colspan="2" rowspan="4">K3 Materials and Resources (26.4 units)
K4 Structures and Mechanisms (26.4 units)
K5 Tools and Equipment (26.4 units)

K6 Production Process (125.4 units)
K8 Concepts of System (6.6 units)
K9Application of Systems (6.6 units)

E2 Material Processing (36.3 units)
E6 System Integration (39.3 units)
E7 Control and Automation (6.6 units)</td></tr>
<tr><td>Combination A (Materials and Production)</td><td>Combination B (Structures and Systems)</td></tr>
<tr><td>K3 Materials and Resources (23.5 units)
K5Tools and Equipment (11.8 units)
K6 Production Process (64.7 units)</td><td>K4 Structures and Mechanisms (25 units)
K5 Tools and Equipment (12.5 units)
K6 Production Process (50 units)
K8 Concepts of System (6.25 units)
K9 Application of Systems (6.25 units)</td></tr>
<tr><td></td></tr>
<tr><td rowspan="5">Secondary 2</td><td colspan="2">Choose one of the following combinations</td><td rowspan="5">K3 Materials and Resources (15.2 units)
K4 Structures and Mechanisms (45.4 units)
K5 Tools and Equipment (21.2 units)
K6 Production Process (91.0 units)
K8 Concepts of system (3 units)
K9 Application of Systems (24.2 units)</td><td colspan="2">K3 Materials and Resources (15.3 units)
K4 Structures and Mechanisms (45.9 units)
K5 Tools and Equipment (21.3 units)
K6 Production Process (91.8 units)
K8 Concepts of system (3 units)
K9 Application of Systems (24.6 units)

Plus one of the following combinations:</td></tr>
<tr><td>Combination A (Materials and Production)</td><td>Combination B (Structures and Systems)</td><td>Combination A (Materials and Production)</td><td>Combination B (Structures and Systems)</td></tr>
<tr><td>K3 Materials and Resources (14.8 units)
K5 Tools and Equipment (20.5 units)
K6 Production Process (64.7 units)</td><td>K4 Structures and Mechanisms (46.9 units)
K6 Production Process (25 units)
K8 Concepts of system (3.1 units)
K9 Application of Systems (25 units)</td><td>E2Material Processing (24.6 units)
E3 Project Management (18.3 units)
E6 System Integration (55.2 units)</td><td>E7 Control and Automation (98.1 units)</td></tr>
<tr><td></td></tr>
</table>

<table>
<tr><th>Level</th><th>1 period per week/cycle
(about 2.5% of the total lesson time)
(assuming that there are 100 units of lesson time per year)</th><th>2 periods per week/cycle
(about 5% of the total lesson time)
(assuming that there are 200 units of lesson time per year)</th><th>3 periods per week/cycle
(about 7.5% of the total lesson time)
(assuming that there are 300 units of lesson time per year)</th></tr>
<tr><td rowspan="3">Secondary 3</td><td colspan="2">Choose one of the following combinations</td><td rowspan="3">K3 Materials and Resources (9 units)
K4 Structures and Mechanisms (15.2 units)
K5 Tools and Equipment (24.2 units)
K6 Production Process (130.4 units)
K8 Concepts of system (3 units)
K9 Application of Systems (18.2 units)</td><td colspan="3">K3 Materials and Resources (10.5/9/9.3 units)
K4 Structures and Mechanisms (17.1/15/15.3 units)
K5 Tools and Equipment (27.6/24/24.6 units)
K6 Production Process (148.2/129/131.4 units)
K8 Concepts of system (3.6/3/3 units)
K9 Application of Systems (20.7/18/18.3 units)

Plus one of the following combinations:</td></tr>
<tr><td>Combination A (Materials and Production)</td><td>Combination B (Structures and Systems)</td><td>E2 Material Processing (44.7 units)

E3 Project Management (27.6 units)</td><td>E6 System Integration (102 units)</td><td>E7 Control and Automation (98.1 units)</td></tr>
<tr><td>K3 Materials and Resources (8.9 units)
K5 Tools and Equipment (23.5 units)
K6 Production Process (67.6 units)</td><td>K4 Structures and Mechanisms (15.6 units)
K6 Production Process (62.5 units)
K8 Concepts of system (3.1 units)
K9 Application of Systems (18.8 units)</td><td colspan="3"></td></tr>
</table>

Figure 16 **Implementation of Modules under Home Economics/Technology and Living and Allocation of Lesson Time**

Level	Half Year Implementation Mode	Whole Year Implementation Mode	
	2 periods per week/cycle (about 2.5% of the total lesson time) (assuming that there are 100 units of lesson time per year)	**2 periods per week/cycle (about 5% of the total lesson time) (assuming that there are 200 units of lesson time per year)**	**3 periods per week/cycle (about 7.5% of the total lesson time) (assuming that there are 300 units of lesson time per year)**
Secondary 1	K10 Food and Nutrition (20 units) K11 Food Preparation and Processing (21 units) K12 Fabric and Clothing Construction (21 units) K13 Fashion and Dress Sense (10 units) K14 Family Living (9 units) K15 Home Management and Technology (19 units)	K10 Food and Nutrition (40 units) K11 Food Preparation and Processing (45 units) K12 Fabric and Clothing Construction (45 units) K13 Fashion and Dress Sense (21 units) K14 Family Living (9 units) K15 Home Management and Technology (40 units)	K10 Food and Nutrition (46 units) K11 Food Preparation and Processing (76 units) K12 Fabric and Clothing Construction (73 units) K13 Fashion and Dress Sense (30 units) K14 Family Living (9 units) K15 Home Management and Technology (48 units) E8 Fabric and Clothing Construction (6 units) E9 Fashion and Dress Sense (6 units) E10 Home Management and Technology (6 units)
Secondary 2	K10 Food and Nutrition (21 units) K11 Food Preparation and Processing (21 units) K12 Fabric and Clothing Construction (22 units) K13 Fashion and Dress Sense (9 units) K14 Family Living (9 units) K15 Home Management and Technology (18 units)	K10 Food and Nutrition (38 units) K11 Food Preparation and Processing (44 units) K12 Fabric and Clothing Construction (46 units) K13 Fashion and Dress Sense (21 units) K14 Family Living (9 units) K15 Home Management and Technology (42 units)	K10 Food and Nutrition (46 units) K11 Food Preparation and Processing (76 units) K12 Fabric and Clothing Construction (72 units) K13 Fashion and Dress Sense (30 units) K14 Family Living (9 units) K15 Home Management and Technology (49 units) E8 Fabric and Clothing Construction (6 units) E9 Fashion and Dress Sense (6 units) E10 Home Management and Technology (6 units)
Secondary 3	K10 Food and Nutrition (22 units) K11 Food Preparation and Processing (19 units) K12 Fabric and Clothing Construction (22 units) K13 Fashion and Dress Sense (9 units) K14 Family Living (9 units) K15 Home Management and Technology (19 units)	K10 Food and Nutrition (38 units) K11 Food Preparation and Processing (44 units) K12 Fabric and Clothing Construction (46 units) K13 Fashion and Dress Sense (21 units) K14 Family Living (9 units) K15 Home Management and Technology (42 units)	K10 Food and Nutrition (46 units) K11 Food Preparation and Processing (76 units) K12 Fabric and Clothing Construction (72 units) K13 Fashion and Dress Sense (30 units) K14 Family Living (9 units) K15 Home Management and Technology (49 units) E8 Fabric and Clothing Construction (6 units) E9 Fashion and Dress Sense (6 units) E10 Home Management and Technology (6 units)

Chapter 4
Learning and Teaching

Chapter 4 Learning and Teaching

Schools may refer to Chapter 4 of the *BECG (Primary 1 - 6) (2014)* and Booklet 3 of the *SECG (Secondary 1 - 6) (2017)* for more ideas on learning and teaching approaches and strategies.

4.1 Principles to Guide Actions

4.1.1 Technology education from KS1 to KS3 provides opportunities for students to acquire a comprehensive range of learning experiences, which could be organised according to the following principles.

Technology learning experiences should:

- be purposeful;
- be progressive and interactive in nature: allowing students to progress at their own pace and to make improvement;
- involve the co-ordination of the hands and minds;
- integrate the different knowledge contexts in the TE curriculum;
- nurture in students the basic knowledge, skills and attitudes for lifelong learning;
- enable the pursuit of excellence in specialised fields for those with interest and/or talent in technology; and
- infuse MRE of the ongoing renewal of the curriculum such as promoting STEM education.

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

4.2 Approaches to Learning and Teaching

4.2.1 Technology learning is always purposeful and starts with a problem as the context of study. Technology learning also has a deliverable such as an artefact and a system, and usually involves the use of both hands and minds. A variety of learning activities can be used, such as classroom teaching, reading and collecting information, designing and processing, and life-wide learning conducted outside the school.

4.2.2 In organising a learning task, it is important to consider a number of essential factors. Some suggestions for planning are given in the following framework that groups the essential factors under six headings.

Essential Factors in Organising a Technology Learning Task	Elaboration of Essential Factors
Key Features: • What is the focus of this task? • What is/are the learning target(s)? • What is the best context to be chosen as the platform of learning?	Learning a specific skill/concept/ principle, developing generic skills, etc.
Task Definition: • What is the nature of learning? • What is the resource implication for this task? • What is/are the final deliverable(s) of this task?	A case study, project work, debate and discussion, learning game, small group activity, individual task, etc. Task to be conducted in a classroom, special room, outside school, a combination of these venues, etc.
Integrated Dimensions of Technology and MRE of the Ongoing Renewal of the School Curriculum: • Which learning element(s) is/are associated with this task? • How many dimensions of technology learning will be involved in this task? • How can students nurture their generic skills and positive values and attitudes through this task?	Emphasis on knowledge contexts, process in technology and impact of technology Task-based learning helps students develop problem solving skills, self-directed learning, and effective collaboration skills.
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 contexts, process in technology and impact of technology

Essential Factors in Organising a Technology Learning Task	Elaboration of Essential Factors
Activity Sequence: • How can the task be structured into a series of activities to provide a logical sequence of learning as well as 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 the task?	Observation checklists, student worksheets, etc.

4.2.3 Technology Learning Activities (TLAs) should be used to help students understand the process of developing technologies, constructing knowledge and nurturing creativity. Please refer to Appendix 1 for a brief description of teachers' consideration in formulating TLAs and a design cycle to be adopted by students for every TLA.

4.2.4 **The Updated Four Key Tasks**

The Four Key Tasks of *Moral and Civic Education, Reading to Learn, Project Learning* and *Information Technology for Self-directed Learning* have been recommended for schools' implementation of the curriculum reform since 2001 to help students develop independent learning capabilities. In the ongoing curriculum renewal, these tasks are updated as **Moral and Civic Education, Reading to Learn, Project Learning,** and **Information Technology (IT) for Interactive Learning**. The updated Four Key Tasks are applicable in the TE KLA to enliven learning and teaching, and to help students achieve whole-person development and become self-directed learners. They can be flexibly embedded into different learning activities as stated in Chapter 3 of the *BECG (Primary 1 - 6)* (2014) *and* Booklets 6 of the *Secondary Education Curriculum Guide (Secondary 1 – 6)* (2017). Suggestions on how to incorporate the updated Four Key Tasks in technology learning activities are given below.

Moral and Civic Education

4.2.5 The learning elements in the TE curriculum, as presented in Figure 6 in Chapter 2, are related to local business and industries as well as our daily life, and help student develop an understanding of the impact of technology on families, society and nation.

4.2.6 Through technology education, students are exposed to topics such as environmental protection, media education, ethics and healthy living. More importantly, students 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 society.

Example 17 Developing Civic Mindedness through Technology Education Learning Activities

In a Technology 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. Students plan and decide what to do with it – repair, restyle or recycle. After designing and making, students introduce the 'new' article of clothing to their classmates and discuss with them its implication on conservation of resources.

Reading to Learn

4.2.7 Reading is an important learning skill in the TE curriculum. 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; and
- the manipulation of new technologies.

These reading materials could help students understand how the development of technology is related to geographical locations and natural resources, as well as its impact on social and economic development.

Example 18 Developing Skills to Read across the Curriculum through Technology Education Learning Activities

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 related to this topic from different sources such as websites and magazines, read them and prepare a presentation in their spare time. The presentation, which is done in the second term, focuses on introducing the new technology and the related reading materials as well as their views on its impact on everyday life. Teachers may also make arrangements for students to share the reading materials through displaying them in the classroom or uploading them to the school intranet.

Project Learning

4.2.8 A project is a tool for both learning and assessment of the TE curriculum. Project learning enables students to construct and connect knowledge, concepts and skills in the TE KLA and/or across KLAs. STEM-related projects are encouraged so as to enable students to integrate and apply their learning, as well as nurturing positive values and attitudes.

Example 19 A Technology Project for Primary Students

In a GS lesson, students work on a small group project to design and make a tall skyscraper model. Students are required to perform a strength test on different materials and also a test on the weight carrying capacity of prisms in different shapes in order to build a model with the highest stability. Through the project, students apply the TLA design cycle (see Section 4.2.3 and Appendix 1 for details) to improve their design and develop an understanding of what material and prism shape are most suitable for making a stable skyscraper model.

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 applications of technologies and enable them to explore different learning resources to develop self-directed learning capabilities. Teacher is no longer the sole provider of knowledge but 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 through different forms such as sounds, pictures, videos or a combination of them.

Example 20 IT for Self-directed Learning in the Technology Education Curriculum

At the beginning of a product design project, students practice evaluating different product designs by visiting websites which provide many examples of designs. Through this mode, students can learn more about design.

4.2.10 "Computational Thinking involves solving problems, designing systems, and understanding human behavior, by drawing on the concepts fundamental to computer science" (Wing, 2006). Students become tool builders instead of tool users through a set of concepts such as abstraction, algorithm and automation. Computational thinking is a problem solving methodology that can be transferred and applied in different contexts. Computational thinkers can accurately describe the problems and construct an algorithm that solves it.

Example 21 **Using Visual Programming Languages to enhance Computational Thinking and Generic Skills**

Visual programming language (VPL) is any programming language that lets users create programs by manipulating program elements graphically rather than by specifying them textually.

Computational thinking:
Computational practices focus on the process of thinking and learning, moving beyond what you are learning to how you are learning. Some VPLs provide learners with a simple visual drag-and-drop user interface for students to manipulate and test different ideas or approaches to a problem.

Testing programs with a simple visual drag-and drop user interface

e-Learning

4.2.11 e-Learning refers to an open and flexible learning mode involving the use of electronic media, including the use of digital resources and communication tools to achieve the learning objectives. The major aim of e-learning is to enhance learning and teaching effectiveness in schools and to help students develop the essential qualities required in the 21st century (e.g. self-directed learning). Teachers may build a repertoire in e-learning strategies to help enhance, modify and complement the pedagogy adopted for the technology classroom.

4.2.12 The use of e-learning to develop students' information literacy, self-directed learning abilities and habits is highly encouraged.

4.2.13 E-learning can be adopted in TE KLA through:

- using simulation or modelling tools (such as networking simulation in Information and Communication Technology and environmental building design in Design and Applied Technology) to help students learn through an experience which could provide instant feedback to facilitate self-directed learning; and
- using mind mapping tools to help students promote collaborative learning and strengthen co-construction of their personal understanding of the contents (such as using mind mapping apps to construct concept maps about ecology and health in Health Management and Social Care in groups).

Teachers should exercise their professional judgements in the appropriate use of IT and ensure that students are provided with sufficient opportunity for hands-on experiences to develop their skills.

Example 22 e-Learning

Before the e-learning lesson, which aims to nurture students the basic knowledge of the devices, students are requested to explore the characteristics of an input or output device on the Internet. They then post a message with a brief description of the device with related websites to the school intranet or an online forum. The messages will then be studied and commented by their teacher and classmates during the lesson.

Example 23 e-Learning Resources

In the context of computer education, there are many resources available on the Internet to support the use of e-learning in the Technology classroom. For examples, there are websites with interactive learning activities and tutorials to enable self-directed learning of programming, such as:

Turtle Academy (http://turtleacademy.com/) and Code Academy (http://www.codecademy.com/learn).

- When using e-learning resources, proper guidance and monitoring of students' learning progress are still required so as to develop their independent learning skills and attitudes.

Life-wide Learning

Schools may refer to "Issues about Life-wide Learning" in Chapter 6 of the *BECG (Primary 1 - 6)* (2014) and Booklet 7 of the *SECG (Secondary 1 - 6)* (2017) for suggestions on organising life-wide learning activities for their students.

4.2.14 TE learning should not be confined to schools. Life-wide learning aims to offer opportunities for students to learn:

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

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

4.2.16 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 workplaces so as to have a wider exposure in different fields related to technology.

4.2.17 There are many possible life-wide learning activities to support the TE curriculum. The following table provides information on some of the LWL activities which are adopted by different schools.

Life-wide Learning Activity	Objectives
• Visits to different organisations (e.g. power plants, switch stations, control stations, model homes, model offices, research laboratories)	To expose students to different specialised areas to understand how technologies are actually applied to solve real life problems
• Talks, seminars and public lectures by practitioners or professionals	For students to gain up-to-date and contextual knowledge and experience related to different technologies and to communicate directly with professionals
• Participation in competitions	For students to apply knowledge and skills acquired and to learn through team work and collaboration
• Career-related experiences	For students to gain knowledge and work experiences and to acquire skills in working with others
• Mentorship programmes by professionals	For students to have a better understanding of a certain knowledge area in the TE curriculum, to work under the guidance of professionals and to be aware of the qualities that employers are looking for in school graduates

Example 24 Technology Education through Life-wide Learning - The Hong Kong Olympiad in Informatics (HKOI) and International Olympiad in Informatics (IOI)

The HKOI is a student computer competition which aims at promoting students' interest in programming. The best contestants will be invited to attend a series of training programmes. Those with outstanding performance in the training programme will then be selected as representatives of the Hong Kong team in some international computer competitions, such as the International Olympiad in Informatics and the National Olympiad in Informatics in China.

