Ongoing Renewal of the School Curriculum –

Focusing, Deepening and Sustaining

Updating the Technology Education Key Learning Area Curriculum

(Primary 1 to Secondary 6)

Consultation Brief

Curriculum Development Council
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Contents

Preamble

Ongoing Renewal of the School Curriculum – Focusing, Deepening and Sustaining

The Learning to Learn curriculum reform that started in 2001 has been promoting curriculum and pedagogical change that fosters learners' whole-person development and learning to learn capabilities to achieve lifelong learning. Over the past decade or so, much has been achieved in schools through the implementation of the reform. To mention a few of the achievements, the curriculum reform has brought about a new breed of students who are more proactive and in possession of greater learning agility and stronger transferable skills; the strength of our students' performance in mathematics, science and reading in Chinese is internationally recognised; teachers have achieved a paradigm shift from teacher-centred classroom practices to learner-centred learning; the assessment culture in schools has changed with greater emphasis placed on assessment for/as learning; and there is increasing collaboration among teachers within and across schools.

Alongside the implementation of the Learning to Learn curriculum reform, there have been a lot of changes and challenges in our society and around the world, such as those observed in economic, scientific, technological and social developments. To maintain Hong Kong's competitive edge and to prepare our students well for the local and global changes taking place in various fields, it is necessary to enhance the Learning to Learn curriculum reform, to sustain and deepen the accomplishments achieved and to identify new focuses in the curriculum as we move to a new phase of curriculum renewal and updating.

Capitalising on the positive impacts and experience gained, the curriculum renewal (also known as "Learning to Learn 2.0") being introduced is an enhanced version of the Learning to Learn curriculum reform that started in 2001. It is not an "add-on" but a continual journey to work smarter and in a more focused manner in promoting Learning to Learn for the next five to ten years. In this new phase of curriculum renewal, the curriculum will remain learner-centred and continue to focus on learning, particularly the improvement of its quality and effectiveness. However, to closely respond to various contextual changes locally and globally, more attention is given to the development of personal attributes expected of our students across Key Learning Areas (KLAs) in the coming decade, and focuses such as Reading across the Curriculum, Information Literacy, as well as Science, Technology, Engineering and Mathematics (STEM) Education will be given stronger emphasis with renewed understanding of learning goals, generic skills and values and attitudes.

In response to the new phase of curriculum renewal, the *Basic Education Curriculum Guide (Primary 1-6)* was updated in mid-2014. The corresponding *Secondary Education Curriculum* Guide and the curriculum guides for the various KLAs are also being updated and will be available for schools' reference in 2016 upon the completion of consultation. Schools are encouraged to sustain, deepen and focus on areas deemed essential for further improving students' independent learning capabilities.

This consultation brief presents the major updates related to the Technology Education Key Learning Area (TEKLA) and the key emphases for the ongoing curriculum renewal proposed for schools' adoption. Examples are also provided to illustrate how these considerations are achieved through this Key Learning Area (KLA), particularly in the

aspects of learning aims/targets/objectives, curriculum planning as well as learning, teaching and assessment. Schools may formulate plans to incorporate these recommended updates and the key emphases for the ongoing curriculum from the 2016/17 school year, taking into consideration the school context, teachers' readiness and students' needs. As the recommendations proposed in this Brief have a direct bearing on school-based curriculum development over the next decade and set new directions for future curriculum updating and renewal and chart the way forward for sustaining the existing curriculum reform, we would like to solicit views and feedback from stakeholders, in particular the school sector. Comments and suggestions on this Brief are welcome and should be sent by 4 January 2016 to:

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1. Why and how is the technology education curriculum updated?

The *Technology Education Key Learning Area Curriculum Guide (Primary 1-Secondary 6)* (2016) 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.

The technology education curriculum comprises a set of interlocking components including: subject knowledge and skills which are expressed in the form of learning targets under the strands of ***Knowledge Contexts in Technology***, ***Process in Technology*** and ***Impact of Technology***, as well as learning objectives; generic skills; positive values and attitudes. The updated version has highlighted the STEM[1] education as the focus of development and incorporated other updated elements of the school curriculum such as the updated learning goals, refined generic skills. Major constituents of the technology education curriculum include the primary General Studies curriculum for Primary 1 to 6, the enriched TEKLA curriculum for Secondary 1 to 3 and Business, Accounting and Financial Studies, Design and Applied Technology, Health Management and Social Care, Information and Communication Technology, and Technology and Living curricula for Secondary 4 to 6.

With an aim to providing students with a solid technology education (TE) foundation in junior secondary, the learning elements in the ***Technology Education Key Learning Area Curriculum Guide*** have been reviewed and enriched. Schools are recommended to offer core learning elements under the enriched TEKLA curriculum to students at the junior secondary level starting from Secondary 1 in the 2014/15 school year and progressively up to the next level. For details, please refer to the Education Bureau Circular Memorandum No. 87/2013.

In response to the changing needs of the 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 education as revealed from international studies and local surveys, the curriculum emphases of the TEKLA have been updated, together with the aims, targets and objectives of science education at different key stages to highlight the updated elements of the ongoing renewal of the school curriculum, especially STEM education. Given that elements of STEM education are already embedded in individual KLAs of Science Education, Technology Education and Mathematics Education of the local 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.

Besides, with no change in the broad framework, the following major areas are put forth to reflect the changing contexts and education trends, and to provide suggestions for the

[1] STEM is an acronym that refers to the academic disciplines of Science, Technology, Engineering and Mathematics.

development and implementation of the TE curriculum for now and in the five to ten years to come:

- Strengthening the ability to integrate and apply knowledge and skills among students through **STEM** education
- Emphasising **technological literacy**, through the cultivation of technological capability, technological understanding, and technological awareness, for a solid foundation on knowledge and skills, development of generic skills, as well as values and attitudes.
- Highlighting other elements of the ongoing renewal of the school curriculum, such as **generic skills, values and attitudes, Language across the Curriculum (LaC) and Information Literacy (IL)** in planning and implementing the school-based TE curriculum
- Promoting **e-learning** to motivate students' interest in learning technology education, enhance interaction and collaboration, and facilitate self-directed learning, with relevant measures in parallel to strengthen **Information Literacy** of students
- Emphasising the importance of **holistic curriculum planning** and the process of **P-I-E** (Planning-Implementation-Evaluation) for successful implementation of emphases and sustainable development of technology education in schools
- Stressing the continuous need to **cater for learner diversity** in technology education with appropriate attention to students of different learning needs and styles, including ordinary students, students with special education needs (SEN) and gifted students

2. What are the Major Updates?

2.1 Fine-tuning the curriculum aims

2.1.1 Seven learning goals

There was a consensus on the seven learning goals in the school community as informed by feedback from various channels and they were considered appropriate for continuing to serve the needs of student learning for the 21st century. These seven learning goals would continue to focus on promoting the whole-person development and lifelong learning capabilities of students, while revisions are made to take into consideration the changes in society as well as the experience gained in the curriculum reform at the school and KLA levels. The TE currciulum aims to develop ***technological literacy*** in students through the cultivation of technological understanding, technological capability, and technological awareness. The aims are aligned with the seven updated learning goals of school curriculum as follows:

