Information and Communication Technology

Introduction

1.   The Information and Communication Technology Curriculum (Senior Secondary) (hereafter known as ICT Curriculum) is built upon the S4-5 Computer and Information Technology Curriculum introduced in 2003, which has already incorporated ideas about how to prepare students for a new senior secondary education.   The curriculum framework, learning and teaching strategies, and assessment are suitably updated, however, taking into account feedback received from the implementation of the S4-5 Computer and Information Technology Curriculum, and the proposed revision of the existing sixth form computer curricula.

2.   The ICT Curriculum is one of the elective subjects offered under the Technology Education Key Learning Area (TE KLA).   A brief explanation of the role and position of Technology Education at senior secondary level can be found in the Appendix for subjects under Technology Education KLA on p.295.

Rationale

3.   The use of information and communication technologies (ICT) is now an integral part of modern society.   Information is regarded as a valuable asset for all individuals.   The ability to construct knowledge from the information gathered is by and large seen as a vital survival skill.   No one can deny that the immediate future of Hong Kong is also dependent upon its transformation into an information-based or knowledge-based society, where information processing, knowledge management and creation are essential features.

4.   The ICT Curriculum, a curriculum with a practical orientation in the new senior secondary curriculum, is intended to develop the ICT abilities of senior secondary students to a high enough level to meet the new socio-economic needs of Hong Kong, including the need to keep pace with the world's on-going rapid advancement.   Our future students need to be confident, creative, ethical and effective users of new technologies, particularly ICT. They need to possess the knowledge, skills and attitudes necessary to apply them effectively, to cope with change, and be aware of the impact of these technologies on society.

Curriculum Aims

5.   Like its preceding curriculum, the ICT Curriculum is framed to serve the following two purposes.

✧   To prepare students to become effective users of ICT so as to support their life-long learning, as well as to provide a pathway into the workforce

✧   To prepare students for further studies in ICT-related fields

6.   The Curriculum Development Council – Hong Kong Examinations and Assessment Authority Committee on Information and Communication Technology (Senior Secondary) is mindful of the need to provide a curriculum which suits most students.   Given the fact that students will have three years to develop themselves in the new senior secondary education system, the ICT Curriculum is able to address both the breadth and the depth of student learning needed in this knowledge domain. Nevertheless, based on the fact that:
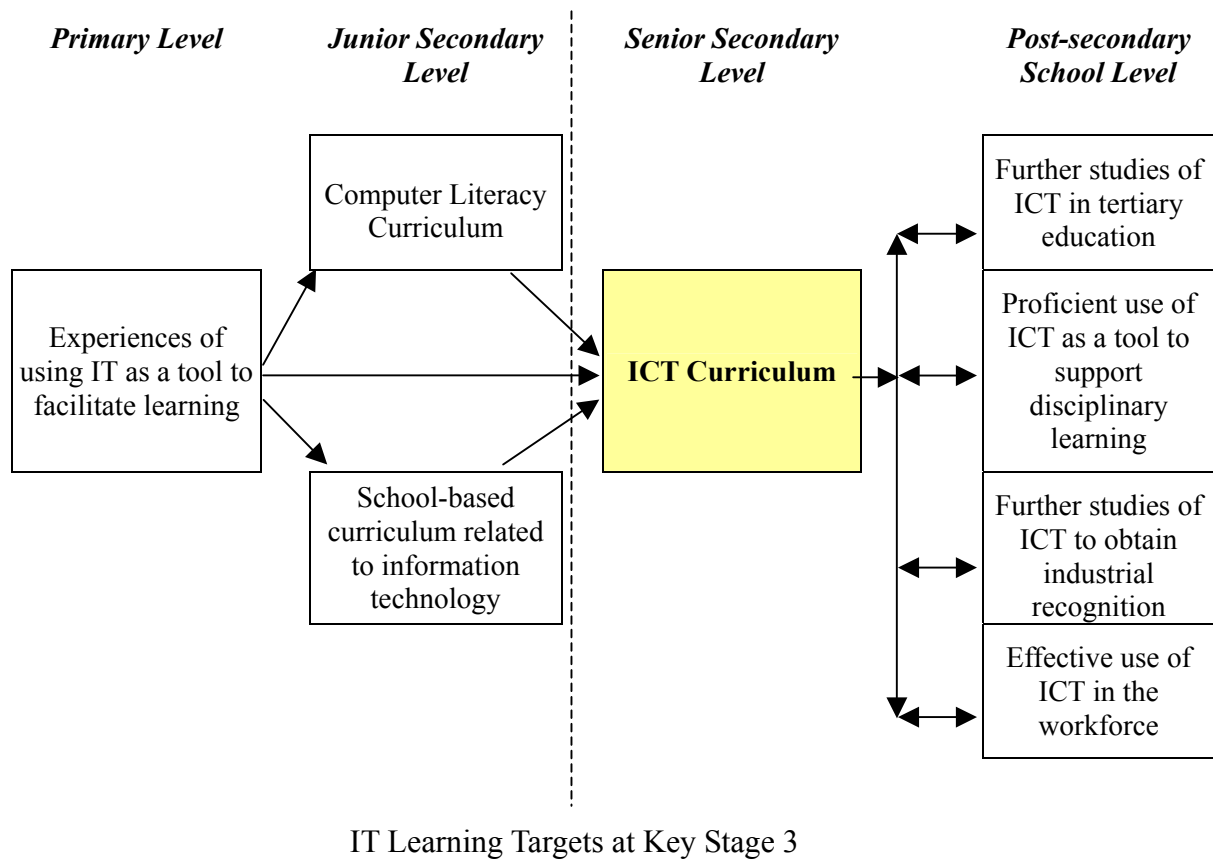
✧   ICT has been advancing so rapidly and has developed into a diversified and vast knowledge area; and

✧   the education at senior secondary level is still a part of the general education for all students;

it is felt that the curriculum should give more weighting to the learning of basic knowledge and transferable generic skills.   The orientation of the ICT Curriculum is therefore intentionally structured for the two afore-mentioned purposes.