The IOI is an annual international computer competition which aims at stimulating students' interest in computing science and information technology, and encouraging students' sharing of their technological and cultural experiences with talented pupils from the various participating countries.

Example 25 Technology Education through Life-wide Learning – Career-related Experiences

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

4.2.18 LWL activities can be organised according to the specific condition of schools. The following are some LWL activities conducted in schools:

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

4.2.19 Strengthening STEM education

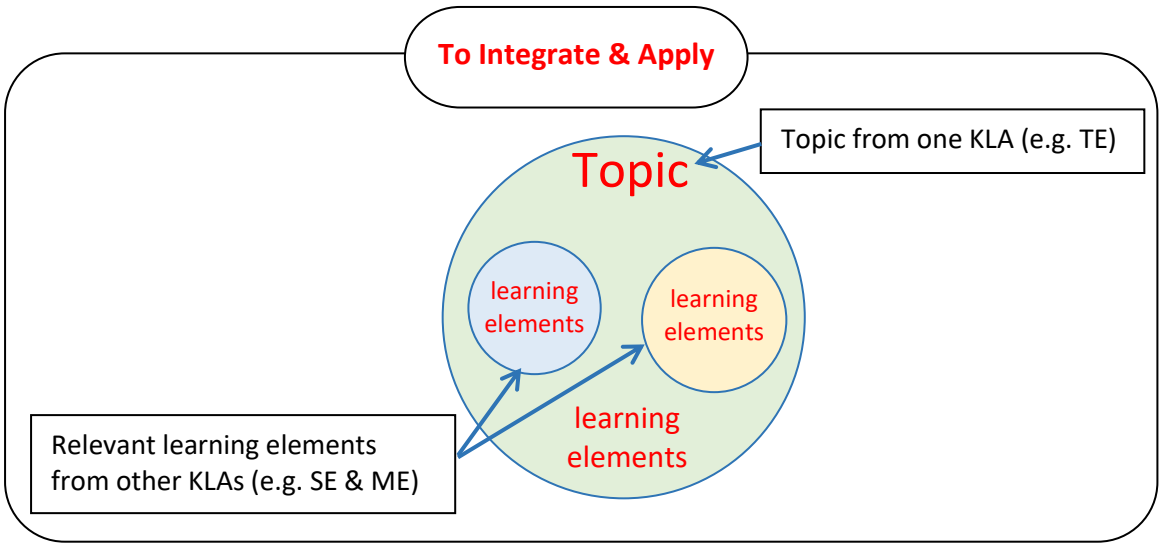
STEM-related learning activities should bridge across the curricula of the KLAs of Science Education, Technology Education and Mathematics Education. When planning and designing these learning activities, teachers of the TE KLA should closely collaborate with teachers of the Science Education and Mathematics Education KLAs to facilitate students' integration and application of knowledge and skills. Two different approaches to organising STEM-related learning activities are recommended (see Figure 17). It should be noted that these two approaches are not mutually exclusive. Depending on the school contexts, students' interests and abilities, and teachers' expertise, schools can adopt one or both of the approaches.

Examples of STEM activities on how to conduct learning activities in an integrative manner and through the application of skills in authentic contexts are provided in the Appendices for teachers' reference.

Figure 17 **Two Approaches to Organising STEM Learning and Teaching Activities**

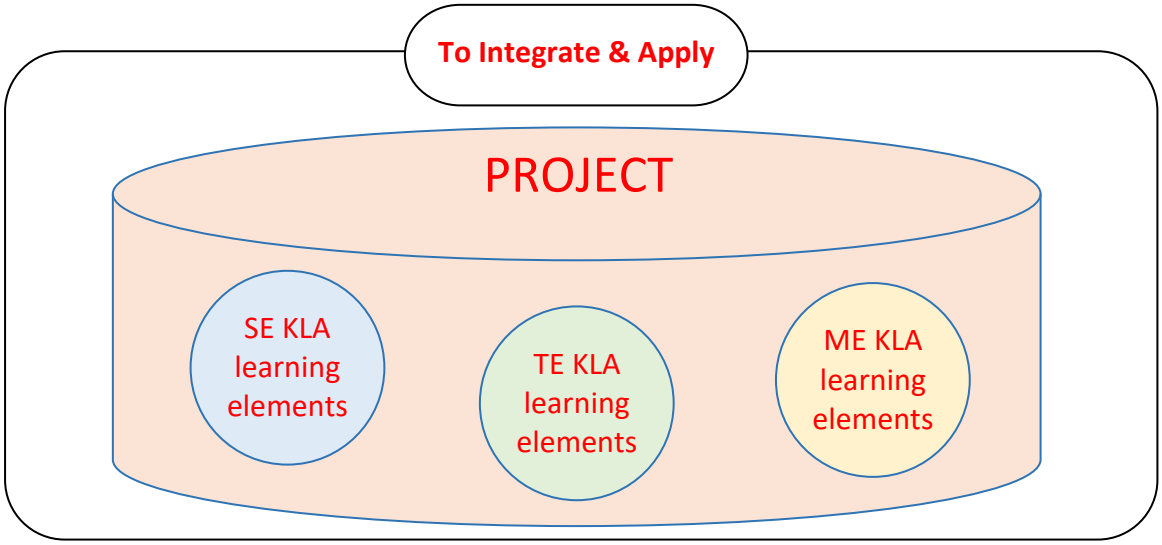
APPROACH ONE

Learning activities based on topics of a KLA for students to integrate relevant learning elements from other KLAs



APPROACH TWO

Projects for students to integrate relevant learning elements from different KLAs



Approach One	<u>Learning activities based on topics of a KLA for students to integrate relevant learning elements from other KLAs</u> A particular topic can be selected from a subject of the TE KLA. Students are encouraged to integrate and apply the knowledge and skills learned from other KLAs in their learning of this particular topic. For example, when students learn a topic related to food and nutrition, food preparation and processing, and meal planning in Technology lessons, teachers may help students recap the learning contents related to "Obesity & Slimming" or "Food & Chemistry" acquired in Science lessons. The learning activities could also be carefully planned in collaboration with Mathematics teachers so that students can learn mathematical or computation skills in Mathematics lessons in advance so as to enrich their learning in the Technology lessons.
Approach Two	<u>Projects for students to integrate relevant learning elements from different KLAs</u> Students are required to solve a particular authentic problem identified as a project. In the process, students explore the issues, bring in relevant learning elements from different KLAs including TE and then integrate the knowledge and skills acquired as well as applying them in an authentic and real-life situation. For example, the problem of elderly people who live alone and suffer from certain physical disabilities is identified in the local community. Students are divided into groups of four and tasked to work on a rehabilitation project to solve this problem. Students should first understand the needs of these elderly people. They may arrange visits to some elderly people's homes or conduct surveys to identify the common problem faced. Students then analyse the survey results and explore possible actions to improve the elderly people's living conditions. Then, they may decide on possible solutions such as designing a smart device to help control the electrical appliances at home, setting up an alerting system when emergency help is needed, and designing an aid to wash up the toilet. Once their decision is made, they need to integrate and apply the knowledge and skills learned in Science, Technology and Mathematics lessons to realise the proposed solution.

The TE curriculum provides ample opportunities for students to think critically and creatively and come up with fresh, problem solving ideas that can be applied in simulated situations and/or authentic business practices. It nurtures in students the qualities of taking initiatives and responsibilities, taking calculated risks, upholding resilience, working autonomously and collaboratively, and striving to improve job skills.

4.2.20 **Professional development of TE teachers**

To support TE teachers in planning the learning and teaching of the TE curriculum, it is essential for schools to promote individual and organisational learning through reflective practice, collaborative lesson preparation, action research, sharing, etc. as suggested in Chapter 10 of the *BECG (Primary 1 - 6)* (2014) and Booklet 11 *of the SECG (Secondary 1 - 6)* (2017). Refer to Chapter 6 of this Guide on "Learning and Teaching Support" for details of the professional development of TE teachers. Through these capacity building opportunities, TE teachers would be better equipped to design holistic learning experiences for students.

4.3 Embracing Learner Diversity

4.3.1 The learning needs of students are different and depend on a number of factors, including students':

- interests and inclinations;
- family and social backgrounds
- motivation and self-esteem;
- perceptions and expectations;
- prior knowledge; and
- learning styles.

4.3.2 There are many different ways to enhance student learning. The direction and strategies to cater for and embrace learner diversity are set out in Chapter 4 of the *BECG (Primary 1 - 6)* (2014) and Booklet 5 of the *SECG (Secondary 1 – 6)* (2017). Detailed descriptions on how a flexible whole-school curriculum with appropriate assessment can address the diverse learning needs of students are also provided.

4.3.3 The TE curriculum provides a wide spectrum of learning elements and allows flexibility in progression. Students at different stages in their learning progression can identify learning elements that match their learning needs. For example, in the context of 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 and microprocessors) to improve the sensitivity of the system.

4.3.4 In organising learning in Technology lessons, schools may, subject to the resources available:

- design different levels of learning modules for the same knowledge context;
- provide a wider variety of technologies in the curriculum to attract the interest of different students;
- allow different modes of assessment so that students of different learning pace can grasp their progress, and thus reduce the pressure from tests and examinations;

- encourage the accumulation of learning evidence, provide authentic hands-on learning experience and reinforce the importance of both manipulative and problem solving skills, so that students of different orientations can find their own way to excel; and
- encourage group work so that students of different orientations could learn to support each other in completing a task through collaboration.

4.3.5 Schools may also make reference to core and extension learning elements in the TE KLA curriculum in designing activities for students with diverse learning needs.

4.3.6 Teachers can put some links on the school e-learning platform and ask students to play games about the vocabulary to check what they have learned. Teachers can also put more challenging quizzes for more able students and an audio vocabulary list for less able students on the platform to embrace learner diversity.

4.4 Meaningful Homework

Schools should refer to Chapter 8 of the *BECG (Primary 1 - 6) (2014)* and Booklet 4 of the *SECG (Secondary 1 – 6)* (2017) for suggestions on setting meaningful homework. Schools should also refer to the EDB circular on "Guidelines on Homework and Tests", formulate the school homework policy, and allow space and time for students to participate in meaningful social and extra-curricular activities conducive to whole-person development.

4.4.1 The outcome of technology 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 application). Well-planned technology homework would help students:

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

4.4.2 Schools' experience suggests that traditional technology homework such as knitting a long scarf or filing a key ring, may contribute to improving the manipulative skills of students but fails to enable students to transfer what they have learned to new situations and to nurture generic skills such as problem solving skills and creativity.

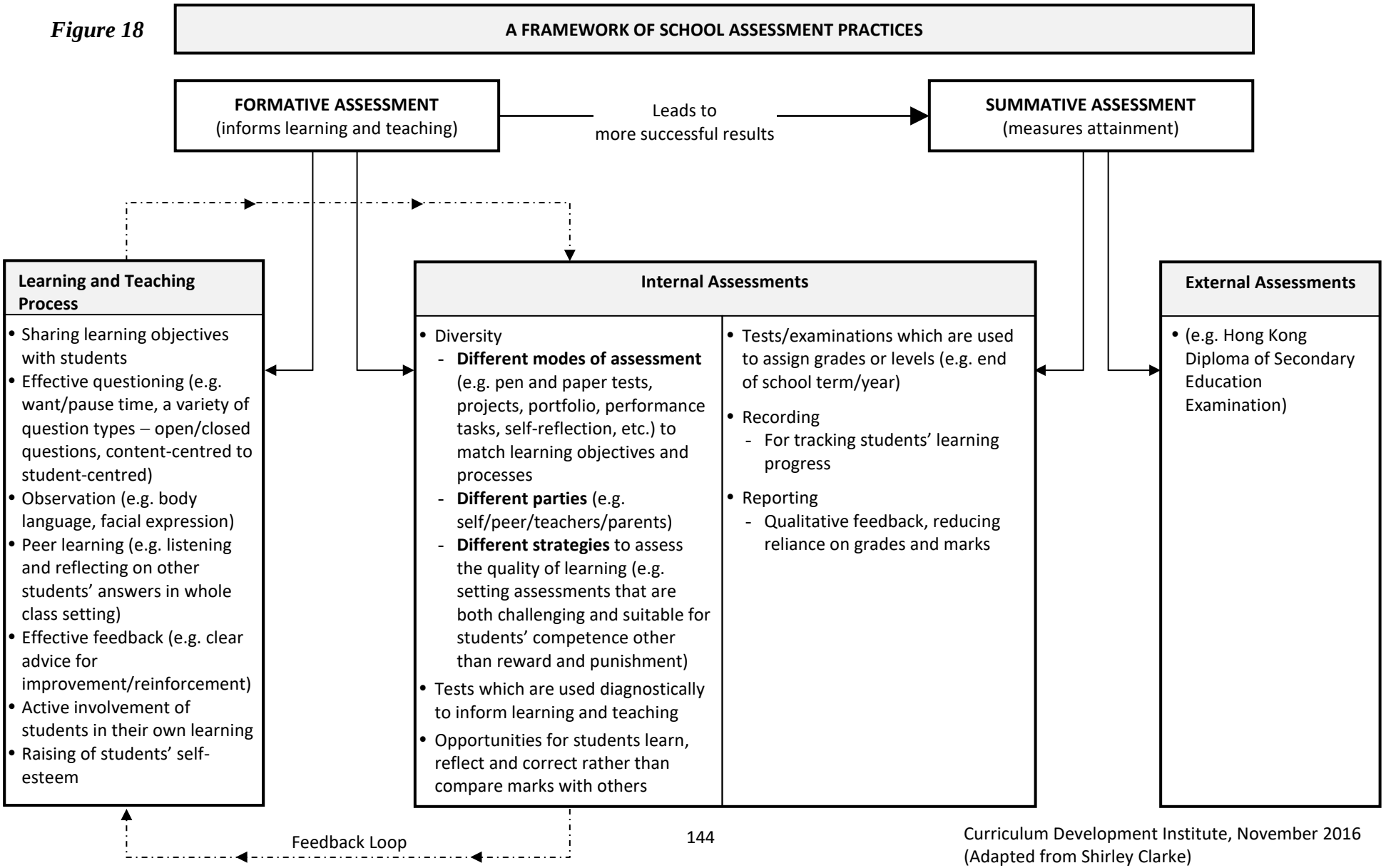
4.4.3 Under the open and flexible TE curriculum framework, schools may assign homework to nurture students' transferable and generic skills, such as planning and cooking a nutritious meal after learning about food and nutrition and healthy eating pyramid, helping community centres to set up small-scale computer networks after studying related topics in the Technology lessons.

4.4.4 Schools need to provide support for students to complete their homework independently after lesson time. Schools may make use of homework to enhance students' interest and self-learning, such as selecting the latest computer/electronic devices based on given e-resources such as webpages and multimedia software.

Schools may request students to submit their work through e-tools such as interactive learning platforms, blogs and wiki platforms to enhance communication and collaboration, as well as enabling learning outside the classroom.

Chapter 5
Assessment

Figure 18



Curriculum Development Institute, November 2016
(Adapted from Shirley Clarke)

Chapter 5 Assessment

This chapter focuses on the guiding principles for formulating assessment strategies for the Technology Education (TE) KLA. Details of the functions of assessment, the connection 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 Chapter 5 of the *BECG (Primary 1 - 6)* (2014) and Booklet 4 of the *SECG (Secondary 1 – 6)* (2017)**.**

5.1 Principles to Guide Actions

5.1.1 Assessment aims at collecting evidence of student learning to inform different stakeholders including students, teachers, schools and parents of the progress made.

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

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

5.2 Modes of Assessment

5.2.1 Student learning in the TE KLA 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 realisation 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, and positive values and attitudes;
- the understanding of the concepts and principles involved in the 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; and
- the ability to integrate various learning elements of the TE curriculum to process, interpret and solve complex issues related to technology.

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

In this Guide, e-assessment is included to facilitate the assessment process for technological activities. In addition, different assessment purposes, i.e. assessment of learning, assessment for learning and assessment as learning are also introduced to enhance TE teachers' assessment literacy. Teachers can use different assessment modes and strategies to address different levels of performance and embrace learner diversity.

5.2.2 In line with the nature of technology learning which is authentic, purposeful and holistic, some common modes of assessment used by TE teachers in drawing up their assessment plans are suggested below:

- project work assessment
- task-based assessment
- assessing essential manipulative skills
- assessing knowledge and concepts
- e-assessment

5.2.3 Project Work Assessment

In project work assessment, students are given a loosely defined problem and requested to produce a final deliverable which could be a real artefact or a working model of a system.

Example 26 Project Work Assessment – Light Source

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

Project work assessment:
Students are given the task of designing and making the concept model for a new torch that is not yet available in the market. The torch is expected 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 a market research. The final concept model needs to be practical and of a high quality of finishing.

Example 27 Project Work Assessment – Improving Our Community

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

Project work assessment:
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 proposal.

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

Example 28 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 library and art room. Some visitors such as parents may wish to explore more information about the school.

Project work assessment:
Students are required to design an interactive information kiosk to be placed at the school entrance. A user-friendly and logical interface and foolproof inputs are desired. The system may be developed using web-based software, presentation or authoring software, or any other software as appropriate. Students should not include too much information and have to prioritise the information to be displayed. A clear site map or information flow diagram should be designed.

5.2.4 The focus of 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 analyse 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
- organise, co-ordinate 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 includes the documentary samples of their work with comments and suggestions from teachers and peers, their own reflections and final products with annotations. Illustrative examples of project work assessment are available in Examples 26, 27 and 28 of this Guide.

5.2.6 Task-based Assessment

Task-based assessment is generally referred to as a purposeful, contextualised 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 the TE curriculum which emphasises authentic and hands-on activities.