Curriculum Aims of TEKLA	**Updated Seven Learning Goals of the School Curriculum**
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	• to acquire and construct a broad and solid knowledge base, and to be able to understand contemporary issues that may impact on learners' daily lives at personal, community, national and global levels
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	• to develop and apply generic skills in an integrative manner, and to become an independent and self-directed learner for further study and work • to use information and information technology ethically, flexibly and effectively • to be proficient in biliterate and trilingual communication for better study and life
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	• to be 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 • to lead a healthy lifestyle with active participation in physical and aesthetic

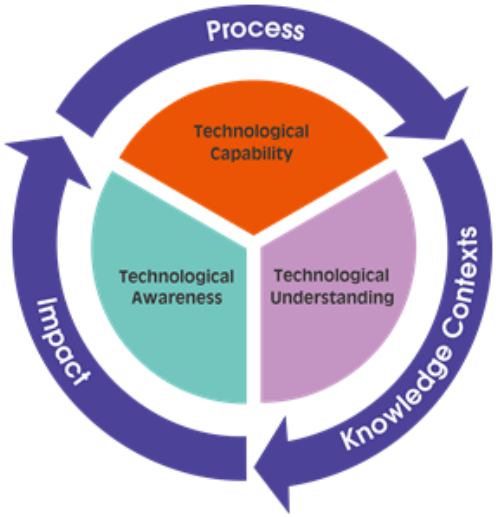
Curriculum Aims of TEKLA	Updated Seven Learning Goals of the School Curriculum
• be aware that the well-being of oneself, one's family, society and the natural environment depends upon decisions on how to use technological artefacts and systems appropriately	activities, and be able to appreciate sports and the arts • to understand one's own interests, aptitudes and abilities, and to develop and reflect upon personal goals with aspirations for future studies and future career

2.1.2 To illustrate the development of technological literacy in students, the following diagram is used to elaborate how the three ***strands*** of learning under TE, namely:

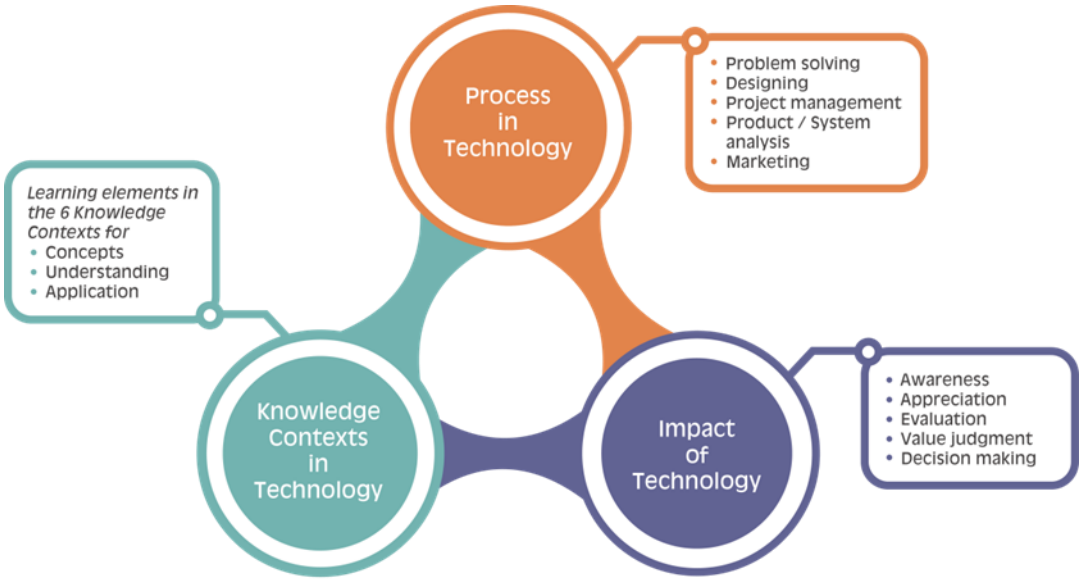
- Process in technology
- Knowledge contexts in technology
- Impact of technology

be woven together to cultivate the three aspects of ***technological literacy***, namely:

- Technological capability
- Technological understanding
- Technological awareness



Another diagram is added to emphasise that the nature of learning in TE should be a close ***connection*** among the three strands of learning. TE learning activities should be designed mainly through an integrated manner of the three strands.



Connection of the Strands in TE

2.1.3 In the section *Position of TEKLA in the School Curriculum*, two major messages are introduced:

- Phasing out of the subjects under the New Technical Curriculum (NTC) by the 2016/17 school year, as such the lists of "Subjects under TEKLA" were updated
- Updating the curriculum with the enriched TEKLA curriculum

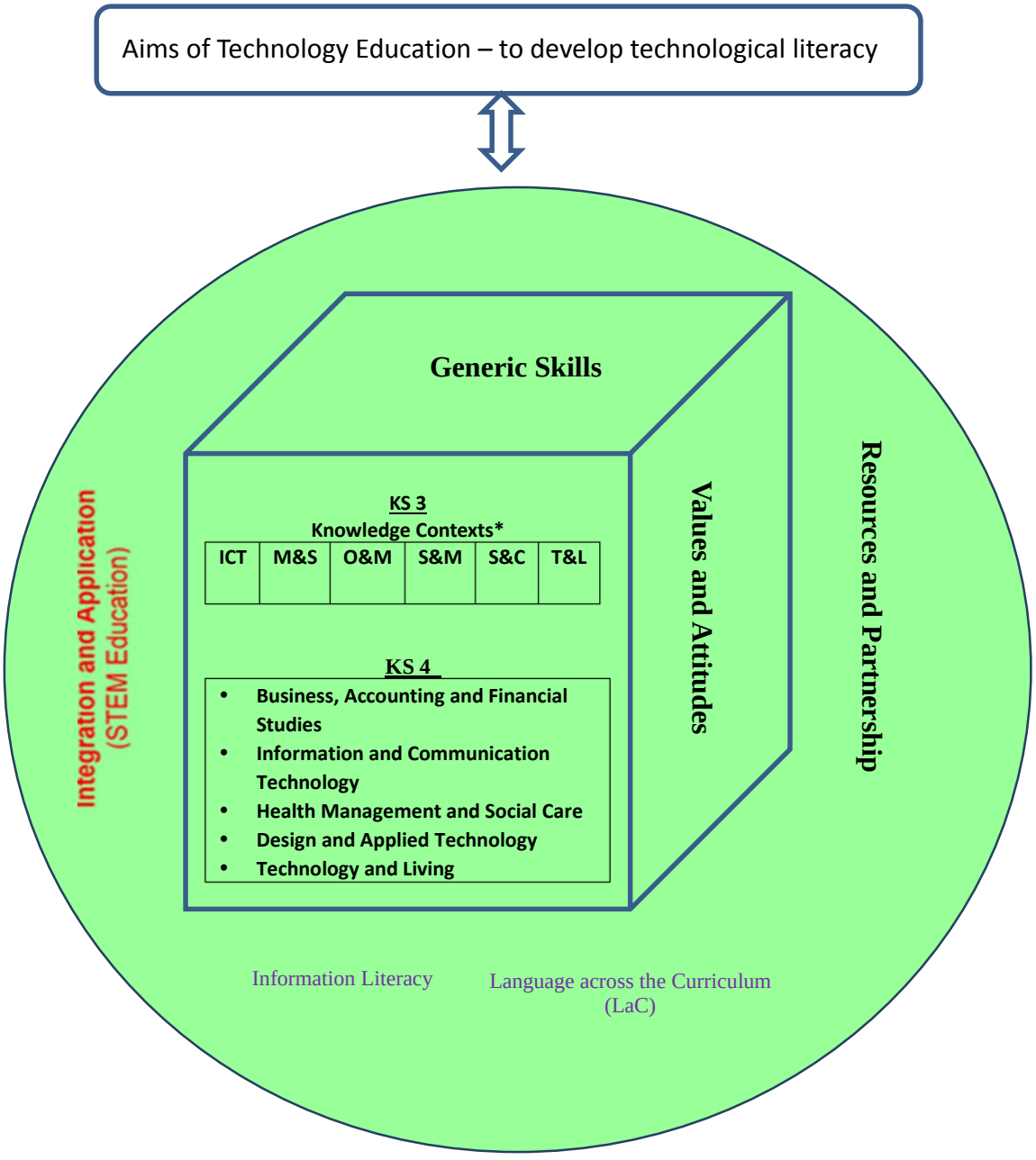
2.1.4 In the sections *Rationale and Direction for Development*, and *Strategies for Development*, the following major emphases are highlighted:

- The essential skills and qualities required in the 21st century with the emphases of enhancing students' creativity, innovation and problem-solving skills through integrative learning and application of skills, in particular STEM education
- The provision of TE learning experiences to enhance students' understanding on the quality of innovation and entrepreneurship in developing healthy lifestyle and financial literacy
- The importance of hands-on experiences and solving problems in authentic contexts
- The interfacing of different key stages should be strengthened
- TE subjects prepare students for lifelong learning

2.2 Updating the curriculum framework

2.2.1 The updated curriculum framework

The curriculum framework of TEKLA is updated as the following diagram.



*The six knowledge contexts for KS3:

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

2.2.2 Learning elements of TE

- At the junior secondary level (Key Stage 3), schools are recommended to implement a broad and balanced TEKLA curriculum so as to lay a solid foundation for students.
- Time allocated to the TE at the junior secondary level is recommended to be maintained at 8% – 15% (220 – 413 hours) of the school's total curriculum time.
- The three strands in TE curriculum framework are consolidated into learning elements which are grouped into 16 core and 10 extension modules under six knowledge contexts.
- Modular approach is proposed in implementing the enriched TEKLA curriculum at junior secondary level.
- 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.
- Content of the learning elements under the Knowledge Contexts in TE were specified in the respective learning modules of the enriched TEKLA curriculum. More details about the content of the learning modules are in Appendix 4.
- In this curriculum, schools are recommended to allocate at least 30% of curriculum time in teaching programming concepts (including coding) under Information & Communication Technology (ICT) learning element at junior secondary level.

- The learning modules under the six knowledge contexts with their objectives are listed as follows.

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**, E denotes **Extension modules**.

2.2.3 Promoting STEM education in Schools

- In the local curriculum context, STEM education is promoted through Science, Technology and Mathematics Education KLAs. The aim of promoting STEM education in schools is to strengthen the Science, Technology and Mathematics Education to nurture diversified talents in the science and technology fields for enhancing the international competitiveness of Hong Kong with specific objectives including:
  - To develop among students a solid knowledge base and to enhance their interests in Science, Technology and Mathematics for further studies and careers in meeting the changes and challenges in the contemporary world
  - 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
  - To strengthen the professional capacity of and collaboration among teachers in schools and the partnerships with community stakeholders
  - To nurture talents and develop experts in STEM areas so as to contribute to the development of Hong Kong and its strategic position at the "Belt and Road" initiative

- 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 the societal environment and that the advancement in science and technology could help improve the quality of life in the contemporary world.

- The experiences of integrating and applying knowledge and skills to solve real-life problems and make inventions would help develop positive values and attitudes among students as part of whole-person development. These learning opportunities facilitate their career explorations in STEM fields and the nurturing of entrepreneurial spirit. This would not only enhance students' interest in STEM areas, but also enable them to prepare for their future studies and careers in the areas and other fields requiring relevant knowledge, skills and attitudes.
- The TEKLA contributes to the promotion of STEM education. Schools can strengthen students' ability to integrate and apply knowledge and skills, as well as develop their positive values and attitudes through:
  - developing among students a solid knowledge base and to enhance their interests in Science, Technology and Mathematics for their future specialisation in 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 Education, Technology Education 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

- STEM-related learning activities should bridge across the curricula of the KLAs of Science, Technology and Mathematics Education to enhance students' interest and innovation, and to develop their ability to integrate and apply knowledge and skills within and across KLAs. When planning and designing these learning activities, technology education teachers should closely collaborate with teachers of the Science and Mathematics Education KLAs to facilitate students' integration and application of knowledge and skills. Depending on the school context, students' interests and abilities, and teachers' expertise, two different approaches to provide STEM-related learning activities for students are recommended. It should be noted that these two approaches are not mutually exclusive.

- Examples of STEM activities are provided at the Appendices for teachers' reference on how to conduct learning activities in an integrative manner and the application of skills in authentic contexts. Two recommended approaches (Please refer to Appendix 3) can be adopted in arranging STEM learning activities:

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/KLA. Students are encouraged to integrate and apply the knowledge and skills learnt from other KLAs in their learning of the particular topic. For example, when students learn the topics about "Obesity & Slimming" or "Food & Chemistry" in science lessons, teachers may help students recap the learning contents related to food and nutrition, food preparation and processing, meal planning acquired in technology education lessons. The learning activity 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 science lessons.
Approach Two	<u>Projects for students to integrate relevant learning elements from different KLAs</u> A particular authentic problem is identified. Students are required to solve the problem as a project. In the progress, students explore the issues, bring in relevant learning elements from different KLAs and then integrate the knowledge and skills acquired as well as apply them in the authentic and a real life situation. For example, students divided in groups of four are tasked to work on a rehabilitation project to solve the problems of elderly people who live alone in the local community yet suffered from certain physical inabilities. Students should understand the needs of these elderlies. They may arrange visits to their homes or do surveys to identify the common problems they face. Students then analyse the survey results and explore possible actions

	to improve his/her living conditions. Then, they may decide on the possible solutions such as to design a smart device to help them control the electrical appliances at home, set up an alerting system when they need emergency help, or design an aid to help their washing up in the toilet. Once their decision was made, they need to integrate and apply the knowledge and skills learnt in science, technology and mathematics lessons to realise the proposed solution.

- Besides, we will continue to enhance students' problem-solving skills through equipping them with coding and programming-related capabilities. Teacher can design and make use of an authentic context to develop students' coding capability involving Science and Mathematics knowledge. An example is given at Appendix 2.

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

More details about the guiding principles and strategies for promoting STEM education in schools are elaborated in the document, *Overview on Promotion of STEM Education – Unleashing Potential in Innovation*.

2.2.4 Other key emphases of the ongoing renewal of the school curriculum

In the TEKLA Curriculum Guide, it has been highlighted in the curriculum framework about the importance of nurturing of *Values and Attitudes* as well as enhancing students' *Generic Skills*. With reference to the ongoing renewal of the school curriculum, the TEKLA curriulum framework is also further updated to incorpoate the following major aspects through infusion in its learning and teaching: Language across the Curriculum, and Information Literacy.