5.2.7 To enable teachers to set the assessment criteria to inform learning and teaching, a framework of assessment task specifications needs to be worked out. Major components of the framework are listed below:

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

Example 29 Task-based Assessment

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

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

Task-based assessment:
The purpose of the writing task is to assess students' business communication skills, including their 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. The assessment may focus on students' performance in organising and presenting the information, and in using accurate and appropriate language in the letter.

5.2.8 Assessing Essential Manipulative Skills

In the technology 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, including:

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

Example 30 Assessing Essential Manipulative Skills

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

In the exercise on a meal planning, teachers' observation of students' performance in the oral presentation, worksheets, peer evaluation and self-reflections can be used to assess students' competence including manipulative skills such as:

- co-operating with team members in completing the task;
- communicating and presenting ideas effectively;
- developing food products, planning and preparing meals for meeting different dietary needs;
- using a variety of food preparation skills in preparing food products/meals;
- organising and presenting information and ideas systematically; and
- justifying ideas and suggestions.

5.2.10 Assessing Knowledge and Concepts

Understanding of technological knowledge and concepts is important for students to further their studies in technology-related fields.

5.2.11 In most cases, the assessment of students' understanding of technological 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 and group discussions.

5.2.12 e-Assessment

e-Assessment can be described as the use of IT to facilitate any assessment activities. Some of these activities may include on-screen testing, computer-aided marking and use of e-portfolios in summative and formative assessments.

5.2.13 One of the key benefits of e-assessment is the immediate feedback and results given to students, either by the assessors or an automated marking process. Flexibility in allowing students to take the assessments anytime and anywhere also leads to greater student engagement.

Example 31 Use of e-Portfolio

To assess students' progress and ability in ICT practical skills such as office automation and multimedia editing software, students can make use of an e-portfolio to capture and showcase their work done in computer classes (e.g. electronic posters and multimedia presentation). Teachers will be able to monitor students' behaviour and learning progress with feedback given electronically. This portfolio can also be used as record of learning evidence to highlight students' achievements and improvements made throughout the course.

5.2.14 Modes of assessment suggested here are by no means exhaustive. Teachers have to understand that adopting a combination of assessment modes enables them to build up a comprehensive picture of students' achievements.

5.2.15 Assessment criteria should be set for different modes of assessment. It can be further used to understand the standard and level of students' achievements. The weightings of the assessment criteria set for each assessment task would let students know the foci of their learning such as projects and exercises.

5.3 Formative Assessment

5.3.1 The major aim of formative assessment is to inform students and teacher 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 technology learning involves the use of both hands and minds, and is purposeful and linked to the final deliverables, a typical technology 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 working on the final deliverable 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 portfolio together with the system or the product, and receiving feedback from their classmates and teachers.

5.3.3 In formative assessment, timely and effective feedback is 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 major aim of formative assessment, i.e. assessment to enhance learning, should always be a feature of the learning process in technology education.

Examples of learning, teaching and assessment of the TE curriculum are given from Examples 36 to 49 of this Guide.

5.3.4 There are various purposes for assessment that occur routinely in the Technology classroom. For formative assessment, there are two main purposes:

- Assessment for Learning
- Assessment as Learning

5.3.5 **Assessment for Learning**

Assessment for learning is about teachers collecting a wide range of data so that learning and teaching strategies can be modified and improved. Marking is not always necessary to make comparative judgements among students, but highlighting students' strengths and weaknesses and providing them with feedback for further improvement in their learning are always required.

5.3.6 **Assessment as Learning**

Assessment as learning involves students in the process of looking at their learning progress and reflecting on their own abilities. It emphasises the role of the student, not only as a contributor to the assessment and learning process, but also as a critical connector between them. A regulatory process of metacognition occurs when students monitor what they are learning and use the feedback to make adjustments, adaptations and even major changes to the learning elements acquired or strategies adopted. Assessment can also provide feedback to teachers as a diagnostic tool to help identify students' learning problems as well as improve their own teaching.

5.4 Summative Assessment

5.4.1 Summative assessment provides information about how students perform and measures what they have achieved at the end of a teaching unit/module, a school term/year or a key stage. It also provides students, teachers, parents, etc. with information about the learning progress in order to plan appropriately for future learning. Common examples of summative assessment are tests and examinations in schools and public examinations.

5.4.2 Summative assessment serves the purpose of assessment of learning. It intends to certify student learning and report to parents and students about students' progress in school, usually by signalling students' relative positions as compared with other students.

5.4.3 Technology learning is multidimensional. It involves the learning of technological knowledge and concepts, processes and skills as well as developing students' awareness of the impact of technology. Therefore, assessment of technology

learning should also be multidimensional too and should not simply rely on paper-and-pencil tests or project products. 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 multidimensional aspects of technology learning and enabling teachers and students to better understand how to plan and prepare for the next stage of learning.

5.4.4 Evidence collected in summative assessment can be used formatively. For example, students' performance in tests can be used to measure their progress and achievement, and at the same time used diagnostically by teachers to understand students' learning needs and revise the classroom instructions.

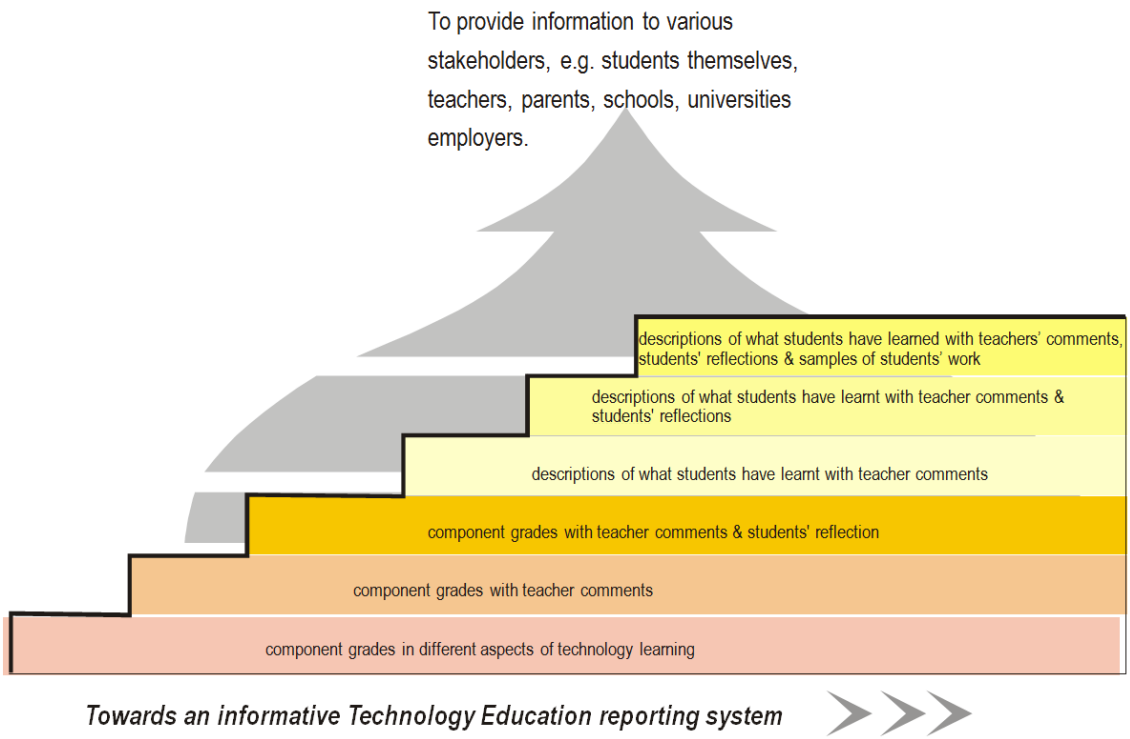
5.5 Reporting

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

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

Schools and teachers could consider adopting one of the reporting systems suggested in Figure 19.

Figure 19 **Technology Education Reporting System**



5.6 Internal Assessment and Public Assessment

5.6.1 Internal assessment refers to the assessment of different modes and scales that schools employ as an integral part of learning and teaching. Teachers are encouraged to incorporate diversified modes of assessment to provide timely feedback to enhance the effectiveness of learning and teaching.

5.6.2 Secondary schools should be aware of the fact that public examination format and content of the Hong Kong Diploma of Secondary Education (HKDSE) Examinations, which are designed to assess the performance of students who have completed their senior secondary education, are far beyond the capability of most of the junior secondary students. Schools are advised not to simply replicate public assessment modes in their internal assessment practices at the junior secondary level. Such undesirable practice will also reduce learning and teaching time in class, increase teachers' workload unnecessarily, and put undue pressure on students.

5.6.3 To align internal assessment practices properly with public examinations, schools should focus more on helping students understand the learning outcomes and assessment requirements of the senior secondary curriculum. Students with better understanding of what they are expected to learn and how their learning is assessed is more likely to attain the required standards of performance.

5.6.4 Nonetheless, it is not to say that the need to familiarise junior secondary students with public examination requirements and formats is to be ignored. It would be more appropriate for schools to plan their assessment policy carefully throughout the six-year secondary education, so that students are charged with tasks similar to the nature and format of the public examinations, but with level of difficulty and complexity fine-tuned to suit students' ability and learning progression. With a reasonable portion of public examination format being incorporated into the internal assessment practices in a gradual and progressive manner, students will be able to develop their understanding and skills of the public examination requirements as they move from the junior to the senior secondary level.

Chapter 6
Learning and Teaching Support

Chapter 6 Learning and Teaching Support

To facilitate effective implementation of the TE curriculum, there are various learning and teaching resources, training programmes, e-platforms, exhibits, competitions etc. developed/organised by the EDB and different institutions/organisations with a view to benefitting student learning and supporting teacher professional development.

6.1 Quality Learning and Teaching Resources

6.1.1 Textbooks

Basic considerations in the selection of learning and teaching resources including textbooks are available in Chapter 7 of the *BECG (Primary 1 – 6)* (2014) and Booklet 10 of the *SECG (Secondary 1 – 6) (2017)*.

In the TE KLA, textbooks are mainly published for the TE KLA Curriculum (S1-S3) – Design and Technology, Information and Communication Technology, Technology and Living knowledge contexts at the junior secondary level; and Business, Accounting and Financial Studies, and Information and Communication Technology at the senior secondary level. A recommended list of textbooks for the TE subjects is available at: http://www.edb.gov.hk/en/ curriculum-development/resource-support/textbook-info/index.html.

6.1.2 Other Learning and Teaching Resources

Technology education must meet the fast changing needs of society and keep pace with the rapidly emerging new technologies. Therefore, teachers should be flexible in planning their learning and teaching activities with the adaptation of a wide range of resources to equip students with the required knowledge and skills to cope with the future needs. These resources may include the curriculum resources on the EDB website: (http://www.edb.gov.hk/en/curriculum-development/kla/technology-edu/resources/index.html), and the learning and teaching resources on the EDB One-stop Portal (http://www.hkedcity.net/edbosp). Besides, there are resources, tools and equipment in learning packages provided by vendors, and supporting materials and learning packages developed by the EDB. Teachers can also make use of various learning and teaching e-platforms and teacher networks for sharing experiences and good practices among themselves in order to strengthen their teaching professionalism.

To facilitate the life-wide learning of technology, teachers may also utilise information and resources available from their own school library, and/or other government departments, non-governmental organisations, private companies, tertiary institutions, professional bodies etc. in structuring relevant learning activities for students.

Lists of reference books, teaching kits, CD-ROMs and local/overseas websites are provided in Appendix 2. As most of these references involve overseas contexts, schools may need to adapt and reorganise the content when they are used.

6.2 Professional Development Programmes

6.2.1 To support school leaders and teachers to implement the TE curriculum, seminars and workshops have been conducted to enhance their understanding of curriculum planning/application as well as sharing with them the good practices for learning and teaching, including the use of IT and e-learning resources to enhance self-directed learning. To enable school leaders and teachers to keep abreast of the development of new technologies and raise their awareness of the consequences of technological developments and their applications, the EDB will strive to support schools and teachers by organising Professional Development Programs (PDPs) to continuously strengthen the professionalism of school leaders and teachers on various MRE. The key focuses of PDPs for the TE KLA are:

- to support teachers in exploring new technologies or learning elements so as to continuously update and enrich their teaching of the TE curriculum;
- to enhance teachers' knowledge, pedagogical and assessment skills for the implementation of the TE curriculum, including the abilities to select and use different approaches such as case studies, thematic projects for organising technology learning experiences for students, and use a variety of methods to assess students' learning progress and outcomes;
- to share with teachers the good practices in developing integrated and cross-disciplinary learning experiences for students through collaboration among STEM-related subjects and KLAs; and
- to enhance peer support and collaboration among teachers through teacher networks and communities of practice.

6.3 Partnership

6.3.1 In order to facilitate the implementation of the TE curriculum, the EDB has been collaborating with tertiary institutions and professional bodies/organisations in organising different exhibitions, competitions, teacher seminars and workshops to support school leaders and teachers in strengthening their professional capacity. Schools should encourage teachers to participate in related activities with a view to strengthening both student learning and teacher professional development through hands-on learning activities and authentic experiences.

6.3.2 Schools are also encouraged to strengthen networking and partnership with other schools, as well as soliciting support from tertiary institutions and professional organisations in offering various kinds of training to enhance the professional capacity of teachers, and organising learning activities and events to broaden students' exposure to technology developments, enrich their learning experiences and nurture their entrepreneurial spirit.

6.4. Resources Management in Schools

6.4.1 Effective implementation of the TE curriculum requires:

- adequate physical space to carry out various learning activities;

- appropriate equipment and software to support learning, such as computer program and modular technology; and
- sufficient learning materials in different formats and media, such as textbooks, reference materials, pictures, graph models and videos.

6.4.2 Technology education is characterised by the need to co-ordinate the hands and minds, hence hands-on learning activities are essential for technology learning. It is necessary to have proper equipment in an appropriate space to enhance student learning. After considering the learning needs of students, it is proposed that:

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

(A) Special area for the learning of Technology and Living

- An area for the teaching of learning elements which require high hygiene standards 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.

(B) Special area for the learning of Information and Communication Technology

- Sufficient space and a wiring system should be provided for setting up a network and data lines, and housing computers with IT equipment.
- Adequate software provisions should be planned to allow a flexible use of the room for learning different elements in the TE curriculum.

(C) Special area for equipment-based technology learning

- A venue should be provided for practical activities in learning the design and processing of different materials such as wood, plastics, fabrics and more complicated materials including composites.
- 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 facilitate learning through modular technology and the design cycle.

6.4.3 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, these schools may wish to consider establishing links with other schools in the vicinity to share the resources.

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

6.4.5 To provide a safe environment for technology 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/Technology and Living in Secondary Schools Safety Booklet (which is available on the following website: http://www.edb.gov.hk/attachment/en/curriculum-development/kla/technology-edu/resources/technology-and-living/safebooklet.pdf),
- Safety in School Workshops (2009) (which is available on the following website: http://www.edb.gov.hk/attachment/en/curriculum-development/kla/technology-edu/resources/tech-subjects/safety%20in%20school%20workshops%202009_eng.pdf),
- Circulars on safety issued by the Education Bureau, and
- Updated information from the appropriate government departments such as:

  - Auxiliary Medical Service (http://www.ams.gov.hk/)
  - Electrical and Mechanical Services Department (http://www.emsd.gov.hk/emsd/)
  - Environmental Protection Department (http://www.epd.gov.hk/epd/)
  - Fire Services Department (http://www.hkfsd.gov.hk/)
  - Food and Environmental Hygiene Department (http://www.fehd.gov.hk/index.html)
  - Information Services Department (http://www.isd.gov.hk/)Labour
  - Department, Occupational Safety and Health (http://www.labour.gov.hk/eng/osh/content.htm)
  - Office of the Government Chief Information Officer (http://www.ogcio.gov.hk/en/index.htm)

Examples of Developing a Technology Education Curriculum in Primary and Secondary Schools

Example 32

Technology Education Curriculum in ABC Secondary School

(A) Planning: School Level

Aims of Technology Education (TE) in School

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

- be broad and balanced
- be offered to all students at Secondary 1 to Secondary 3 levels
- develop students' independent learning ability through : project learning, reading to learn and information technology for self-directed learning
- develop competencies in Technology:
  - Computer Literacy (CL), e.g. information processing and presentation skills
  - Design &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 learners' diversity

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 assessment count towards final results
- Using a profile to display the assessment results

(B) 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 of technology through extended learning activities and learning experiences outside the classroom

Programme Structure

Rationale

- The TE curriculum over the three years should draw together the essential contents in the existing TE subjects in order to provide a broad and balanced knowledge context for student learning.
- The TE curriculum will be arranged in modules to allow flexibility in 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 organised 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 Secondary 1 to Secondary 3:

- Technology modules:
  - core learning elements modules to be studied by all students
  - focus on developing the understanding of knowledge and application of skills in different TE subjects (i.e. CL, D&T and HEc)
- Project modules:
  - each student chooses a project theme on D&T, HEc or CL or integrated areas of the three subjects
  - 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 "A Healthy Body" and "Making Use of Electricity" in Science etc.)
  - internal and external competitions

(C) Programme Content

Secondary 1

Technology modules (50% TE curriculum time)	Project modules (17 % TE curriculum time)	Application modules (33% TE curriculum time)
HEc – Food (12.5% TE curriculum time) • Food & Nutrition - hygienic & safe practices, food groups & eating habits • Food Preparation & Processing - simple food preparation & processing skills • Home Management and Technology – impact of processed food in daily life • Family Living HEc – Fashion (4.5% TE curriculum time) • Fashion and Dress Sense – fashion trend and development	Project themes: e.g. • Desktop tidy • Snack design • Sustainable products	HEc – Food • Food & Nutrition – dietary goals and meal planning HEc – Fashion • Fabric and Clothing Construction – pattern and garment construction
D&T (16.5% TE curriculum time) • 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
CL (16.5% TE curriculum time) • Information & Communication – basic computer operations; using the Internet; using common information processing tools		CL • Components of computer systems

(D) 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 Secondary 1 to Secondary 3.
- Context: From personal (Secondary 1) $\rightarrow$ to family (Secondary 2) $\rightarrow$ to community (Secondary 3)

Example 33

Technology Education Curriculum in LCM Secondary School

Positioning of Technology Education (TE) in the School Curriculum

- The provision of a broad and balanced curriculum with a strong inclination towards technology for all students throughout their schooling is deemed desirable, thus about 15% 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 lifelong learning.
- Students learn knowledge and skills applicable to resolve issues in authentic environment.
- The learning experience in TE prepares students for further studies and multiple career pathways.