2.2.4.1 Refined generic skills

- Nine generic skills have been identified as essential for student learning for the 21st century in the school curriculum since 2001. Based on past experience of implementing the reform, as well as 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:

Basic Skills	**Thinking Skills**	**Personal and Social Skills**
Communication Skills	Critical Thinking Skills	Self-management Skills
Mathematical Skills[2]	Creativity	Self-learning Skills[3]
IT Skills	Problem Solving Skills	Collaboration Skills

Remarks: [2]NumeracySkills and [3]Study Skills were used respectively in *Learning to Learn: The Way Forward in Curriculum Development - Life-long Learning and Whole-person Development* (2001)

- In TE, problem solving, creativity, and critical thinking skills are of particular importance in learning and teaching which should be put at a more prominent position in curriculum planning and evaluation in TEKLA. However, they are closely connected with other skill groups and can never be treated in isolation.

- Whole-school curriculum and TEKLA

  TEKLA provides meaningful contexts for the development of generic skills through appropriate learning and teaching activities and specific topics alongside KLA/subject specific skills. Schools should plan TEKLA-related learning and teaching activities in a holistic manner whereby the generic/cluster of skills would be suitably and effectively applied and developed. TE activities such as design and make, case studies, product investigation and other technology-related theme-based learning allow students to be actively engaged in the learning process. They are the effective ways to develop generic skills.

2.2.4.2 Promoting values education

- Values education/cultivation of positive values and attitudes is an integral part of the school curriculum through different components in KLAs/subjects, moral and civic education, cross-curricular learning opportunities and life-wide learning experiences.

- According to the framework for moral and civic education provided by the Curriculum Development Council in 2008, the seven priority values and attitudes, which reflect both Chinese and Western cultures/values and address students' and societal needs, were identified as of vital importance for students' whole-person development. They are perseverance, respect for others, responsibility, national identity, commitment, integrity, and care for others.

- Schools are recommended to implement values education and cultivate positive values and attitudes related to individual, family, society, the country and the world as well as those values in accordance with the mission and contexts of their schools.

- Schools should adopt a whole-school approach to curriculum planning that closely connects with the KLAs/subjects, and design relevant learning experiences for students to nurture their positive values and attitudes. In TEKLA, values education can be carried out through relevant topics and appropriate learning and teaching activities that help students apply and reflect on the positive values and attitudes, or introducing different situations in which students are required to understand the issues from different perspectives, analyse them in a rational and objective manner, and adopt positive values and attitudes as the guiding principles to make judgment and decisions. For example:

  - choice of design to meet specific purpose
  - choice of materials for a specific design
  - choice of process, tools, equipment to realise a design

2.2.4.3 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. Helping students master the literacy skills, i.e. reading and writing skills, is central to language learning at school level. It is essential that literacy be also developed in different KLAs which provide the contexts for learners to apply their literacy skills to construct knowledge and to facilitate that development into lifelong learners. With the rapid development of information technology 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.

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

- TEKLA teachers can collaborate with English/Chinese 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 English/Chinese knowledge and relevant language skills
    - developing learning, teaching and assessment materials and activities that connect students' learning experiences
    - identifying a common topic between the TEKLA and English/Chinese Language for learners to read about and discuss, and assigning learning activities or tasks outside classroom to broaden learners' experience
    - providing learners with exposure to the text types typical of the TEKLA (e.g. procedure/instructions)
    - teaching KLA-specific language features and rhetorical functions (e.g. expressing reasons and explanations/cause and effect, comparing and contrasting, giving explanations) explicitly to facilitate the completion of the TEKLA-based tasks

- During the process of learning of technology, students need to read, understand, analysis, evaluate and always need to create written texts or materials for communication in the contexts of technology. Therefore, technology education teachers are encouraged to collaborate with teachers of the English Language/Chinese Language to promote language across the curriculum for more effective learning under technology education

as well as the English/Chinese languages.

- More co-ordinated planning and strengthened collaboration between teachers of the TEKLA and teachers of the English Language Education KLA/Chinese Language Education KLA can facilitate the implementation of LaC activities. The following are some examples that can enhance reading and writing in technology.

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

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

2.2.4.4 Strengthening Information Literacy (IL)

- IL is an ability and attitude that would lead to effective and ethical use of information. It aims to help students i) identify the need for information, ii) locate, evaluate, extract, organise and present information; iii) create new ideas; iv) cope with the dynamic in our information world; and v) use information ethically and refrain from immoral practices such as cyber bullying, infringing intellectual property rights. The Four Key Tasks will provide opportunities for students to develop and apply IL.

- Student learning requires the use of IL whenever necessary. TEKLA has a role to play in developing students' IL. IL could be developed through the application of the generic skills in the context of handling information in different media in our information world. It involves various knowledge contexts and links with KLAs/subjects and STEM education. Infusion of IL in the Technology Education KLA and the primary General Studies in schools would provide authentic contexts for students to apply the skills and gain experience in learning technology, and 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.

2.3 Pedagogies (including e-learning)

2.3.1 Approaches to learning and teaching

- TE learning is always purposeful with a problem as the context of study. TE learning also has a deliverable – such as an artefact, a system and is usually involving the use of both the hands and the mind.

- A variety of learning activities, such as classroom teaching, reading and information collection, designing and processing, out-of-school activities, can be used. The updated TEKLA Curriculum Guide encourages the integration of different dimensions of technology with the emphases of ongoing curriculum renewal.

2.3.2 Effective learning and teaching strategies for technology education

- Project Learning

  A project is a tool for both learning and assessment in TE. Project learning enables students to construct and connect knowledge, concepts, skills in TE and/or across different KLAs (such as STEM education) so as to integrate learning and application, as well as to nurture values and attitudes.

- Information Technology for Interactive Learning

  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. 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 in different media, such as drawing, pictures, videos or a combination of media.

  Computational Thinking (CT) is an approach to solve problems in a way that can be implemented with a computer. Students become tool builders instead of tool users. They use a set of concepts, such as abstraction, recursion, and iteration, to process and analyse data, and to create real and virtual artefacts. CT is a problem solving methodology that can be automated, transferred and applied across subjects. In particular, a computational thinker can take a problem and state it precisely for it to be potentially solvable by an algorithm. Once the problem has been stated in the right way, a computational thinker tries to construct an algorithm that solves it.

- e-Learning

  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 essence of e-learning is to enhance learning and teaching effectiveness in schools and helps develop students' necessary qualities (e.g. self-directed learning) for the 21st century. Teachers may develop a repertoire whereby e-learning may help enhance, modify and complement some existing learning and teaching strategies or break new ground in pedagogy.

  In line with the Fourth Strategy on Information Technology in Education, the use of e-learning to develop students' information literacy, self-directed learning abilities and habits is highly encouraged.

  In the context of TE, e-learning can be adopted through:

  - using simulation/modelling tools to help students learn through experience, such as networking simulation in Information and

Communication Technology, environmental building design in Design and Applied Technology which could provide instant feedback to students so as to facilitate self-directed learning.

- using mind mapping tools to promote collaborative learning, such as students worked in groups to use mind mapping apps to construct their concept maps about ecology and health in Health Management and Social Care so as to strengthen co-construction of their personal understanding of the contents.