(A) 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 in society, 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, aptitudes and abilities.

Details

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

Time Allocation

- 6 periods per five-day week for 15 weeks

Learning Elements

- the curriculum includes all core learning elements in Information and Communication Technology, Materials and Structures, Operations and Manufacturing, Strategies and Management, Systems and Control as well as Technology and Living with some extension modules

Role of the Panel

- School administrators mobilise adequate resources, such as timetable arrangements, facilities, equipment and human resources.
- The Panel ensures that the curriculum content, timetable organisation, strategies in planning students' learning experiences, assessment policy, etc. are in line with the school policy;
- The Panel is responsible for planning, organising, 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 apply ideas to solve practical problems or challenges in life;
- Students apply knowledge, skills and experience in using resources to create products or systems to satisfy the 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 organisations, the sharing of ideas through inter-school competitions and community activities.

Programme

- The learning of existing TE subjects is moving away from subject-based teaching towards theme-based teaching for a coherent and balanced development of capability, understanding and awareness of technology.
- The programme is implemented in the second term of Secondary 3 or whenever desirable to ensure that it is working in the best interests of the students.
- Commencing in the first term of Secondary 3, the students will be informed of the theme-based learning in the second term for better preparation. The learning experiences for the theme, including activities such as research study, classroom teaching, workshop sessions, small group activities, reading assignments and projects, last for the entire second term, should be conducted in a co-ordinated manner with full collaboration of teachers from the four disciplines. The learning activities involved should incorporate the aforesaid learning topics with the following characteristics. They should:
    - be coherent and progressive in nature

- integrate the different knowledge contexts of TE
- nurture students' basic skills, attitudes and an ability for learning in TE
- ensure basic competence in core elements and encourage the pursuit of excellence in specialised fields
- be aware of the needs of sustainable development in the community

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 of projects should include the management of time and resources, in searching for information and in presentation.

(B) Planning: Form Level

Form Level: Secondary 3

Theme: Planning for an Activation of a Historical Architecture in Your Community

Time Allocation: 90 periods (6 periods per five-day week for 15 weeks)

Teachers involved in the form level planning and implementation: 6 teachers in the Technology Education panel specialising in the following disciplines: Business, Computer Education, Design and Technology, and Technology and Living.

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.
- recognise that different stakeholders in the community may have different needs and to know how to work out a solution to suit their needs.
- acquire knowledge and concepts related to redevelopment, conservation, revitalisation and rehabilitation.
- explore how to activate the use of historical architectures for sustainable development of the community

- integrate their technological knowledge with that of other Key Learning Areas (KLAs) such as Personal, Social and Humanities Education (PSHE), Arts and Science through engaging with issues in community planning, heritage conservation and the construction of new buildings.
- acquire life-wide learning experience by interacting with various stakeholders in the community.

(C)Programme Content

The Technology Education panel should plan stages of learning and organise the content according to the interest and abilities of the students. The allocation of tasks among teachers should be made in accordance with their own expertise.

Stages	Learning Elements	Learning Activities
1. Knowing the community (2 weeks)	• 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 related to the community development
2. Planning to activate the use of historical architecture (3 weeks)	• Information Processing and Presentation • Resources Management • Design and Applications • Technology and Society • Safety and Health • Business Environment	• Searching for information • Information analysis • Reading to learn • Group discussions • Teaching • Visits and participation in activities related to the community development

3. Model building (8 weeks)	• Design and Applications • Material and Resources • Information Processing and Presentation • Material Processing • Structure and Mechanism • Control and Automation • Project Management • Safety and Health • Technology and Society • Business Environment • Marketing	• Reading to learn • Group discussions • Teaching • Designing • Workshop practice
4. Presentation and Evaluation (2 weeks)	• Consolidation of the above TE contents	• Presentation and Discussions • Self-reflection • Peer assessment

(D)**Assessment**

Assessment should be planned to motivate students and provide feedback.

Assessment	**Assessor**
• Project portfolio as an accumulation of progress of work in different stages	• Self, teachers
• Observation on students' progress	• Teachers
• Final Product - artefacts such as models, computer graphics, sketches to show the design ideas - reports/portfolios 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 test/examination on the related knowledge as appropriate	• Teachers

Example 34

Technology Education Curriculum in DEF Primary School

(A) 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 recognise 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 21 teachers and most 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 the process of learning which include:
  - projects
  - observation
  - portfolios
  - tests and examinations, etc
- The final grading for students is based on the results of the above.
- A profile for individual students will be used to display their assessment results.

(B) Planning: Class Level

Key Stage: 2

Theme: Pinhole camera

Time allocation: 3 hours

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

Objectives

To enable students to:

- understand that light travels in straight lines by applying the principle of image formation of a pinhole camera to project an inverted image;
- take into account various factors, such as size of the pinhole and distance between the outer and inner boxes, to find the best solution;
- tackle the problem, see the impact of changing the pinhole size on brightness of the image, as well as that of changing the distance between the outer and inner boxes on size of the image;
- integrate through technological activity the knowledge, skills and attitudes of various Key Learning Areas (KLAs) such as Technology, Science, Mathematics, Arts and Languages;
- investigate through the design cycle the optimal distance and pinhole size for projecting the sharpest inverted image.

(C) Programme

In the context of making a pinhole camera, the GS panel takes into consideration students' interest to organise the knowledge, skills, values and attitudes regarding how light works.

Examples of Learning, Teaching and Assessment Activities

Example 35

A Multimedia Presentation for Promoting "Discover Hong Kong"

Key Stage: 3

(A) Key Features

In this learning activity, students are expected to:

- understand the basic concept of marketing and the simple tools used 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 the 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 exploring the new attractions 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, teachers 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 requirement	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 tourism 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 new attractions for overseas tourists. During the investigation, students take into account the cultural backgrounds 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 organise 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 digital cameras, video recorders, scanners, or other digital devices etc, as well as by creating the content in video/animation format.
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, the 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.

Example 36

Case Study: 3G - Green Design, Green Technology and Green Enterprise

Key Stage: 3

(A) Key Features

In this learning activity, students are expected to:

- have a sense of global economy regarding the environmental issue;
- understand the detrimental effect of electronic products to the environment;
- understand what the green design concept;
- understand what Green technologies are being used and developed;
- what policies are being adopted by "Green Enterprise" in response to environmental conscious consumers;
- consider the economical factor in green policy;
- propose a sustainable green policy for the school or propose a conceptual design of a green electronic gadget;
- develop their communication and organisation skills by implementing their plan.

(B) Task Definition

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

Suggested Student Tasks:

1. Interview the school stakeholders to collect information about the way of promoting sustainable green policy in school.
2. Propose a plan on sustainable green policy for the school.
3. List the green design features to be adopted in a selected new product.
4. Design a promotion poster for a selected new product with focus on the green design features.

(C) Integrated Dimensions of Technology

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

- Technology & Society - environmental issues, green design, green technology and green enterprise
- Design and Applications - design consideration, product design

- Consumer Education - consumers' rights and consumers' choice
- Application of Systems - electronic products: fluorescent light
- Project Management - Planning and organising work, cooperation and coordination in projects

(D) Intended Learning Objectives

Knowledge Contexts	Process	Impact
Students should be able to: • recognise the environmental issues, green design, green technology and green enterprise • understand the basic concepts involved in product design and apply them in the production process • realise the consumers' rights and consumers' choice • understand the concepts of electronic products: fluorescent light • plan and management a collaborative project	Students should be able to: • conduct information search from Internet on environmental issues • write a proposal on Green policy for the school • develop communication and organisation skills	Students should be able to: • be aware of different views from different stakeholders • value the green sense of the enterprise operation • respond to climate change and global warming • apply knowledge in "3 Green" to propose a sustainable green policy

(E) Lesson Sequence

Lesson	Teaching/Learning Activities
1	**Understanding the case and tasks** • Briefly explain the case topic; • Explain the tasks and activities; • Explain the assessment criteria; • Brainstorm a MP3 product; • Complete Class Activity One – *Green MP3*; *Class Activity One:* • *Use a Concept Map to present the ideas of Green MP3 in group* • Complete evaluation sheet before the end of the lesson.

Lesson	Teaching/Learning Activities
2-3	**Forming groups and Studying the case** • Form in groups of 3 to 4 students; • Introduce the story of the case study; • Information search about RoHS, WEEE, CFLs and T5; • Guide students to complete Class Activity Two to Four through small groups and class discussions – *Information Search and Investigation of Technological Principles of CFL*; <u>*Class Activity Two*</u> *Conduct an Information search to answer the following questions:* *1. What is the coverage of RoHS and WEEE on electrical and electronic products?* *2. What are the six harmful substances banned by RoHS?* <u>*Class Activity Three*</u> *Answer the following open-ended questions:* *1. What is BFR? Why is it used in the printed circuit board?* *2. Why the recycling rate is so low? What hinder the enterprise to recycle the used products?* <u>*Class Activity Four*</u> *Investigate the materials inside the Compact fluorescent light bulbs and the shape of spiral tube the CFLs.* • Complete evaluation sheet before the end of the lesson.
4-5	**Research and data collection** • Encourage small group discussion to understand the case content; • Conduct an interview to collect primary information; • Use Interview Record Sheet; • Prepare a 10-minute presentation; • Teacher provides guidance to each group but not the answer.
6-8	**Prepare a School Plan/Product Design** Task 1 • Guide students to apply the knowledge acquired to propose asustainable Green policy for their school; • Guide students to prepare an implementation plan; • Guide students to prepare an evaluation or criteria to assess the implementation of the project; • Guide students to propose a project schedule.
	Task 2 • Design a conceptual design of a green electronic gadget based on the agreed criteria; • Present design ideas in a poster; • Propose marketing strategy.
9-10	**Presentation** • Students deliver a 10-minute presentation of their proposal on a green policy or a green product design; • Teacher and peer assessment; • Students will vote which plan/product will be selected for implementation or which one is the best environmental-friendly design.

Lesson	Teaching/Learning Activities
11-12	**Implementation of School Plan** • Students use their time after school to organise this activities; • Teachers provide resources and guidance to the students.

(F) Assessment and Evaluation

- Assessment Rubrics for Final Presentation

Assessment Code: *SAS-CHK-01*			
Student Name: _____	***Team:*** _____		
Focus of Assessment: Teamwork	***Date:*** ____/_____/_____		
Criteria	**Self**	**Peer**	**Teacher**
1. I understand the lesson objectives.	Yes/No	Yes/No	Yes/No
2. I work with team members cooperatively.	Yes/No	Yes/No	Yes/No
3. I give my views responsibly.	Yes/No	Yes/No	Yes/No
4. I respect and listen to other members' ideas.	Yes/No	Yes/No	Yes/No
5. I can draw conclusion after this lesson.	Yes/No	Yes/No	Yes/No
6. I am satisfied with my learning today.	Yes/No	Yes/No	Yes/No

- The Peer Assessment Rubric

Focus	No	Assessment Criteria
Knowledge	1	Understanding of the objective
	2	Have the "know-how"
	3	Clear definition of work
	4	Content is at appropriate level.
	5	Assign appropriate responsibility and person
Attitude	6	Good communication
	7	Fair share of workload
	8	Good time management
	9	Work in synergy
	10	Active participation
Presentation	11	Appropriate strategy
	12	Appropriate organisation
	13	Appropriate workload
	14	Show appropriate of IT or equipment
	15	Show quality output

Example 37

From Tough to Tender – Methods of Tenderising Meat

Key Stage: 3

(A) Key Features

In this unit, the aims are to enable students to:

- identify the characteristics of meat tissue;
- explain factors that cause some meat cuts to be tougher than other cuts;
- suggest different ways of tenderising meat using natural resources;
- choose suitable methods of tenderising meat in daily cooking based on factors such as available resources, volume of meat to be tenderised, etc.;
- co-operate with team members in 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 tissue in meat and investigating different methods of tenderising meat, students are expected to identify how meat can be tenderised. During the process, students develop their ability to making informed decisions on the appropriate method of meat tenderising in their daily cooking. They also develop manipulative skills and observe safety measures in using tools and equipment.

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

(C) Integrated Dimensions of Technology

In developing this interactive learning activity, teachers 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
  - Choose, 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: • recognise that the length of tissue affects the tenderness of the meat • realise that acid helps dissolve the connective tissue • recognise that meat tissue can be softened in liquid	Students should be able to: • apply suitable and safe technology, materials, tools and process 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 tenderising meat • apply suitable methods of tenderising meat in daily cooking • promote management and critical thinking skills among students

(E) Lesson Sequences

1. Teacher illustrates connective tissue of meat under the microscope.
2. Teacher introduces different cuts of meat, and points to the factors that cause some meat cuts be tougher than others.
3. Students are divided into groups to investigate how meat can be tenderised.

   Task A – through physical method
   Task B – through chemical method
   Task C – through ways of cooking

   Learning activity arrangement:

   - Group 1 and 3: task A & C
   - Group 2 and 4: task B & C
4. Each group reports on how meat can be tenderised.

   Task A
   Physical method – to grind, pound or cut it
   Reason – to break the connective tissue into short pieces. The shorter the connective tissue, the more tender the meat is.

   Task B
   Chemical method – to marinate meat in an acidic solution, such as lemon juice/vinegar or sprinkle meat with meat tenderiser
   Reason – to dissolve the connective tissue

Task C
Ways of cooking – to fry or stew meat
Reason – cooking causes connective tissue to soften. The slower the cooking, the more time the connective tissue needs to become soft and tender. At high temperatures, meat cooks so quickly that connective tissue does not have enough time to soften. Cooking meat in liquid also softens the connective tissue and helps make meat tender.

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

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

(F) Evaluation

Assessment of Processing Skills

Learning Expectations	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 Skills, Concepts and Knowledge

Learning Expectations	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 tenderising meat	Students' presentation and report of findings	Teacher and Peer

Example 38

Building a Tower

Key Stage: 3

(A) Key Features:

In this 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 verbally 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.
- Structure 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
Student 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	Student 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	Student 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) Teaching 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 the 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 to students' outlines.
9. Require students to develop appropriate tests for their products.
10. Organise group presentation for their designs and testing.
11. Judge and comment on students' work.
12. Probe students with key questions.
13. Help students summarise their findings.

(F) Evaluation

Possible assessment activities and the related assessors are suggested as 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

Example 39

Meal Planning

Key Stage: 3

(A) Learning Targets

In this unit students are expected to:

- examine the nutritional, physical, cultural and sensory characteristics of food
- devise and implement plans to address the needs of individuals and occasions
- demonstrate management and organisational skills using a range of appropriate food preparation techniques

(B) Task Definition

Students are divided into groups of four. They will plan and prepare different meals in meeting the needs of different individuals and festive occasions. They will also develop a new recipe to reflect the essence of a food culture.

(C) Integrated Dimensions of Technology

- Materials and Structure
  - materials and resources
- Operation and Manufacturing
  - tools and equipment
  - production process
- Strategies and Management
  - business environments, operations and organisation
- Technology and Living
  - food and nutrition
  - food preparation and processing
  - family living
  - home management and technology
- Information and Processing Presentation
  - information processing and information processing tools

(D) Intended Learning Objectives

Knowledge Context	Process	Impact
Students should be able to: • recognise the meal pattern of a three-course meal • explain the functions, classifications and sources of micro nutrients • illustrate different ways of retaining nutritional values in food • distinguish different functional properties of food • understand the principles of different food preparation process • describe the stages of food product development • identify specific features and examine factors affecting the development of different food cultures	Students should be able to: • plan a meal to meet the needs of individuals (such as vegetarian, people of different age group, people having high blood pressure/heart disease/diabetes/weight, management/deficiency in different nutrients) or/and for celebrations • prepare a meal using a variety of food preparation skills • use appropriate meal presentation skills for different occasions • evaluate the suitability of the planned meals prepared in meeting the needs of individuals and occasions • apply the design cycle to develop a new recipe to reflect a food culture	Students should be able to: • respond sensibly to the nutritional needs of different individuals and occasions • appreciate the roles of food in the family and different cultures • be aware of the impact of food technology on family life or healthy lifestyles

(E) Lesson Sequence

Classroom Activity (1) – Food Test

1. Teacher introduces the function, classification and sources of micro nutrients, as well as dietary guidelines for people with deficiency in different micro-nutrients including fat-soluble vitamins (vitamin A and vitamin D), water-soluble vitamins (vitamin B and vitamin C) and minerals (iron, calcium and iodine). Teacher may consider recapitulating students' acquired knowledge in Science lessons on related topics.

2. Students conduct tests on the effects of heat on food. They have to record the findings and prepare a summary of the tests.
   - heat fruit juices with different amount of time (testing for vitamin C content)
   - steam green leafy vegetables with different amount of time (testing for texture and taste)
   - shallow fry egg with different amount of time (testing for coagulation of protein)
   - toast bread with different amount of time/temperature (dextrinsation of starch)

- boil rice/pasta with different amount of time (gelatinisation of starch)
- prepare salad dressing with different ratios of oil and vinegar (emulsification of fat)

3. Students present their findings and summary. Teacher and students discuss different ways to retain nutritive value in food and the functional properties of protein, carbohydrates and fats illustrated by the findings collected from food tests.

Classroom Activity (2) – Snacks and Health

Part One

1. Teacher explains the causes of eating disorder and ways for prevention or treatment.
2. Teacher demonstrates the preparation of pasties by using short crust pastry/Chinese pastry.
3. Students prepare pasties with pastry having different ratios of fat to flour.
4. Teacher introduces proper ways to conduct sensory test.
5. Students conduct sensory test and suggest the suitability of pasties they have prepared.
6. Teacher summaries the pros and cons of different ratios of fat to flour.
7. Students suggest ways to prepare dishes made from pastry for people with eating disorder.

Part Two

1. Teacher introduces the dietary guidelines for preparing food for people with special needs such as vegetarians, people having high blood pressure/heart disease/diabetes/weight management.
2. Teacher demonstrates the preparation of pancakes/hotcakes.
3. Students develop pancake/hotcake recipes for people with special needs by adapting the original recipe
    - use different fillings for pancakes
    - use different accompaniment for pancakes/hotcakes
    - use different amount and/or type of fat/sugar/milk/egg/flour
    - use different cooking utensils/method for making pancakes/hotcakes
4. Students conduct sensory test and compare with the original recipe.
5. Students evaluate the suitability of the developed recipes.

Classroom Activity (3) – Meaning of Food

1. Teacher introduces meal patterns of different cultures and food for celebrations.
2. Students discuss the role of food in the family and different cultures.
3. Teacher demonstrate the preparation of 1 – 2 kinds of food for celebration
    - festive food for Christmas (e.g. Yule Log, Ginger Bread, Gingerbread biscuits, Christmas Cake, Mince Pies)

- festive food for Easter (e.g. Hot Cross Buns, Easter Bread, Easter Eggs)
- birthday (e.g. birthday cake, birthday bun (壽桃包))

4. Students prepare food for celebration.
5. Students describe the factors contributing to the development of a food culture illustrated by the food they have prepared.

Classroom Activity (4) – Food Heritage

1. Teacher recapitulates the dietary guidelines for people with special needs.
2. Teacher introduces the stages of food product development and ways for consumer testing.
3. Students compare the similarities and differences between stages of food product development and steps in a design cycle.
4. Students develop a traditional festive food for people with special needs and reflect their culture, e.g.
   - Chinese New Year
   - Spring Lantern Festival
   - Dragon Boat Festival
   - Mid-autumn Festival
   - Winter Solstice
5. Students conduct sensory/consumer testing and present their finding by star diagrams.
6. Students suggest ways to preserve and label the developed food product.
7. Teacher summarises the pros and cons of the suggested methods by referring to the principles and purpose of food preservation
8. Students identify the impact of food preservation technology on family life/healthy lifestyle illustrated by the food product developed.

Classroom Activity (5) – The Table Makes the Family

1. Teacher introduces the causes and conditions leading to food spoilage, food contamination and related food-borne diseases.
2. Teacher identifies dietary goals for different age group and the use of functional food in enhancing health of family members.
3. Students select dishes for a three-course meal and prepare a time plan and division of work.
4. Students prepare and serve a three-course meal for a family with members of selected age groups.
5. Students explain the suitability of dishes prepared and identify critical points that may cause food contamination during food preparation.
6. Students discuss and present the importance of having meals with family members.

(F) Assessment

Possible assessment activities and related assessors are suggested below:

Learning Expectation	Assessment	Assessor
• Cooperate with team members in completing the task	• Teacher observation • Self-reflection • Peer evaluation	• Teacher • Students
• Communicate and present ideas effectively	• Oral presentation	• Teacher • Student
• Develop food products/plan and prepare meals for meeting different dietary needs	• Oral presentation • Worksheets	• Teacher • Students
• Use a variety of food preparation skills in preparing food products/meals	• Teacher observation • Self-reflection • Peer evaluation	• Teacher • Students
• Organise and present information and ideas systemically	• Worksheet • Oral presentation	• Teacher • Students
• Justify ideas and suggestions	• Oral presentation	• Teacher • Students

(G)Teaching Points and Learning Elements:

The following table shows the coverage of TE learning elements under the theme "Meal Planning".

Teaching Points		ICT	M&S	O&M	S&M	S&C	T&L
Foundation	Extended Study						
Meal Planning ● meal pattern of three course meal - Western - Chinese ● meals for people with special needs - vegetarian/high blood pressure /weight management - deficiency in different nutrients (vitamin B/C, iron/calcium) ● meals for special occasion - festive cooking/party Food and Nutrition ● dietary goals for people with special needs and dietary requirements ● nutrients (vitamins and minerals) - function - classification - source ● retention of nutritional values in foods - protein - carbohydrates - fat - vitamins & minerals ● legislation and guidelines on food labeling Food Preparation	Meal Planning ● meals for people with special needs - people with heart disease/diabetes ● meals for special occasion - celebration Food and Nutrition ● nutrients (vitamins and minerals) ● deficiency ● dietary goals for different age groups ● cause of eating disorder ● use of functional food Food Preparation ● food preparation and cooking techniques (batter, cake making, use of setting agent) Food Safety ● causes and prevention of food contamination and food-borne disease Food Product Development ● development of prototypes ● consumer testing Food Culture ● festive food - Chinese New Year - Mid-autumn Festival	Apply knowledge and skills acquired in S1 and S2 CL, e.g. ● use of office automation software (K16) ● search and download useful information through Internet (K16) ● skills in searching for specific information (K16) ● word processing features (K16)	1. Apply concepts related to materials through the use of fresh food (naturally occurring materials) and processed food (man-made materials), e.g. ● application of a variety of common materials to design and make simple products (K3) 2. Collaboration with D&T could enhance students' understanding and provide opportunities for the application of knowledge through a variety of practical tasks	1. Apply concepts related to tools & equipment through the use of food preparation equipment and appliances, e.g. ● application of a range of machines to implement solutions to design problems (K5) 2. Apply concepts related to production process (design consideration and product design) in meal planning, e.g. ● organisation of resources and processes for making simple products of proposed solution (K6) ● selection and application of appropriate tools and equipment and apply proper skills to implement solutions to	1. Apply concepts related to types of business organisation, e.g. ● decision making, evaluation and quality assurance (K7) 2 Collaboration with other TE subjects such as CL and D&T could enhance students' understanding and provide opportunities for the application of knowledge through a variety of practical tasks	1. Apply concepts related to input, process and output in food preparation, e.g. ● concept of open loop system (K8) ● functions of system components (K8) ● design of simple systems to meet specified problems (K9) 2 Collaboration with other TE subjects such as CL and D&T could enhance students' understanding and provide opportunities for the application of knowledge through a variety of practical tasks	1. Food groups (K10) ● sources, functions and deficiencies of micro nutrients ● local and global supply, safety issues, retention of food values 2. Dietary goals and eating habits (K10) ● recommended daily intake, dietary guidelines, dietary goals for different age groups and people with different needs and dietary requirements 3. Meal planning (K10) ● principles in food costing and budgeting and the meal pattern of a three-course meal ● meal planning for different age groups, people with special needs ● meal presentation for different occasions ● development of creative recipes for meeting different needs 4. Hygiene and safety (K11) ● principles and adaptation of safety and hygienic practices 5. Principles of food preparation and processing (K11) ● principles underlying heat transference in cooking ● choice, use and care of kitchen equipment and appliances 6. Skills in food preparation and processing (K11) ● planning and organising time and resources in preparing a three-course meal and meals

Teaching Points		ICT	M&S	O&M	S&M	S&C	T&L
Foundation	Extended Study						
● labour saving devices (blender/mincer) - choice - usage ● food preparation and cooking techniques (shaping, coating, caking making, pastry making) <u>Food Preservation</u> ● principles and purpose ● preservation methods <u>Food Product Development</u> ● idea generation ● sensory evaluation <u>Food Culture</u> ● factors affecting the development of a food culture ● role of food in family and society	- Christmas - Easter ● food consumption pattern of different cultures			design problems (K6) 3. Collaboration with D&T could enhance students' understanding and provide opportunities for the application of knowledge through a variety of practical tasks			for special occasions and celebrations ● food preparation techniques ● choosing and combining appropriate cooking methods for different foods and dishes ● tools for sensory tasting and evaluation ● working habits and organisation of work in food preparation 7. Family relationship (K14) ● impact of technology on family life 8. Management of family resources and budgeting (K15) ● utilisation of resources in the family (use and care of equipment and appliance for food preparation) 9. Food technology (K15) ● technology in food processing including functional properties of food ● food product development ● basic ideas of evaluating a food product 10. Energy saving device (K15) ● cost , benefit and impact of using energy saving devices

Example 40

Project Work Assessment - Design Challenge - Mobile Device

Key Stage: 3

In a Secondary 2 Design and Technology lesson, a teacher sets a challenge to his class to design and make a concept model of a mobile device. The concept model is to show accurately what the finished product may look like.

To be successful, students need to:

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

Assessment focuses:

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

Scoring rubrics:

	Designing	**Making**
A	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 understand their characteristics ● uses sophisticated computer techniques to model design.
B	The design folio: ● shows evidence that market research and analysis have been carried out	The finished concept-product is: ● finished ● usable to obtain feedback from customers. Student:

	• 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.	• works with a range of tools, materials, equipment, components and processes with some precision • use appropriate computer modeling techniques to model design.
C	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 modeled with some limited success • completed but with little or no surface finish. Student: • selects and works with a range of tools and materials • use limited computer techniques to model design.
D	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 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 computer graphic model.

Example 41

Theme–based Learning: Sustainable Architecture

Key Stage: 4

Duration: 50 periods

(A) Key Features

In these learning activities, students are expected to:

- understand the fundamentals of technological knowledge and principles related to sustainable development;
- make use of investigations into technological practices;
- apply the knowledge of sustainable architecture for solving practical and technical problems;
- be aware of technology development and its impact on society.

(B) Task Definition

In these thematic learning activities, students will study several examples of sustainable architecture, and learn how to use CAD/CAM in modelling design solutions. Moreover, students will explore the possibilities of embodying sustainable ideas (e.g. save energy and reduce waste) in building development projects, and examine corresponding structures, materials and construction methods.

The eventual task is to integrate and apply knowledge of environmental factors and other relevant disciplines to design built environments that are functional, innovative, sustainable, comfortable and beautiful.

Learning Activities include:

(1) Case Studies：Overseas Sustainable Buildings

(2) Technology Exploration：Visit to the Education Path at the EMSD Headquarters; Search of Harmful Constructional Materials

(3) Design Project：Greening Local Building Development Projects (group project)

(C) Integrated Dimensions of Technology

In developing this learning activity, teachers will incorporate the learning elements in the following strands and modules:

Core Strands：

(S1) Design & Innovation

(S2) Technological Principles

(S3) Values & Impact

Elective Modules：

(M1) Design Implementation & Material Processing

(M2) Visualisation & CAD Modelling

(D) Intended Learning Tasks and Objectives

Stage	Knowledge Context		
	Learning topics	**Learning process**	**Learning outcomes**
Introduction	• impacts of rash extraction of resources on the natural environment	• investigate local building development projects • identify the elements of "sustainable architecture"	• sort out the ways to protect the environment and resources while maintaining the rate of development of the community and the improvement of our quality of life
Case Studies	• examples of sustainable architecture: - Reichstagsgebäude - Kaohsiung National Stadium - Earthship Brighton	• understand the technology of "sustainable architecture" • compare the sustainable strategies of different countries	• integrate and apply knowledge of environmental factors and other relevant disciplines to design built environments that are functional, innovative, sustainable, comfortable and beautiful.
Technology Exploration	• visit to the Education Path at the EMSD Headquarters • harmful constructional materials investigation	• explore the information of environmental-friendly construction methods	• understand "green" buildings and constructional materials
Design and Development:	• design the sustainable building and deal with the	• explore the possibilities of local	• define the difference of architectural styles

Stage	Knowledge Context		
	Learning topics	**Learning process**	**Learning outcomes**
	project management and teamwork	sustainable architecture ● consider the function, users' needs, surrounding environment, construction methods & materials, etc. of the proposed sustainable building ● explore how to use CAD/CAM to design and make architectural models	● master the techniques of CAD/CAM to design and make architectural models
Workshop Realisation	● demonstrate and practice the operation of relevant tools and equipment	● conduct group discussion and deal with job allocation ● fabricate the architectural model representing the outlook, interior setting, base, surrounding environment, etc. of the sustainable building	● manage the design project folder including analysis of information, design sketches, working drawings, etc.
Presentation and Evaluation	● project exhibition and presentation ● peer assessment and self-evaluation	● prepare the feedbacks, reflection and conclusion	● complete the fabrication report and the log book ● wrap up the design project folder

(E) Lesson Sequence

（I）Introduction

Lesson	Teaching/Learning /Assessment activities
1-3	● By means of different visual aids, teacher explains the impacts of the expanding building industry on the natural environment. ● Teacher discusses with students on the issues of how people can protect the environment and resources while maintaining the rate of development of the community and the quality of life.

	• Using the reference materials of the theme, teacher explains the design task is to integrate and apply knowledge of environmental factors and other relevant disciplines to design built environments that are functional, innovative, sustainable, comfortable and beautiful. • In these learning activities, students will study several examples of sustainable architecture, and learn how to use CAD/CAM in modelling design solutions. Moreover, students will explore the possibilities of embodying sustainable ideas (e.g. save energy and reduce waste) in building development projects, and examine corresponding structures, materials and construction methods. • The extended learning activities of students are to investigate local building development projects and to explore "sustainable architecture".

（II）Case Studies

Lesson	Teaching/Learning /Assessment activities
4-9	• Using the reference materials of case studies, teacher explains the following examples of sustainable architecture to students: - Reichstagsgebäude - Kaohsiung National Stadium - Earthship Brighton • Teacher guides students to discuss the following points: - What are the design features of the case? (e.g. appropriate use of energy & constructional materials) - What knowledge and technology are involved in such type of green design? (e.g. renewable materials and improvements on the indoor environment quality) - Can the relevant measures be applied to the design project? • The extended learning activity of students is to search for the information of environmental- friendly construction methods and materials.

（III）Technology Exploration

Lesson	Teaching/Learning /Assessment activities
10-15	• Teacher leads students to visit the Education Path at the EMSD Headquarters. Students study the facilities of solar energy and wind energy, and the applications of green products. • Teacher assists students to implement the search of harmful constructional materials, including the usage, raw materials, processing methods, impacts on the environment and the users, etc. At the end, the group work of all students is a "Handbook of Harmful Constructional Materials".

	• The extended learning activities of students are to search the information of different architectural styles and to explore how to use CAD/CAM to design and make architectural models.

（IV）Design and Development

Lesson	Teaching/Learning /Assessment activities
16-31	• Group presentation of students' research on different architectural styles. • Using related learning materials, teacher explains the concept of "Sustainable Architecture" and discusses with students on the corresponding roles of designers and engineers. • Teacher helps students explore the possibilities of local sustainable architecture. Then, in groups, students consider the function, users' needs, surrounding environment, construction methods and materials, etc. of their proposed sustainable buildings. • Teacher discusses with students on design specifications including environmental factors such as interior setting, lighting, ventilation, accesses as well as the resources and techniques required in production. • Guided by the teacher, different groups of students design their sustainable buildings and deal with the project management and teamwork respectively. • Students complete the design project folder collaboratively; relevant items include analysis of information, design specifications, sketches, computer graphics, working drawings, etc. • In the meantime, teacher gives feedback to different groups, e.g. the sustainability of the design and the practicality of the solution.

（V）Workshop Realisation

Lesson	Teaching/Learning /Assessment activities
32-45	• Teacher demonstrates how to use specific tools, CAD/CAM equipment and materials to make architectural models. • Students discuss in groups to allocate their jobs such as drawing pictures or collecting useful components. • With the help of teacher, different groups follow their schedules to make the architectural models. Items include the exterior of the building, interior setting, foundation and the surrounding environment. • In the stage of realisation, students have to document the materials, components, tools, equipment and methods/procedures used in the fabrication report.

	• In addition, students must follow the safety measures and point out the problems encountered and the related solutions. • Every time after a task is completed, each group has to review their performance and writes down a review in the log. • Teacher assesses students' learning progress through examining their log books, fabrication reports and design project folders. • Teacher gives feedback to students by means of interview or notes, in order to make learning more effective.

(VI）Presentation and Evaluation

Lesson	Teaching/Learning /Assessment activities
46-50	• Teacher discusses with students on the criteria of evaluating products (e.g. originality of the design concept, quality of the models and opinion of the third parties). • Teacher organises the project exhibition and different groups conduct their presentations. In the meantime, invite third parties such as teachers, staff or students to evaluate the products and to complete the evaluation forms. • Each group uses the points of design specification and others' feedback to evaluate their own product, and make suggestions for future improvements in their report. • Teacher discusses with students on the criteria of project assessment (e.g. completeness, collaboration, motivation). • Students conduct peer assessment and self-evaluation. • As a summative assessment, teacher uses the project assessment forms to give students meaningful, constructive and proactive feedback. • Teacher makes reflection with students on the theme, and forms a conclusion on each other's performance and the way of improvement.

Example 42

Cater for Learner Diversity in Health Management and Social Care

Topic：	**Health and well-being**
Key Stage：	4
Duration:	10-12 Periods
Learning Targets：	• to develop a holistic view on health • to analyse the interrelationship between different aspects of health as well as factors affecting health and well-being
Related topics:	• Holistic concept of health • Healthy lifestyles
Key Questions:	What does health mean to you? How can we stay healthy?
Learning Task	**Health Education Week** A range of events are organised for Health Management and Social Care (HMSC) students to participate actively as student leaders and apply what they learned from HMSC theories
Preparation	Teacher liaises with different stakeholders including the school management, social worker, the owner of the tuck shop, and other teachers to suggest and provide a range of health promotion activities during the week.