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

2.3.3 Catering for learner diversity

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

- In organising TE learning/lesson, subject to the resources available, schools may:
  - design learning modules of different levels for the same knowledge context
  - provide a wider variety of technologies in the curriculum to attract the interests of different students
  - allow different modes of assessment so that students of different learning pace can grasp their progress, thus reducing the threat of test
  - encourage the accumulation of learning evidences and provide authentic hands-on learning experiences and reinforce the importance of both manipulative and problem-solving skills so that students of different orientations can find their own way to excel, and
  - encourage group work in TE so that students of different orientations, could learn to support each other in completing a task through collaboration.

- Schools may also make reference to core and extensions learning element in enriched TEKLA curriculum in designing activities for students with diverse learning needs.

- 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 learnt. Teachers can also put more challenging quizzes for more able students and audio vocabulary list for less able students on the platform to cater for learner diversity.

2.4 Assessment

2.4.1 Highlighting different modes of assessment for different purposes

- Assessment is in general divided into two modes: summative and formative, which are both valued in technology education. Summative assessment measures what students have learnt through tests and examinations. It can also be formative when it is used to measure student progress and understanding during teaching and learning in the classroom. There are two different approaches for formative assessment, namely assessment for learning and assessment as learning.

- In the updated TEKLA Curriculum Guide, introduction of e-assessment is included to facilitate the process of assessment activities. In addition, different modes of assessments i.e. assessment for learning, assessment of learning and assessment as learning are included so as to enhance the assessment literacy of teachers. Teachers can use different assessment modes and strategies to address different levels of performance and cater for learner diversity.

- *Assessment for learning* is that teachers collect a wide range of data so that they can modify the learning work for their students. Marking is not designed to make comparative judgments among students but to highlight their strengths and weaknesses and provide them with feedback that will further improve their learning.

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

- *Assessment as learning* involves students in the process of looking at their learning 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 the critical connector between them. This is the regulatory process in metacognition. It occurs when students monitor what they are learning and use the feedback from this monitoring to make adjustments, adaptations, and even major changes in what they understand. Assessment can also provide feedback to teachers as diagnostic tool to help identify students' learning problems as well as to improve their own teaching.

2.4.2 Assessment strategies useful for technology education

- Some common assessment strategies that technology teachers usually use in drawing up their assessment plans are:
    - project work assessment
    - task-based assessment
    - assessing essential manipulative skills
    - assessing knowledge and concepts
    - e-assessment

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

- One of the key benefits of e-assessment is the immediate feedback and result given to learners, either by the assessors or an automated marking process. Flexibility in allowing learners to take the assessments at any time anywhere also leads to greater learner engagement.

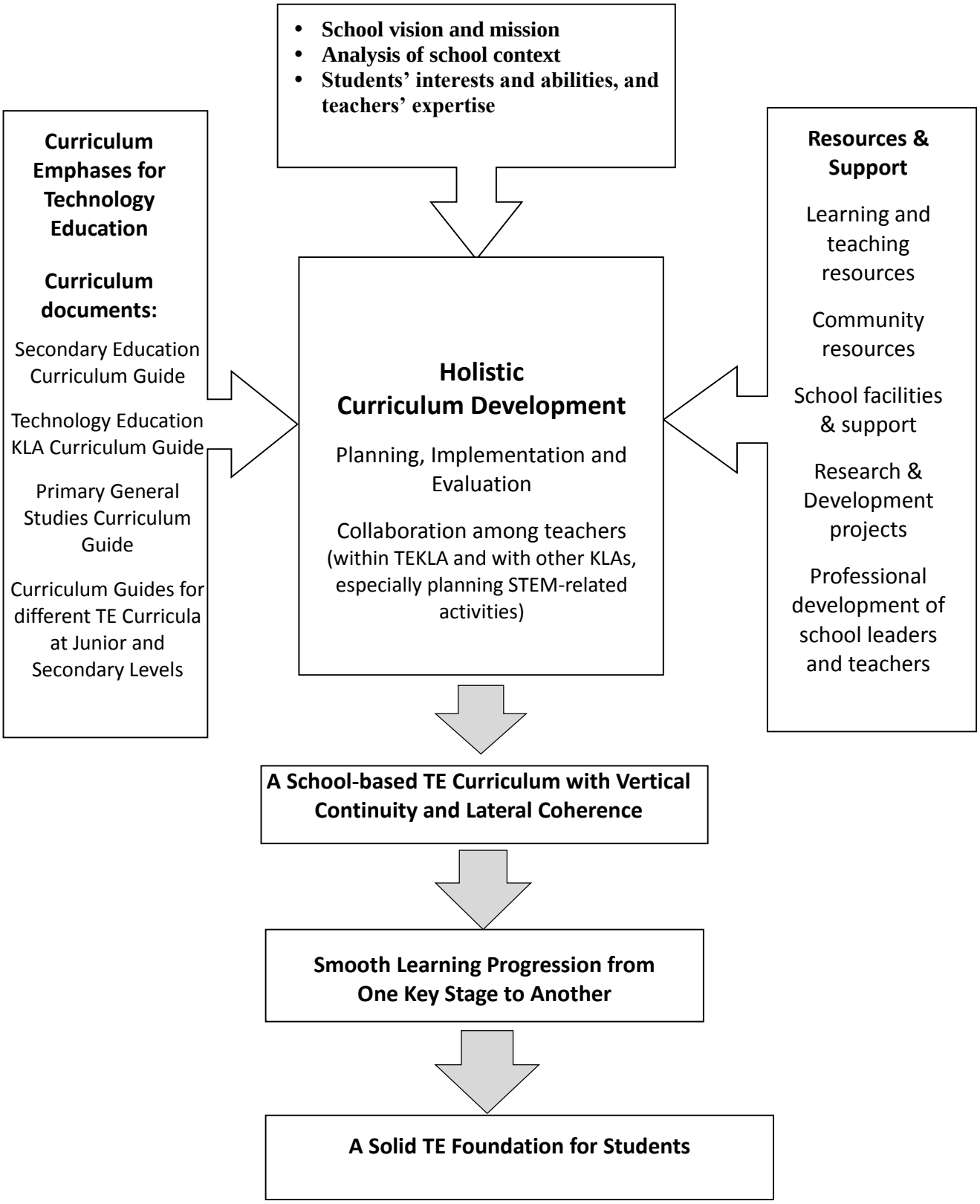
- Assessment strategies suggested here are by no means exhaustive. Adopting a combination of assessment strategies enables teachers to build up a comprehensive picture of students' achievements.

2.5 Curriculum management and planning of learning time

2.5.1 Holistic planning

The diagram below shows the major factors to consider during holistic planning of the school-based technology education curriculum.

Holistic Curriculum Development in Technology Education KLA



2.5.2 Building knowledge foundation in TEKLA

- Study TE is the entitlement of every student. Students develop technological literacy through studying the three strands of TE, namely knowledge contexts in technology, process in technology and impact of technology. In order to provide a solid TE foundation to students, schools should allocate sufficient curriculum time to TE.

- The TEKLA Curriculum Guide provides a central curriculum in the form of an open and flexible framework. At the primary level, learning elements of TE are delivered through General Studies. At the junior secondary level, schools are recommended to adopt a modular approach for managing the TE curriculum. TE learning elements are grouped into core and extensions within 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 interfacing with senior secondary, core learning elements should be covered in the school-based 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 student learning needs to adapt the central curriculum and plan their school-based TE curriculum through 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 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 students' interests, abilities and needs.