Learners with Multiple Intelligences	Activities in Health Education Week
Verbal-Linguistic Intelligence Students' auditory skills tend to be highly developed, and they learn best when they can speak, listen, read, or write.	- Talks and seminars by health professionals on mental health for all S4 students
Spatial Intelligence Students learn best through graphs, tables, or images; and are often able to convert words or impression into mental images.	- HMSC students design and produce a set of display boards to introduce the holistic concepts of health and the related information/ articles
Bodily-kinesthetic Intelligence Students learn best by doing, moving, and acting things out.	- Competition on rope skipping for the whole school to promote physical health - Healthy Breakfast Day for HMSC students to carry out activities to promote healthy diet
Interpersonal Intelligence Students learn best when they can relate to other people.	- HMSC students serving as the leaders and working in groups to plan, organise and implement the activities in the "Health Education Week"
Intrapersonal Intelligence	- HMSC students read the stories of 'life warriors' and write reflective

Students are in touch with their inner feelings and are able to form realistic goals and conceptions of themselves.	journals with the theme on 'Resilience'. These self-reflective journals are displayed and shared with other students

Reflection

- When teaching the high academic achievers, some teachers may be concerned about the progress in covering all the teaching contents to prepare students for public examinations. Schools are reluctant to allocate lesson time for other cross-curricular learning opportunities for students. As a result, only verbal-linguistic or logical-mathematical intelligences are addressed in their lessons without paying much attention to other equally important capabilities of students
- The potentials of the able achievers can be stretched by providing them with a wide range of learning and teaching activities. This in turn provides ample opportunities for learners of different multiple intelligences to learn more effectively and have greater opportunities to succeed in different areas.

Reference

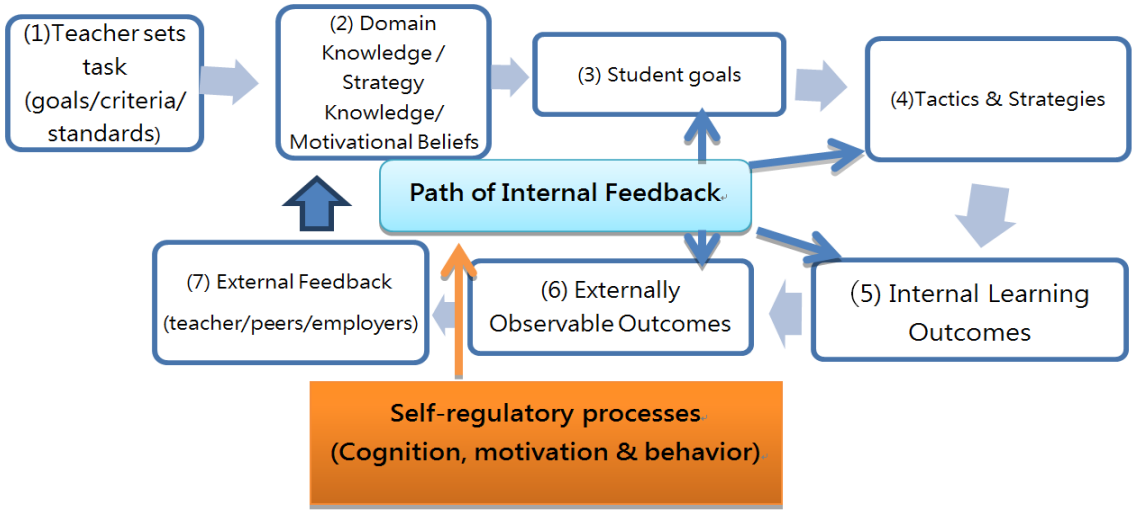
Gardner, H. (1983) Frames of Mind: The Theory of Multiple Intelligences. New York: Basic Books.

Example 43

Self-directed Learning in Health Management and Social Care

Topic：	**Building a Healthy City**
Key Stage：	4
Duration:	10-12 Periods
Prior knowledge：	• Needs and development at different life stages • Holistic health • Protective and risk factors • Healthy lifestyle
Related topics:	• Risk assessment • Healthy city
Key Question:	How could we promote health and safety in different settings and for different target groups?
Field Learning Tasks	Four groups of students visit elderly and children centres and develop the following themes for their field learning tasks: • Elderly fall – most common reasons and physical exercises for fall prevention • Eating habit and its influence on the physical health of the elderly • Confidence-building (for children) • Building peer relationship (for children)

Self-regulated Model



Self-directed Learning	Application in HMSC Learning and Teaching
(1) Teacher setting learning targets, requirements, and assessment standards for field learning	**Learning Targets**： ● Knowledge - To apply knowledge for deeper understanding of concepts of health promotion, holistic health, risk assessments, professional roles and healthy city. - To apply the theories and concepts learnt in classroom and to identify the discrepancies between theories and the real life situation ● Skills - To learn different data collection skills in the activities such as setting questionnaires, interviews, observation and survey **Task Description** ● Students are required to apply relevant knowledge to implement the field learning plan, present the plan to the service units, carry out the health promotion activities for different target groups and complete the reflective journal
(2) Students' prior knowledge and skills	**Prior knowledge**：the key concepts related to health promotion and the tasks: ● 5 Action Themes of Ottawa Charter ● PIES (physical, intellectual, emotional and social dimensions of health) ● concentric circle of curriculum design (from individual to global levels) **Pre-requisite skills**: Planning and writing proposal
(3) Students setting learning goals	● Students work in groups to develop their learning goals and study questions for implementing health promotion activities at different settings for different target groups (see the example below)
(4) Students planning and carrying out the field learning tasks	**Preparation** ● Gather information – background information of the target groups and related services ● Plan the purposes, forms and division of work in the activities **Process** ● Implement the tasks and make appropriate adjustments if needed ● Collect data in the field through interviews, observation and survey ● Consolidate and analyse data in reflection **Presentation** ● Invite the target groups to help them present their learning

<table>
<tr><td>Self-directed Learning</td><td colspan="3">Application in HMSC Learning and Teaching</td></tr>
<tr><td></td><td colspan="3">outcomes in the activities of the health promotion week at school</td></tr>
<tr><td rowspan="2">(5) Internal learning outcomes</td><td>Knowledge</td><td>Skills</td><td>Attitude</td></tr>
<tr><td><u>Elderly</u>
● Healthy eating
● Risks at home and community
● Fall prevention
● Elderly services
● Physical activities
<u>Children</u>
● Growth and development
● Confidence/ self-concept
● Communicatio n
● Relationship-building</td><td>● Health promotion skills related to healthy meals, exercises, games and child learning
● Communication skills with elderly and children
● Organisation skills
● Collaboration skills
● Presentation skills including introducing the proposal, interview skills
● Observation skills
● Writing Report</td><td>● Respect the dignity of individuals , i.e. elderly and children
● Appreciate and promote the value of healthy lifestyle</td></tr>
<tr><td>(6) Internal feedback and self-regulated process</td><td colspan="3">● Internal feedback derived from a comparison of current progress against desired goals, is generated at a variety of levels (i.e. cognitive, motivational and behavioral). It is these comparisons that help the student to undertake self-regulation — particularly he/she will consider whether he/she is correct in interpreting the tasks and/or setting the goals and strategies, or whether he/she needs to make revision or changes to meet his/her newly constructed knowledge.</td></tr>
<tr><td>(7) Externally observable outcomes</td><td colspan="3">● Presentations of learning outcomes during health promotion week at schools through:
- Display
- Activities
- Power-point presentations

● Assignments submitted at the end
- Field learning plan
- Field learning notes
- Reflective journal</td></tr>
</table>

Self-directed Learning	Application in HMSC Learning and Teaching
(8) External feedback	**<u>From teachers</u>** ● During presentations ● On reflective journals **<u>From peers</u>** ● Classroom discussion ● Peer assessment **<u>From staff of the service units and target groups</u>** ● Oral feedback before, during and after the activities **<u>From school and community</u>** ● Oral feedback /survey conducted during or after the activities

<u>Example: Field Learning Plans</u>		
Theme	***Healthy Setting for Young Kids***	***Healthy Setting for Elderly***
Group	***Group 1***	***Group 2***
Target Group	Children (7-10 years old)	Elderly (60 -70 years old)
Project Topic	The peer relationship among the children of the trustee programme	Prevention of fall
Related topics/concepts	Formal support Social network Interpersonal relationship Conflict management	Health belief model Risk management
Planning of the learning hours	● Prepare the visit ● Site visit (1) – to collect information about the children ● Site visit (2) – to play communication games with children ● Site visit (3) – to play communication games with children ● Group work – to analyse the data and information collected and revise the plan ● Prepare and man the booths at schools ● School visit (game booths) – to play games with children at school	● Site visit (1) – to present the proposal and get feedback from social workers ● Site visit (2) – to interview the elderly and introduce the exercises to strengthen the muscles for prevention of fall ● School visit (health conference) – to practise the exercise with the elderly and measure the blood pressure for the elderly

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Example 44

Project-based Learning: Business Venture – From Theory into Practice

Key Stage: 4

Duration: 8-12 periods

(A) Learning Objectives

In this project, students are expected to:

- integrate knowledge relating to budgeting, financial recording, human resources management, marketing and buying behavior etc. to solve business problems arising from the formation and operation of the business venture
- develop their entrepreneurial and leadership skills, teamwork capability and awareness on social responsibility throughout the learning experience

(B) Pre-requisite Knowledge

- Importance of entrepreneurship
- Factors affecting business decisions
- Basic management functions for organisation
- Meaning of accounting equation and principles of double entry

(C) Task Definition

Students are divided into groups of 9-10 and work collaboratively to set up and manage a business venture of their own in an open event (e.g. Parents' Day) of the school. Each group has to plan a business to operate before the event date (Planning Stage), implement the plan on the event date (Organising Stage) and evaluate the effectiveness of the business after the event date (Evaluating Stage).

Intended Learning Tasks:

Stage	Knowledge Context		
	Learning topics	Learning process	Learning outcomes
Planning	• Hong Kong Business Environment • Forms of Business Ownership • Business Ethics and Social Responsibilities	Students will be able to: • distinguish the forms of their business venture • identify factors affecting business operation and decisions such as	Students will be able to: • decide what product to sell/not to sell, at what price and quantity to sell • define the role and responsibilities of each team member

Stage	Knowledge Context		
	Learning topics	Learning process	Learning outcomes
	• Key Business Functions • Purposes and Role of Accounting • Budgeting	available fund and technology, as well as target customers and location of the venture etc. • describe how business ethics and social responsibilities affect business decisions such as whether to sell pirated or expired goods etc. • explain the role and importance of different key business functions in managing the venture • explain the need and importance to record and classify business transactions • prepare budgets for the venture on income and spending	• map out a schedule of work for the venture • prepare different kinds of forms for recording receipts and payments of the venture • make use of financial budgeting to forecast revenues and expenditures of the venture
Organising	• Management Functions • The Accounting Cycle • Role of Marketing • Customer Behavior • Marketing Strategies for Goods and Services	Students will be able to: • demonstrate a basic understanding of the management functions in planning and organising resources, leading team members and controlling expenses etc. • record business transactions in ledgers accounts • realise the importance of	Students will be able to: • apply various principles of effective management in managing the venture • develop promotion campaign to attract sales • apply appropriate marketing strategies in selling such as deciding whether to offer discount to product at times

Stage	Knowledge Context		
	Learning topics	Learning process	Learning outcomes
		marketing as a business function • understand the customer decision-making process and identify factors affecting customer decisions	when the event is about to close
Evaluating	• Uses of Financial Statements • Basic Ratio Analysis	Students will be able to: • prepare financial statements from the receipts and payments records of the venture • calculate and interpret different liquidity and profitability ratios	Students will be able to: • understand the uses and limitations of financial statements in making business decision • assess and evaluate the performance of the venture in terms of its profitability

(D) Integrated Dimensions of Technology

In developing this project-based learning activity, teachers will incorporate the following learning elements:

- Marketing – finding out key features of a commercial product and investigating interests of target customers
- Resources Management – scheduling of resources and making financial budgeting
- Information Processing and Presentation – applying computer skills to keep records of receipts and payments, and preparing financial statements of the business venture
- Design and Applications – designing promotional items such as posters and leaflets to attract target customers

(E) Resources

- Sponsorship from School and/or Parent Association etc. as source(s) of finance of the business venture
- Open area such as school hall or covered playground for the event to be held
- Time allocation: 2 periods per week, 4-6 weeks per year

(F) Suggested Lesson Sequence

Lesson Unit	Time allocation/ Topic	Activities
1	2 periods/ Knowing the requirements of the project	In-class: 1. Teacher introduces the project and explain its aims and requirements 2. In designing the business venture, teacher to facilitate students to discuss on various factors affecting business decisions and explain the importance of budgeting and business ethics in setting up a business and selling a product Extended: • Students divide themselves into groups of 9-10 and work collaboratively to collect background information for the project, investigate and identify what kind of product to be sold and formulate plans to operate the venture • Students apply financial budgeting to make forecast on its cash inflows and outflows as well as project its profitability
2	2 periods/ Understanding and providing feedbacks to the project	In-class: 3. Each group presents its preliminary findings and propose a business venture to operate 4. Teacher provides feedback on the feasibility of the proposed business venture in connection with factors such as the group's available fund, target customer and their characteristics, copyright issue on goods sold and life span of the business Extended: • Students write up a schedule of work for the venture with clear progress of work, product specification, manpower distribution, marketing strategies and promotion campaign etc. • Students start purchasing/making goods for selling as well as doing other preparatory work for the business venture • Students develop different forms for recording accounting transactions of the venture
3	2 periods/ Reviewing and monitoring the project	In-class: 5. Each group presents the schedule of work and report on its progress and seek advice or help from teacher 6. Teacher reviews each business proposal and provide further feedback on its practicability 7. Teacher identifies with students any potential threats of the business venture and make remedial actions

Lesson Unit	Time allocation/ Topic	Activities
		Extended: • Students continue to purchase/make goods for selling, finalise costs and prices of the products as well as preparing items and materials for promotion and marketing
4	Event day/ Implementing the project	In the event: 8. Students apply what they have learnt in the subject and planned in the business proposal into action for profits 9. Teacher monitors the event and provide assistance to students if necessary Extended: • Students prepare a written report including financial statements and accounting ratios for the business venture after the event day in order to assess the venture's profitability and management efficiency
5	2 periods/ Evaluating the effectiveness of the project	In-class: 10. Each group presents the written report of the business venture for discussion on its performance 11. Students share their learning experience in the project 12. Teacher addresses students on any discrepancies from theory into practice when setting up, managing and ending a business venture, debrief them issues and concerns in communicating and collaborating with team members, as well as suggesting ways for improvement for each group or students

(G) Assessment and Evaluation

Different modes of assessment are used to suit the purposes and process of learning including:

Modes of assessment	Assessor
• Schedule of work as an accumulation of pieces of work to evaluate students' understanding of the requirements of the project	• Teacher • Students
• Observation in forms of a checklist to assess students or peers involvement, progress of work and performance throughout the project period	• Teacher • Students
• Final products in terms of its popularity, safety and profitability etc.	• Teacher • Students

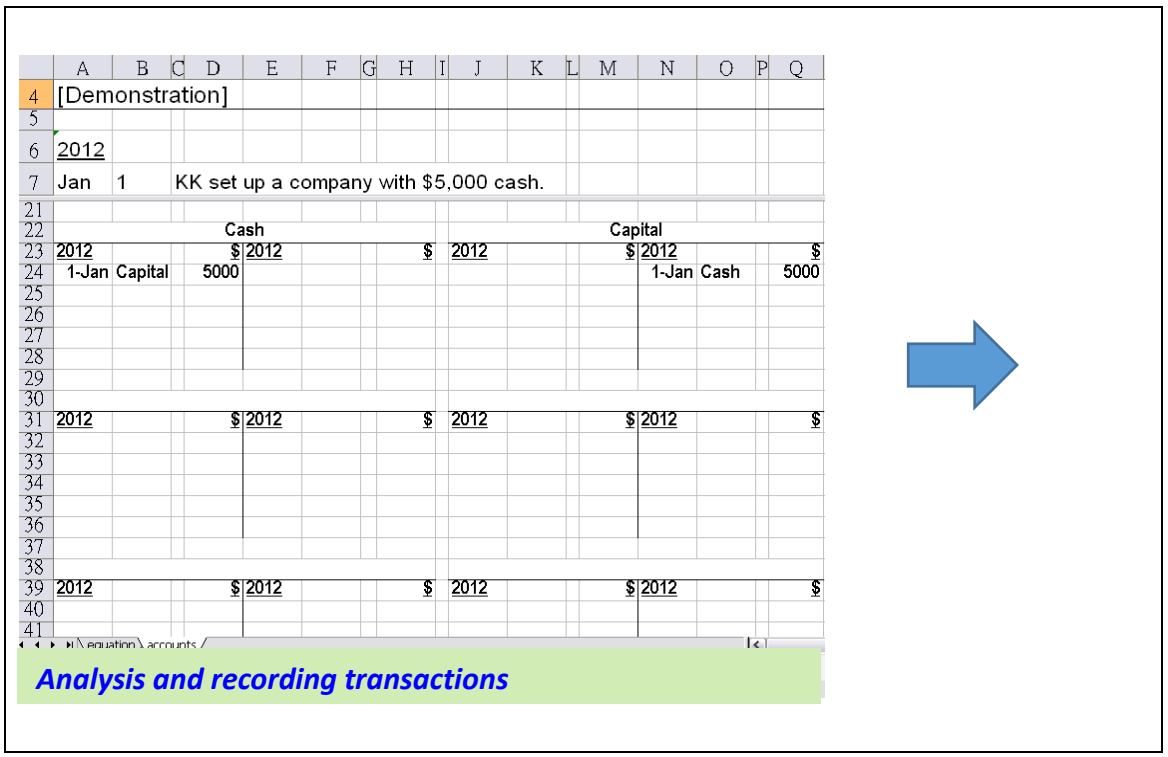
• Observation on student's interaction and communication with customers in terms of their courtesy and sincerity in delivering the products ethically and responsibly etc.	• Other stakeholders in the event
• Oral presentation to summarise the performance of the business venture and learning experience from operating a business	• Teacher • Students
• Summary report as a reflection of the learning experience	• Teachers

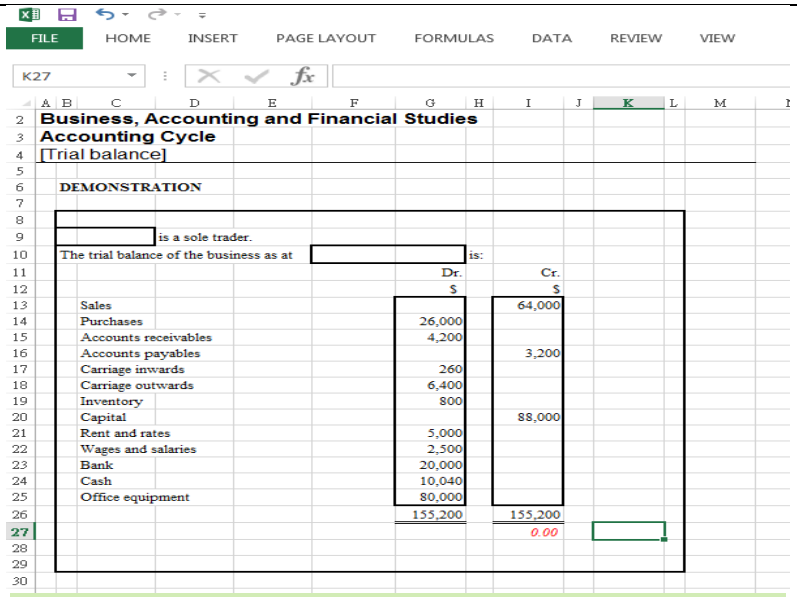
Example 45

Use of Information Technology in Teaching Accounting

Curriculum:	Business, Accounting and Financial Studies (BAFS)
Key Stage:	4
Topic:	The accounting cycle
Pedagogy:	Use of Spreadsheet in teaching the accounting cycle
Learning target:	To demonstrate how transactions are recorded and the related changes in account values for each entry in the accounting cycle.

To facilitate students' understanding of the debits and credits of double entry with transactions, teachers can make use of spreadsheet to demonstrate the flow of accounting cycle and their impacts on the company's financial statements. In conducting the lesson, teachers can start with describing the flow of an accounting cycle to students and visualise the major steps of the accounting cycle with illustrative examples by using spreadsheet. Students can find it easier to track every single step in recording transactions, and related change in account values for each entry in the accounting cycle.





Business, Accounting and Financial Studies
Accounting Cycle
[Trial balance]

DEMONSTRATION

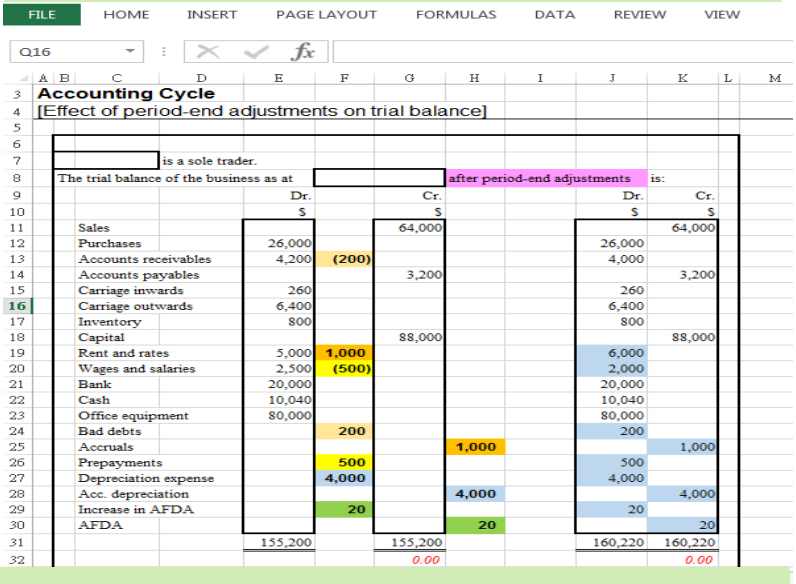
_____ is a sole trader.
The trial balance of the business as at _____ is:

	Dr.	Cr.
	$	$
Sales		64,000
Purchases	26,000	
Accounts receivables	4,200	
Accounts payables		3,200
Carriage inwards	260	
Carriage outwards	6,400	
Inventory	800	
Capital		88,000
Rent and rates	5,000	
Wages and salaries	2,500	
Bank	20,000	
Cash	10,040	
Office equipment	80,000	
	155,200	155,200
		0.00

Accumulating post adjustment accounting balances

	Period-end adjustments	*Definition*	*ENTRIES*		*COMMON MISTAKES*	
			DR	CR	DR	CR
1	Accruals of expense	Expenses during a period but have not been by the end of the period.	Expense 1000	Accruals 1000		
2	Prepayments of expense	Expenses during a period but have not been by the end of the period.	Prepayments 500	Expense 500		
3	Depreciation	Systematic allocation of the of the tangible NCA over its .	Depreciation expense 4000	Accumulated depreciation 4000		
4	Increase in allowance for doubtful accounts	Allowance made at the end of an accounting period for those AR that are to become uncollectiable.	P/L 20	AFDA 20		
5	Bad debts	AR that have been to be uncollectible.	Bad debts 200	AR 200		
6	Bad debts recovery	A debtor is able to all or part of the debt that was previously .	AR Bank / Cash	BD / BDR AR		

Recording Adjustments

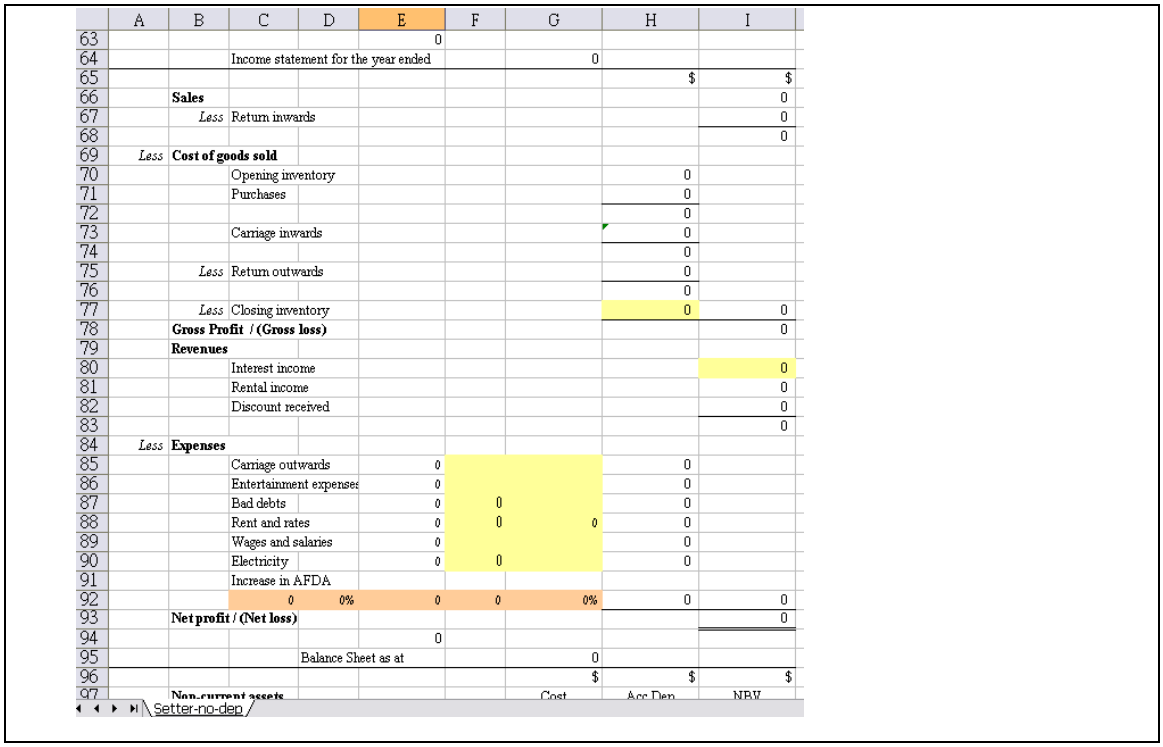


Accounting Cycle
[Effect of period-end adjustments on trial balance]

_____ is a sole trader.
The trial balance of the business as at _____ after period-end adjustments is:

	Dr.		Cr.		Dr.	Cr.
	$		$		$	$
Sales			64,000			64,000
Purchases	26,000				26,000	
Accounts receivables	4,200	(200)			4,000	
Accounts payables			3,200			3,200
Carriage inwards	260				260	
Carriage outwards	6,400				6,400	
Inventory	800				800	
Capital			88,000			88,000
Rent and rates	5,000	1,000			6,000	
Wages and salaries	2,500	(500)			2,000	
Bank	20,000				20,000	
Cash	10,040				10,040	
Office equipment	80,000				80,000	
Bad debts		200			200	
Accruals				1,000		1,000
Prepayments		500			500	
Depreciation expense		4,000			4,000	
Acc. depreciation				4,000		4,000
Increase in AFDA		20			20	
AFDA				20		20
	155,200		155,200		160,220	160,220
			0.00			0.00

Using the information to construct financial statement



	A	B	C	D	E	F	G	H	I
63					0				
64			Income statement for the year ended				0		
65								$	$
66		**Sales**							0
67		*Less*	Return inwards						0
68									0
69	*Less*	**Cost of goods sold**							
70			Opening inventory					0	
71			Purchases					0	
72								0	
73			Carriage inwards					0	
74								0	
75		*Less*	Return outwards					0	
76								0	
77		*Less*	Closing inventory					0	0
78		**Gross Profit / (Gross loss)**							0
79		**Revenues**							
80			Interest income						0
81			Rental income						0
82			Discount received						0
83									0
84	*Less*	**Expenses**							
85			Carriage outwards		0			0	
86			Entertainment expenses		0			0	
87			Bad debts		0	0		0	
88			Rent and rates		0	0	0	0	
89			Wages and salaries		0			0	
90			Electricity		0	0		0	
91			Increase in AFDA						
92			0	0%	0	0	0%	0	0
93		**Net profit / (Net loss)**							0
94					0				
95				Balance Sheet as at			0		
96							$	$	$
97		**Non-current assets**					Cost	Acc Dep	NBV

Setter-no-dep

Example 46

Developing Integrative Learning Capabilities through Project Learning

Key Stage: 3

Curriculum: Cross-KLAs

Emphasis: STEM education/The ability to integrate and apply knowledge and skills

Project Topic: A weekly menu for a school lunch box supplier

Project Scenario:

Students are required to design a healthy diet menu for use by the lunch box supplier of their school, in order to fulfill the needs of students in acquiring healthy and quality food within the school. Students are required to:

- design a weekly menu for the lunch box supplier
- design and prepare dishes of the weekly menu
- prepare a presentation with following items for the lunch box supplier to be presented to the Parent-Teacher Association
  - select food items to be included in the weekly menu supported by market research and results of consumer testing with statistical graphs
  - a production plan with budgets, processing procedures, list of materials and equipment needed
  - packaging and logistic arrangement
  - promotion strategies, in particular the development of healthy lifestyle among teenagers

KLA	Learning Content
Technology Education	• Use of computer network • Application of resources for design work • Choice and use of material process, tools, equipment and machines for realisation of design solutions • Planning and organising work in steps or procedures • Resources and marketing • Food groups, dietary goals and eating habits and meal planning • Functional properties of food and food tests • Principles and skills, hygienic and safe practices in food preparation • Food product development – using a design cycle to create and develop food products to meet the design specifications of a task (e.g. address the health concerns of teenagers and sensory requirements of the products) • Healthy lifestyle/sedentary lifestyle/unhealthy lifestyle

Science Education	• Common food substance • Function of food substance • Food pyramids • Balanced diet • Healthy lifestyles
Mathematics Education	• Estimation and measurement • Collect and organise data • Construction and interpretation of statistical graphs • Measures of central tendency

In this activity, teacher adopts a cross-disciplinary integration approach to integrate the learning of Science education KLA, Technology education KLA and Mathematics education KLA. The project itself is arranged as an independent activity. Learning elements from different KLAs would be drawn in by the students themselves or by the teachers during the course of the project learning activity.

In the beginning, the teacher chooses an authentic problem which most students would be concerned. Quite often, there are students complaining about the taste, quality and quantity of the lunch boxes provided by the school canteen. On the other hand, the nutritional values of lunch boxes are also an issue related to the health of teenagers. Therefore, teachers can ask students to conduct a project to design a healthy diet menu for the lunch box supplier, to meet with the needs of healthy and quality food in school.

Starting from the essential question, plenty of learning opportunities can be provided for the students to construct, integrate and apply knowledge and skills from different KLAs. Students conduct market research including trends in the marketplace, meal patterns, recommended daily intake of teenagers, packaging materials for food products, logistic management etc. They design and develop prototypes and carry out consumer testing to collect views from their fellow students. Students can also apply computational skills to calculate and analyse the nutritive values of different prototypes. After proper analysis, student have to prepare a presentation for the lunch box supplier to be presented to the Parent-Teacher Association for considerations.

During the progress of the project, teachers can provide proper guidance and feedback, resources and assistance to their when needed.

Examples of implementation of project:

Example 1 – aligning STEM subjects

Week	Delivery of related learning elements through three KLAs		
1-8		Science Education	
7			Mathematics Education
8 – 12	Technology Education		
13	Presentation and evaluation		

Example 2 – collaboration among STEM subjects

Week	Delivery of related learning elements through three KLAs		
Between 1 – 8	Technology Education	Science Education	Mathematics Education
9 – 16			
17 - 22	Presentation and evaluation		

Example 3 – STEM week

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction and information search	Related theories and concepts of three KLAs	Design and development of prototype	Data collection and interpretation	Presentation and evaluation

Example 47

Cross-curricular Project Learning for STEM Education

Level： KS3 - Secondary One
Project: An environmental friendly greenhouse

Scenario:
Students are requested to build a model of an environmental friendly greenhouse for which the user can create an environment with adjustable temperature/humidity to facilitate the growth of plants.

Flexible Implementation Modes:
(i) Aligning teaching elements of STEM Subjects;
(ii) Collaboration among STEM Subjects; or
(iii) STEM Week.

(A) Key Features

In this project learning activity, students are expected to integrate and apply knowledge and skills from Science, Technology and Mathematics (STEM) Education through a hands-on design project, which may include the following learning elements from STEM subjects:

Science
- Understand the essential living conditions of growing plants
- Understand and utilise natural resources in daily life, such as solar and water
- Understand the concepts of energy changes, heat transfer and water conservation
- Verify assumptions and design concepts through Investigation and experiments

Technology
- Understand and utilise stable structure in the design and construction of green house
- Understand and construct simple circuit for electrical appliances
- Use tools, machines and equipment to process appropriate materials
- Understand CAD and CAM (3D printing) through design and make of 3D components for the greenhouse

Mathematics
- Understand and apply mathematical concepts and skills to solve scientific and technological problems, such as finding surface areas and volumes, and plotting graphs

(B) Prerequisite Knowledge in General Studies and Mathematics at Primary School

The Greenhouse project is designed for S1 students to integrate their STEM knowledge and skills without requiring sophisticated technological skills and advanced scientific knowledge. However, the following prerequisite knowledge and skills from the KS1 and KS2 could help S1 students to scaffold their learning to the expected learning outcomes.

	General Studies	Mathematics
KS1	• Common materials	• Calculates the perimeter and area of the polygon • Read and create line charts • Use the cuboid volume formula • Understanding cylinder and cone
KS2	• Testing of shower head • Essential elements for growing plants • The design of skyscraper	

(C) Task Definition

Through an integrated project approach, connected learning tasks could be organised to apply essential knowledge, concepts and skills from STEM subjects in an authentic context. A wide variety of learning tasks suggested for STEM subjects which students can work together in groups, including:

Scientific Investigations and Exploration

- Devise water-conserving methods for irrigation of the plants in the greenhouse
- Conduct fair tests to explore ways to maintain the temperature/humidity in the greenhouse
- Investigate how the orientation of the solar panels affects the electrical power generated for use by the exhaust fan in the greenhouse

Design and Make

- Design and make a greenhouse model with wood strips and polycarbonate sheets
- Design and make a solar powered exhaust fan to control the temperature/humidity inside the greenhouse
- Design and make a rain water collection, storage and pumping system for watering the plants
- Design and make the required components/parts for the greenhouse with 3D CAD software and 3D printer
- Test the structure and functions of the greenhouse

Problem Solving with Mathematical Skills

- Investigate the surface areas of greenhouses having the same volume but of different shapes
- Calculate the amount of materials needed for building the greenhouse model
- Draw figures and graphs to present data collected, e.g. temperature, humidity

(D) Relevant Learning Elements in STEM Subjects

When engaging in this project learning activity, students will require the following learning elements from STEM subjects, teachers may need to adjust the teaching sequence to facilitate the project learning activities.