2.5.3 Cross-curricular learning

- Learning of TE through design activities can encourage students to apply knowledge, skills and values in using resources to create products, services, or systems to meet our needs and wants. TE 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 lives. Project learning and task-based activities in TE enhance cross-curricular learning such as STEM education and promotes the development of entrepreneurship through interesting business and management activities.

2.5.4 Strengthening integrative learning and application skills with disciplines of Science Education and Mathematics Education Key Learning Areas

- Science, Technology and Mathematics Education KLAs have an important role to play in the promotion of STEM education. Schools can strengthen students' ability to integrate and apply knowledge and skills, as well as development of positive values and attitudes, through:

    - providing a favourable environment with ample opportunities for students to integrate and apply knowledge and skills of different disciplines during the process of learning

- holistic curriculum planning with due consideration of providing different scenarios for students to integrate and apply knowledge and skills across disciplines
- making use of KLA-based and cross-disciplinary learning activities of different natures, such as project learning, case-based/problem-based learning and mathematical modeling to provide meaningful contexts that are closely geared to daily life to engage students in problem solving (the activities may include scientific investigations, design and make tasks, etc. that can foster integration and application of knowledge and skills of different disciplines)
- encouraging and supporting students to participate in STEM-related competitions and other fun-filled learning activities arranged by different local and overseas organisations wherever appropriate, as well as those regularly organised by local museums and professional bodies
- promoting collaboration among teachers at school level in planning and organising cross-disciplinary learning activities

2.5.5 Planning of learning time

- Teachers are encouraged to use the time flexibly to help students to attain the learning targets and objects in TEKLA through various learning experiences inside and outside classroom. In order to provide a solid TE foundation to students, schools should allocate sufficient curriculum time to TE.
  - At the primary level, 12-15% of the total curriculum time allocated to General Studies is recommended by the General Studies Curriculum Guide (2011).
  - At the junior secondary level (S1-3), the suggested time allocation for TE is 8-15% of the total curriculum time. Examples of implementation are provided for schools' reference (Appendix 4).
  - At the senior secondary level (S4-6), 10-15% of the total curriculum time is recommended to allocate to each of the TE elective subjects.

3. What are the supporting strategies?

3.1 Learning and teaching resources

- Due to the fact that Technology Education (TE) must meet the fast changing needs of society and keep in pace with rapidly emerging new technologies, teachers shall be flexible in planning their learning and teaching activities with the adoption of a wide range of resources materials to meet students' needs.

- Textbooks are not the only learning and teaching resources to support technology education. Teachers and students may also use the free learning and teaching resources and authentic materials developed and offered online by the EDB (www.edb.gov.hk/en/curriculum-development/kla/technology-edu/resources/index.html) over the years. For easy access of the resources by teachers and students, the EDB has set up a portal at the Hong Kong Education City, namely "EDB One-stop Portal for Learning and Teaching Resources" (www.hkedcity.net/edbosp), for users to access the many up-to-date web-based resources that have been developed to support learning and teaching of the TE curriculum.

- The school libraries provide access to timely information in various formats, such as reference books, journals and multimedia productions on TEKLA.

- Resources available from other government departments, non-government organisations, private companies, tertiary institutions, professional bodies, etc. could be utilised to facilitate life-wide learning of TEKLA and enrich the learning experiences of students.

- TE is characterised by the need to co-ordinate hands and the mind, hence hands-on learning activities are essential for TE learning. It is necessary to have proper equipment in an appropriate space to enhance student learning. After considering the learning needs of TE students, it is proposed that:
  - For primary schools, it is desirable to have a multi-purpose room for housing the equipment and materials and conducting TE related learning activities.
  - For secondary schools, it is desirable to have special rooms with designated areas for the learning of TE.

3.2 Partnerships with key players in the community

- While various professional support services have been offered to schools regularly on various aspects of curriculum planning and implementation, it is fairly common nowadays for schools to solicit support from tertiary institutions and professional organisations, through collaborative projects or professional development programmes (PDPs), to enhance the professional capacity of teachers.

- Schools are encouraged to strengthen network and partnership with other schools, professional organisations, tertiary institutions to enhance professional development of teachers and benefit student learning.

- In order to facilitate the implementation of TE curriculum, the EDB has been collaborating with tertiary institutions and professional bodies/organisations in

organising different exhibitions, competitions, teacher seminars and workshops. Schools should encourage teachers to participate in related activities organised by the EDB with a view to benefiting student learning and teacher professional development through hands-on learning activities and life experiences.

3.3 Professional development of school leaders and teachers

- 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.

- Seminars and workshops have been conducting for school leaders and teachers to enhance their understanding of curriculum planning/application of learning and teaching strategies in implementing the TE curriculum, as well as to share the good practices in the use of information technology and e-learning resources to deliver the curriculum contents effectively. To ensure that school leaders and teachers keep abreast of the development of new technologies and aware of the consequences of technological development and their applications, the EDB will strive to support schools and teachers by organising PDPs to continuously strengthen the professionalism of teachers and school leaders on various emphases under development. The key focuses of PDPs are identified as follows:
    - To support teachers in exploring new technologies or learning elements so as to continuously update and enrich their teaching of TE curriculum.
    - To enhance teachers' knowledge, pedagogical and assessment skills for implementation of TE curriculum, including the abilities to select and use different approaches such as case studies, thematic projects, for organising TE learning experiences for students, and use a variety of methods to assess students' learning processes and outcomes.
    - To share with teachers the good practices in developing integrated and cross disciplinary learning experiences for students through collaboration among subjects under STEM education.
    - To enhance peer support and collaboration among teachers through teachers' networks/learning communities.

- To extend opportunities for students' life-wide learning, the EDB will continue to liaise with tertiary institutions and professional bodies/organisations to enhance the development of TE, as well as to support school leaders and teachers in broadening students' exposure to technology developments and nurturing students' entrepreneurial spirit.

4. Frequently Asked Questions

Q 1: What is Learning to Learn 2.0?

A 1: Learning to Learn 2.0 is referred as the ongoing curriculum renewal of the Learning to Learn curriculum reform implemented since 2001 in response to the local and global contextual changes in economic, scientific, technological, social and political aspects. With a view to keeping our school education abreast of the times and maintaining the global competitiveness of our students, it is necessary for the Hong Kong school curriculum to embark on the next cycle of updating and renewal, which aims to deepen and sustain the accomplishments and to focus on the possible areas for curriculum planning. Ongoing engagement of stakeholders through multiple channels has been conducted in setting the direction for the ongoing curriculum renewal.

Q 2: How could business-related learning in the enriched TEKLA curriculum at junior secondary level be implemented if the school does not offer business subjects?

A2: To lay a solid Technology Education (TE) foundation on completion of the junior secondary education, schools are advised to adopt a modular approach in implementing the enriched TEKLA curriculum. Schools should plan for their school-based TE curriculum by selecting a combination of core and extension modules that offers a broad and balanced learning journey to students according to schools' own strength. In case where no business subject could be offered, the school might consider incorporating the business-related learning elements in the junior secondary curriculum through business projects, theme-based learning as well as life experience of students within or outside school.