Science	Technology	Mathematics
● Water purification ● Water conservation and pollution ● Energy sources: solar energy ● Energy: forms, conversion, conservation ● Heat transfer: conduction, convection and radiation ● Science process skills (e.g. designing investigations, conducting practical, inferring, communicating)	● Design process and design considerations ● Appropriate choice and use of materials and structures ● Appropriate choice and use of tools and equipment ● Electrical control system and devices ● Computer-aided manufacturing : 3D Printing ● Information processing and information processing tools	● Finding surface areas and volumes, i.e. amount of materials needed ● Presenting the design using 3-D drawings ● Plotting graphs of temperature of the greenhouse against time

(E) Intended STEM Learning Tasks Outcomes

This STEM project is intended to integrate and apply essential knowledge, concepts and skills from STEM subjects in an authentic learning experience, the following outcomes/products could be achieved:

Scientific Investigation	Design and Making	Problem Solving with Mathematical Skills
● Scientific investigation/ testing report on: ▶ ways to conserve water in daily use ▶ possible means to purify muddy water ▶ factors affecting conduction, convection and radiation ▶ ways to keep the temperature constant ▶ efficiency of electricity generated with a solar cell	● A functional greenhouse model with a solar powered exhaust fan to control the temperature ● A rain water collection and purification sub-system for watering the plants	● A greenhouse design having a reasonable ratio of volume to material consumption ● Figures and presentation charts of experiment results

(F) Flexible Implementation Modes

This STEM project could be implemented according to school's unique situation and curriculum setting; individual school could consider the following modes of implementation.

Mode 1 – **Aligning teaching elements of STEM Subjects**

Teaching sequence of related topics in STEM subjects are aligned within a certain period of a school term to facilitate the scaffolding of essential concepts.

Week	Science lessons	Technology lessons	Mathematics lessons
1 – 6	● Explore ways to conserve water in daily use ● Explore possible means to purify muddy water ● Conduct investigations on factors affecting conduction, convection and radiation ● Explore ways to keep the temperature constant ● Generate electricity using a solar cell		
7			● Investigate the surface areas of greenhouses having the same volume but of different shapes ● Calculate the amount of materials needed for building the greenhouse model ● Drawing figures and graphs to present data collected
8 - 12		● Design and make a greenhouse model with wood strip and polycarbonate sheet ● Design and make a solar powered exhaust fan to control the temperature inside the greenhouse ● Design and make a rain water collection and purification system for watering the plants ● Design and make the required components with 3D CAD software and 3D printer	

13	● Realisation and evaluation of greenhouse design, including: ▶ Scientific investigation/testing report with surveys and presentation charts; and ▶ A functional greenhouse model.

Mode 2 – **<u>Collaboration among STEM Subjects</u>**
Learning and teaching of related topics in STEM subjects commence concurrently in order to facilitate the integration of knowledge and skills collaboratively.

<table>
<tr><th>Week</th><th>Science lessons</th><th>Technology lessons</th><th>Mathematics lessons</th></tr>
<tr><td>1 - 8</td><td>● Explore ways to conserve water in daily use
● Explore possible means to purify muddy water
● Conduct investigations on factors affecting conduction, convection and radiation
● Explore ways to keep the temperature constant
● Generate electricity using a solar cell</td><td>● Design and make a greenhouse model with wood strip and polycarbonate sheet
● Design and make a solar powered exhaust fan to control the temperature inside the greenhouse
● Design and make a rain water collection and purification system for watering the plants
● Design and make the required components with 3D CAD software and 3D printer</td><td>● Investigate the surface areas of greenhouses having the same volume but of different shapes
● Calculate the amount of materials needed for building the greenhouse model
● Drawing figures and graphs to present data collected</td></tr>
<tr><td>9 - 16</td><td></td><td></td><td></td></tr>
<tr><td>17 - 22</td><td colspan="3">● Realisation and evaluation of greenhouse design, including:
▶ Scientific investigation/testing report with surveys and presentation charts; and
▶ A functional greenhouse model.</td></tr>
</table>

Mode 3 – **STEM Week**

Learning activities in STEM subjects were fully integrated as a holistic learning experience within a week.

Day 1	Day 2	Day 3	Day 4 - 5
● Introduction and information search ● **[SE]** Explore ways to conserve water in daily use ● **[TE]** Design and make a greenhouse model with wood strip and polycarbonate sheet ● [**ME]** Investigate the surface areas of greenhouses having the same volume but of different shapes	● **[SE]** Explore possible means to purify muddy water ● **[SE]** Conduct investigations on factors affecting conduction, convection and radiation ● **[TE]** Design and make a rain water collection and purification system for watering the plants ● **[ME]** Calculate the amount of materials needed for building the greenhouse model	● **[SE]** Explore ways to keep the temperature constant ● **[SE]** Generate electricity using a solar cell ● **[TE]** Design and make a solar powered exhaust fan to control the temperature inside the greenhouse ● **[TE]** Design and make the required components with 3D CAD software and 3D printer ● **[ME]** Drawing figures and graphs to present data collected	● Realisation and evaluation of greenhouse design, including: ► **[SE] [ME]** Scientific investigation/ testing report with surveys and presentation charts; ► **[TE]** A functional greenhouse model.

Remarks: *[SE]: Science Education; [TE]: Technology Education; and [ME]: Mathematics Education.*

(G)Notes to the Teachers

The implementation of STEM project is a new initiative to schools which requires substantial support and joint effort from various stakeholders. Teachers should be aware of the following areas when devising STEM project in school:

- Teachers' readiness for collaboration and acquiring new skills;
- Engaging students' learning, with authentic learning experience;
- Schools offer an open and flexible curriculum framework and implementation modes;
- Resources available including makers' space and resources materials; and
- Stakeholders' support and involvement.

Example 48

Developing Students' Coding Capability: Simulation package for the Cat to Find the Mouse

Key Stage: 3

Curriculum: Cross-KLAs

Emphasis: STEM education/Developing student's computational thinking

KLA	Learning Content
Technology Education	• Program coding • Program debugging/testing
Science Education	• Law of reflection
Mathematics Education	• Rectangular co-ordinate system

In this activity, a plane mirror is used as an authentic context to develop students' computational thinking, including coding skills, testing, and debugging. Students need to apply their knowledge about light reflection acquired in Science lessons as well as rectangular co-ordinate system in Mathematics lessons so as to complete the task.

Teacher uses Scratch develops package to show how a cat can find a mouse through a plane mirror. Concept of light reflection will be involved to show how image is seen through the plane mirror.

Activity 1

Students run the Scratch (Cat sees Mouse) program developed by teacher. The plane mirror is dragged to a defined position. Image is formed through the light ray reflected by the plane mirror. Through the path of the light ray as shown, the object (i.e. the mouse) can be seen by the cat (Figure 1 refers). After execution of the program, students are required to read and learn about the program codes. Teacher may lead students to experiment by changing different parts of the codes, including the position of the plane mirror, the inclination angle of the plane mirror so as to have different results. Hence, students experience program testing and debugging while at the same time learn about co-ordinate system as well as consolidate their learning about law of reflection.

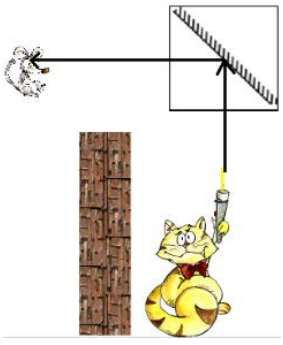


Fig. 1 Light ray shown

Activity 2

Now, the position of the object (the mouse) is changed. The mouse stays behind the wall and additional plane mirrors are provided. Students are required to modify the Scratch program by selecting appropriate plane mirrors as well as moving the plane mirrors to the appropriate position so as to enable the mouse be seen by the cat again. With the experience from Activity 1, students can make reference to the law of reflection so as to position the plane mirrors at appropriate place by modifying the codes in the program. In this activity, students also need to apply knowledge of the rectangular co-ordinate system so as to move the plane mirrors to the positions correctly.

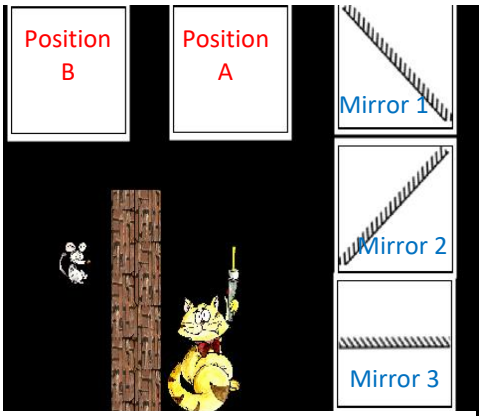


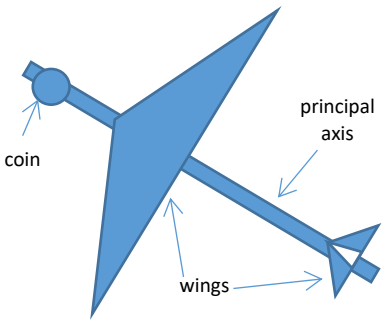
Fig.2 Light reflection with two mirrors

Example 49

Learning Technology through Project Learning at the Primary Level

Key Stage: 1 and 2

In General Studies lessons, Primary 2 students work on a small group project to design and make a toy airplane. They are required to assemble and test various materials so as to create an airplane with the highest stability/longest flight distance. Through the project, students develop an understanding of the properties of different materials and their applications (light/heavy/solid/hollow)



Primary 6 students can take a step further by designing the wing shape for a streamlined airplane so as to reduce air friction when flying, and by changing the wing position along the principal axis to achieve “force-balance”. Through this simple inquiry activity, students develop an understanding of the relationship between the shape of an airplane and its flight characteristics via application of the design cycle.

Example 50

Fostering Deep Learning in Technology Education

Example of HIJ School

Level: **Key Stage 3 and 4**

Feature: HIJ School makes use of projects/competitions as vehicles for providing authentic experiences for students to apply their learning in technology education (TE) subjects into real life contexts.

The authentic experiences from participating in these projects/competitions enable students of the HIJ School to:

A. Enhance their technological literacy

For example, through inventing new things (such as portable air-quality & weather measuring system), students demonstrated their abilities to:

- identify problem
- e.g. insufficiency of the existing air-quality index to provide geographically close data for target group's reference in the project/competition (technology capability)
- apply knowledge in designing, making and evaluating the product, system and solution
- e.g. application of their computer knowledge on programming and networking in designing and making of a new air-quality and weather measuring system (technology understanding)
- be aware of the impact of technology
- e.g. realisation of how patients with chronic illnesses could be benefited from the more accurate air quality and weather information (technology awareness)

B. Engage in deep learning

For example, through performing the following tasks, students developed the **6 competencies** in deep learning:

- design and make the products with **creativity**
- realise their **citizenship** from addressing the needs and problems of people and the environment
- work in teams for **collaboration** in the design and making process

- exchange their project ideas through **communication**
- analyse and use data and information to evaluate the products with a **critical thinking** mindset
- develop their **character** such as hard working, perseverance and self-confidence through the projects

Fostering Deep Learning (DL) through 'New Pedagogies'[9]

The following table shows the key features of 'new pedagogies' (Fullan, 2014) as well as the practical arrangements and ways of HIJ School to foster deep learning in technology education:

<table>
<tr><td colspan="2">Key Feature 1 : New Learning Partnership</td></tr>
<tr><td>Ways to Foster DL</td><td>Practical Arrangement</td></tr>
<tr><td>• Relationships
- Teacher became co-learners with students.
- Human relationships were leveraged as part of learning enterprise.
• Learning to Learn
- Students mastered the learning process by defining their own learning goals and success criteria; monitoring their learning and critically examining their own work etc.</td><td>• Students worked in groups for the projects/competitions within or outside school.
• Learning clusters among students were set up and graduates working in related fields (e.g. IT experts, makers, entrepreneurs in IT industries) were invited to give advices/suggestions to students.
• Teacher provided more guidance at the beginning to help students brainstorm the idea of projects (e.g. brainwave, sensors, etc.) and formulate marketing strategies for setting up proper themes and directions. Frequent encouragement and step-by-step assistance were needed as students easily gave up during the process.</td></tr>
<tr><td colspan="2">Key Feature 2: Deep Learning Task</td></tr>
<tr><td>Ways to Foster DL</td><td>Practical Arrangement</td></tr>
<tr><td>• Re-structure Learning Activities
- Teachers re-arranged students' learning of curricular content in more challenging and engaging ways towards a guided learning goal.
• Create and Use New Knowledge</td><td>• Learning element of programming concepts in computer subjects at junior and senior secondary levels were enriched to enhance students' interest and aspiration in learning information and communication technology.
• Students' programming skills at junior secondary level were consolidated through the learning of programming physical objects (e.g. IQ Bug) with flow-charts in computer lessons. Besides, more</td></tr>
</table>

[9] Michael Fullan & Maria Langworthy, 2014, A Rich Seam – How New Pedagogies Find Deep Learning

- Students integrated prior knowledge with ideas, information and concepts into a brand-new product, concepts or solution.	challenging tasks were designed for learning and teaching. • A clear and challenging learning goal for both teachers and students was set: "From Apps user to Apps creator". Students were then engaged to integrate prior programming skills with more advanced programming languages (e.g. from C to C#) in their study.
Key Feature 3: Digital Tools and Resources	
• ***Put learning and pedagogies first*** - Teacher focused first on student learning goal, second on pedagogy, and third on technology to facilitate and accelerate student learning in a high-level standard. • ***Make use of digital tools to enable content discovery, collaboration, creation and use of new knowledge*** - Learning partners used technology to construct knowledge, investigate and solve real problems, assess one another's work, give each other feedback, collaborate and communicate with peers, experts and others throughout the world etc.	**Practical Arrangement** • Teacher employed digital tools and resources (such as App Inventor) to facilitate student learning under the new pedagogical approach of "From App users and App creator". • Students used on-line resources and tools (such as cloud storage) to make visible of their learning process, and enable them for a more inclusive and connected learning with their team-mates. • Students used Internet as a powerful source to discover and master new content knowledge for their self-directed learning in projects/competitions. They also used various analytical software and multi-media presentation tools to perform quantitative analysis and visual display of findings in the ways that they would be expected to work in the future.

<u>Reflection</u>

The principal of HIJ School initiated the introduction of more programming elements in the learning of computer subject at junior secondary level several years ago. It demonstrated the importance of having "new change leadership", in which both principals and middle managers set up clear learning and teaching direction and the learning conditions were shaped by leaders from all levels as catalysts of changes.

Moreover, the teacher in HIJ School found his effort paid off as s/he witnessed the deep learning outcomes of the students. It demonstrated the balance of costs and benefits bring about from the "new system economics", in which the costs of investing human and capital resources in the capacities and policies needed for effective implementation of the

new pedagogies would be counter-off by the strong potential of improved student learning outcomes from deep learning.

Appendices

Appendices

Appendix 1

Technology Learning Activity

When designing Technology Learning Activity (TLA), 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' specialties, 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:

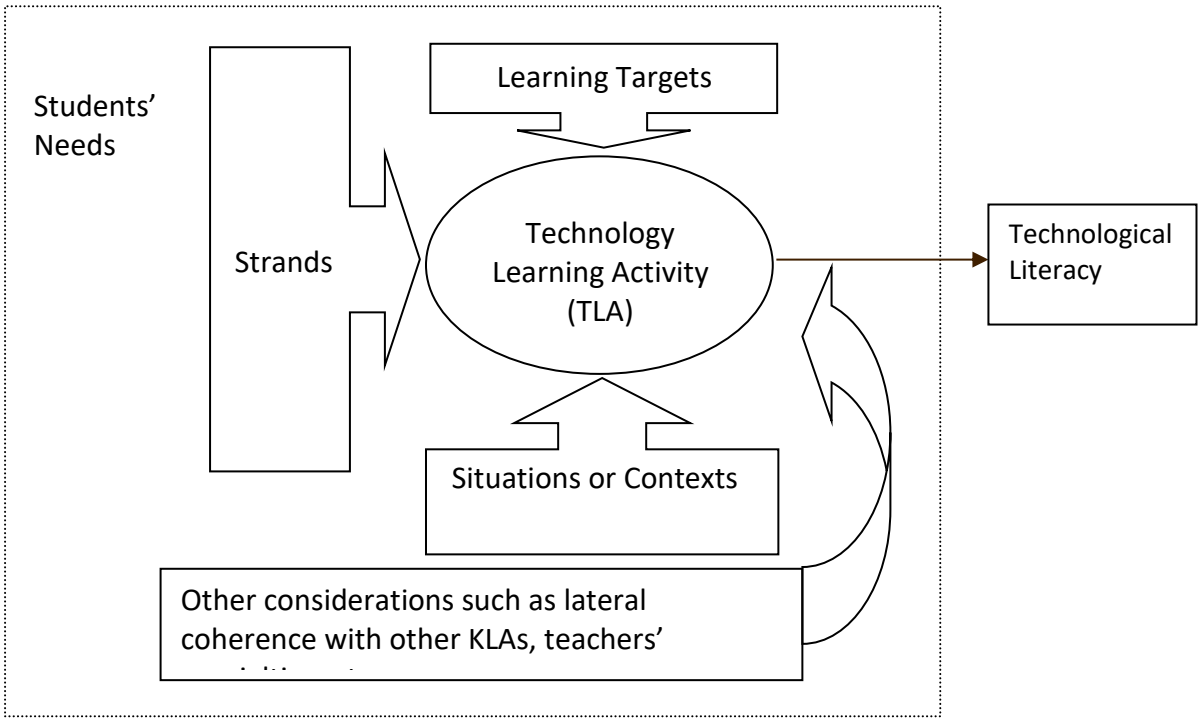


Figure on Schema for Formulating TLA

TLA 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 organisation of relevant information, employing this and other knowledge already acquired to make informed decisions;
- Development of a solution through an interaction between the initial plan and the perceived reality;
- Planning, organising and managing the realisation 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 above mentioned activities or to go through them in any particular order. There is no standard solution to a technological problem. Students should be encouraged to generate alternatives or multiple solutions to nurture creativity, and compare them critically to further enhance their critical thinking skills.

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International Technology Education Association	http://www.iteawww.org/
International Technology and Engineering Education Association	http://www.iteea.org/
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