Q 3: How can the enriched TEKLA curriculum be implemented in schools?

A 3: As the curriculum framework and structure of the TE curriculum remain unchanged and, only the learning elements of the six TE knowledge contexts are elaborated, schools could still adopt different modes of curriculum planning to meet the learning needs of their students. Collaborations within subjects of TEKLA or across KLAs are encouraged, and various modes of curriculum development such as project-based learning, life experiences of students could be used to enhance the effectiveness of learning and teaching.

Q 4: Are there any support measures for the implementation of the enriched TEKLA curriculum?

A 4: Professional development programmes have been conducted since 2012 to brief teachers on the enriched TEKLA curriculum and to suggest modes and strategies in implementing the curriculum. Besides, learning and teaching resources are developed and uploaded onto the TE webpage (www.edb.gov.hk/en/curriculum-development/kla/technology-edu/resources/index.html).

Appendices

Appendix 1

The seven learning goals which students are expected to achieve upon completion of primary education as listed in the *Basic Education Curriculum Guide – To Sustain, Deepen and Focus on Learning to Learn (Primary 1-6)(BECG) (2014)* are provided in the following table for reference.

The Seven Learning Goals in BECG	Details
1. Responsibility	• Know how to distinguish right from wrong, fulfil their duties as members in the family, society and the nation, and show acceptance and tolerance towards pluralistic values;
2. National Identity	• Understand their national identity and be concerned about society, the nation and the world, and to fulfil their role as a responsible citizen
3. Habit of Reading	• Develop an interest in reading extensively and cultivate a habit of reading
4. Language Skills	• Actively communicate with others in English and Chinese (including Putonghua);
5. Learning Skills	• Develop independent learning skills, especially self-management skills and collaboration skills
6. Breath of Knowledge	• Master the basics of the eight Key Learning Areas to prepare for studying in secondary schools
7. Healthy Lifestyle	• Lead a healthy lifestyle and develop an interest in aesthetic and physical activities and an ability to appreciate these activities

Source: BECG https://cd.edb.gov.hk/becg/english/chapter1.html#s1.7

Appendix 2

Example 1

Adopting e-learning approach in teaching accounting cycle

Curriculum:	Business, Accounting and Financial Studies (BAFS)
Level:	SS4, S5 or S6
Topic:	The accounting cycle
Pedagogy:	Use of Spreadsheet in teaching the accounting cycle
Learning target:	Facilitate the demonstration of how transactions are recorded and their effects to accounting equation

To facilitate the understanding of how accounts interact when transactions arisen, teachers can make use of various types of spreadsheet to demonstrate the effects of an entry to the accounting equation and their impacts as to the profit of a company. In conducting the lesson, teachers can start with describing the flow of an accounting cycle to students and visualise the relevant steps of the accounting cycle (including recording transactions, determining trial balance, recording adjustments and accumulating post-adjustments account balances) with illustrative examples by using spreadsheet.

The spreadsheet approach in teaching the topic not only helps conceptualise students' understanding of the impact of transactions as to the accounting equation, it also allows students to easily track the every single step in recording transactions, and trace the related dollar amounts of an entry throughout the accounting cycle.

Example 2

STEM Education

Developing Integrative Learning Capabilities through Project Learning

Level: S1-3

Curriculum: Cross-KLAs

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

Project Topic: Design a healthy diet menu for a school lunch box supplier

KLA	Learning Content
Technology Education	• Food groups, dietary goals and eating habits • Meal planning • 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 • Health lifestyle/sedentary lifestyle/unhealthy lifestyle • Use of computer network
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 work 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 KLA. Students can use IT skills to search information about food and diet, including the functions of food substances, nutritional values, recommended daily intake, etc. Students can apply computational skills to calculate and analyse the nutritional values of different food. Students could conduct a survey to collect food preference of their fellow students, and prepare food for tasting. After proper analysis, student can submit the healthy diet menu to the school lunch box provider for reference.

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

Example 3

Developing students' coding capability
Simulation package for the cat to find the mouse

Level: S1-3

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' coding skills, including 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 to develop package to show how a cat can find a mouse on top of the wall 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

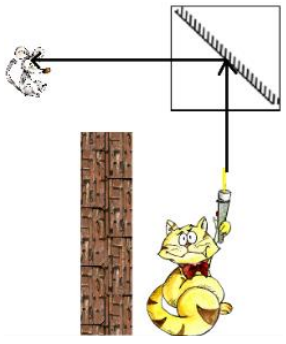


Fig. 1 Light ray shown

same time learn about co-ordinate system as well as consolidate their learning about law of reflection.

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.

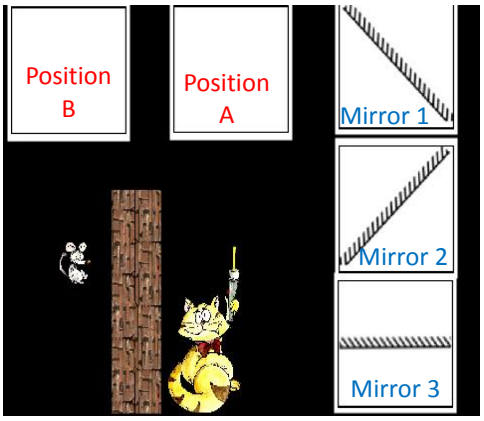
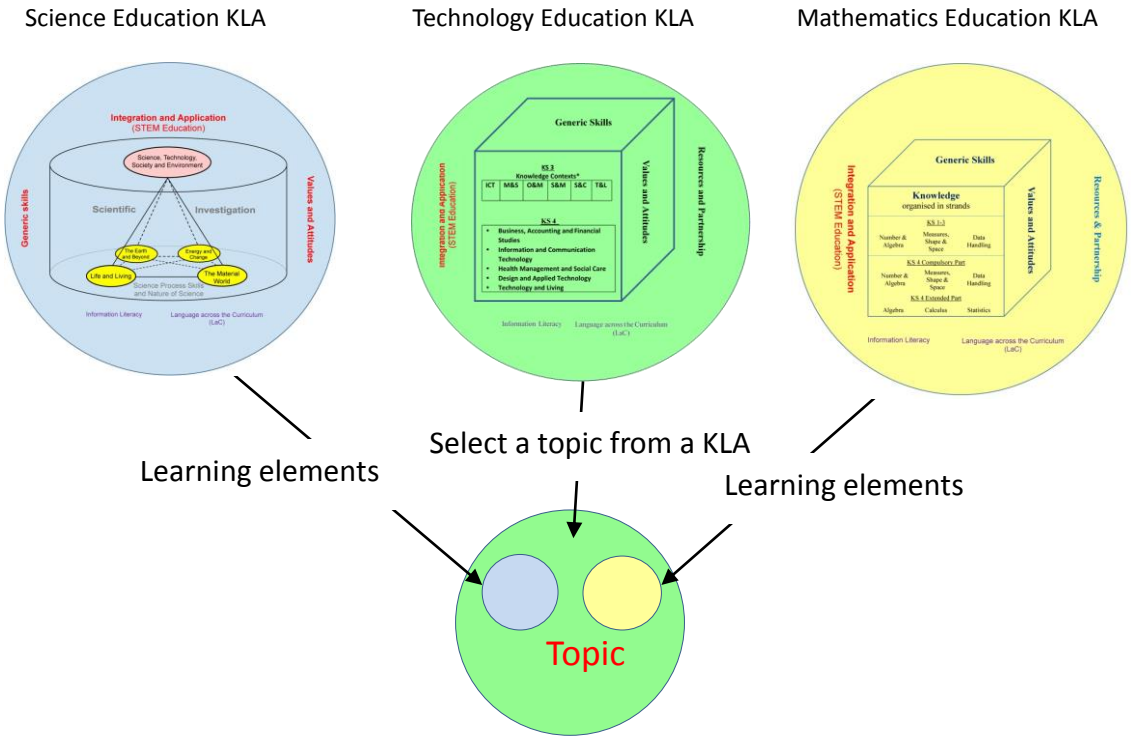
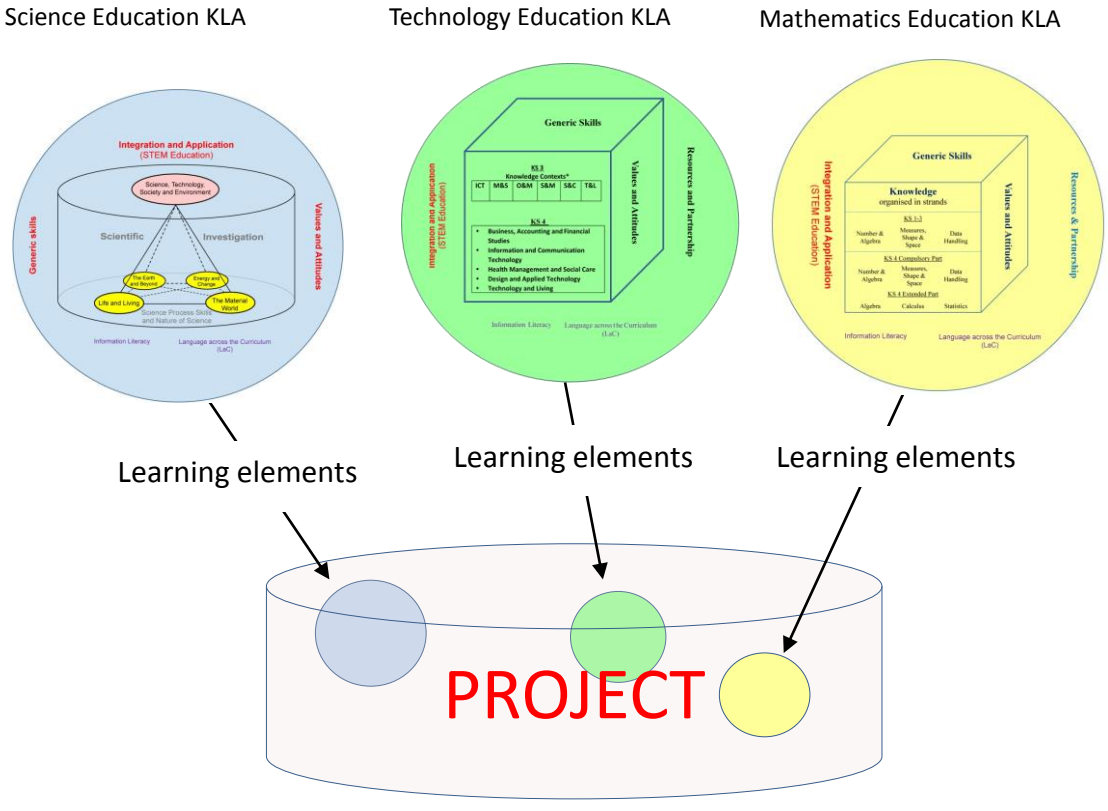


Fig.2 Light reflection with two mirrors

TWO RECOMMENDED APPROACHES FOR ARRANGING STEM LEARNING AND TEACHING ACTIVITIES



APPROACH ONE



APPROACH TWO

Appendix 4

Enriched Technology Education Key Learning Area Curriculum (Secondary 1 to 3) Examples of Implementation

8% of the School's Total Curriculum Time (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 and 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)
Secondary2 (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 time for Secondary 1-3: 220 hrs. (13200)						

Enriched Technology Education Key Learning Area Curriculum
(Secondary 1 to 3)
Examples of Implementation
15% of the School's Total Curriculum Time (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 II (80) • E 9 Fashion and Dress Sense II (80) • E10 Home Management and Technology II (80)
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 II (80) • E 9 Fashion and Dress Sense II (80) • E10 Home Management and Technology II (80)
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 II (80) • E 9 Fashion and Dress Sense II (80) • E10 Home Management and Technology II (80)
						Total Time for Secondary 1-3: 413 hrs. (24780)

Enriched Technology Education Key Learning Area Curriculum (Secondary 1 to 3)
Examples of modular selection under Computer Literacy with different curriculum time allocation

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 marked with * such as properties and functions of usual components in K1 or concepts of database in K16 are rarely taught at primary levels. Students' prior knowledge in these modules is presumed to be very similar.
- Content marked with # is extension learning element module which focuses on computer networks for schools that wish to provide additional learning elements in their CL lessons.
- Other contents such as ideas of a stored program in K2, and office applications 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.

Enriched Technology Education Key Learning Area Curriculum (Secondary 1 to 3)
Examples of modular selection under Design and Technology with different curriculum time allocation

<table>
<tr><th>Level</th><th>1 period per week/cycle
(about 2.5% of the total curriculum time)
(assumes 100 units of lesson time per year)</th><th>2 periods per week/cycle
(about 5% of the total curriculum time)
(assumes200 units of lesson time per year)</th><th>3 periods per week/cycle
(about 7.5% of the total curriculum time)
(assumes300 units of lesson time per year)</th></tr>
<tr><td>Secondary 1</td><td>Choose one of the combinations
<table><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)
K5 Tools 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></table></td><td>K3 Materials and Resources (24.2units)
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)
K9 Application of Systems (6 units)</td><td>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)
K9 Application 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>Secondary 2</td><td>Choose one of the combinations
<table><tr><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></tr></table></td><td>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>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:
<table><tr><td>Combination A (Materials and Production)</td><td>Combination B (Structures and Systems)</td></tr><tr><td>E2 Material Processing (24.6 units)
E3 Project Management (18.3 units)
E6 System Integration (55.2 units)</td><td>E7Control and Automation (98.1 units)</td></tr></table></td></tr>
<tr><td>Secondary 3</td><td>Choose one of the combinations
<table><tr><td>Combination A (Materials and Production)</td><td>Combination B (Structures and Systems)</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></tr></table></td><td>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>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:
<table><tr><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></table></td></tr>
</table>

Enriched Technology Education Key Learning Area Curriculum (Secondary 1 to 3) Examples of Implementation under Home Economics / Technology and Living with different curriculum time allocation

Level	Half Year Implementation Mode	Whole Year Implementation Mode	
	2 periods 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)**	**3 periods per week/cycle (about 7.5% of the total curriculum time) (assumes 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 II (6 units) • E9 Fashion and Dress Sense II (6 units) • E10 Home Management and Technology II (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 II (6 units) • E9 Fashion and Dress Sense II (6 units) • E10 Home Management and Technology II (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 II (6 units) • E9 Fashion and Dress Sense II (6 units) • E10 Home Management and Technology II (6 units)