7.   As a course designed for senior secondary students, the ICT Curriculum assumes that:

✧   students have already developed the information technology (IT) skills at Level 3 of the IT Learning Targets as an entry point; and

✧   they will be working with IT or using IT skills in an integrated and holistic manner within real-life contexts.

8.   The linkage of the curriculum with students' various learning experiences of ICT at school levels and beyond can be depicted in the diagram below:

| *Primary Level* | *Junior Secondary Level* | *Senior Secondary Level* | *Post-secondary School Level* |

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                  ┌─────────────────┐
                  │ Computer Literacy│
                  │   Curriculum    │                    ┌──────────────────┐
                  └─────────────────┘                    │ Further studies of│
┌──────────────┐                       ┌────────────┐    │  ICT in tertiary  │
│ Experiences of│                      │            │    │    education      │
│ using IT as a │  →                   │    ICT     │ ←→ ├──────────────────┤
│ tool to       │  →                   │ Curriculum │ ←→ │ Proficient use of │
│ facilitate    │  →                   │            │    │ ICT as a tool to  │
│ learning      │                      └────────────┘    │     support       │
└──────────────┘                                         │ disciplinary      │
                  ┌─────────────────┐                    │    learning       │
                  │  School-based   │                    ├──────────────────┤
                  │ curriculum      │                    │ Further studies of│
                  │ related to      │                ←→  │  ICT to obtain    │
                  │ information     │                    │   industrial      │
                  │ technology      │                    │   recognition     │
                  └─────────────────┘                    ├──────────────────┤
                                                      ←→ │ Effective use of  │
                                                         │  ICT in the       │
                                                         │   workforce       │
                                                         └──────────────────┘
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IT Learning Targets at Key Stage 3

The Continuum of Learning for Students in ICT

9.   In order to fulfil the above purposes, the ICT Curriculum, like the S4-5 Computer and Information Technology Curriculum, comprises a compulsory part and an elective part. The compulsory part helps students to build a firm foundation and focuses more on the basic knowledge and transferable skills.   The elective part is comprised of modules that students can choose in accordance with their interests, needs and abilities.   It involves a more in-depth and advanced study and students are required to study one of the given modules. The modules in the elective part are drawn from distinctive fields of computing and information science as well as their applications.   They closely reflect global technological trends.

10.   In short, the aims of the curriculum are to enable students to:

✧   Develop an understanding of ICT and apply their knowledge and skills to solve real-life problems.

✧ Nurture their problem-solving, critical thinking and communication skills, as well as their learning to learn abilities and their creativity.

✧ Appraise and appreciate the impact of ICT.

✧ Develop positive values and attitudes regarding the appropriate use of ICT in everyday life.

✧ Stretch their full potential in the learning and use of ICT.

Curriculum Framework

(This part should be read in conjunction with the section "Curriculum Framework" of the Main Document. It should be noted that the curriculum framework suggested below is for initial consultation only. Feedback from the public will be taken into account and further details will be provided in the next stage of consultation.)

11.   The curriculum framework of the ICT Curriculum is illustrated in the diagram shown on p.286.   A summary of the time allocation and the requirements of the compulsory and elective parts are set out in the table below.

	Number of Hours Allocated
Compulsory Part • comprises a number of topics for students to build up a firm foundation	135
Elective Part • comprises a number of modules in which students will have an in-depth study • students will be required to study one of the modules	90

12.   Students will have another 30 hours for independent study / coursework or other activities contributing to the School-based Assessment component of the public examination, making a total of 255 hours for the whole course.

Compulsory Part

13.   The compulsory part of the curriculum will occupy 135 hours and span approximately one and a half years. It will be composed of a number of topics chosen from the core module and essential elements of the elective modules set out in the S4-5 Computer and Information Technology Curriculum, and a new topic. The new topic is *Databases and Database Management Systems*. This topic is already an essential part of the current sixth-form course and has numerous applications in everyday life.

14.   The variety of topics in the compulsory part will provide both a foundation as well as a broad area of study in ICT.   The learning targets in the compulsory part and how they compare with those of the current S4-5 Computer and Information Technology Curriculum are shown in the table on pp.287-289.

Elective Part

15.   The modules in the elective part can broadly be categorized as those illustrating applications of computers in specific areas, and those intended for students who will pursue further studies in ICT as a discipline in tertiary education, but the two are not mutually exclusive.   The elective part will provide an opportunity for students to do an in-depth study in a specialized area of ICT.   The modules in the elective part are tentatively proposed as follows:

✧   Software Development

✧   Data Communications and Networking

✧   Multimedia Production and Web Development

✧   e-Commerce

16.   The elective part will take up about 90 hours of curriculum time and span about one year.   Students will have to attend one module in studying the ICT curriculum.

Conceptual Framework for Information and Communication Technology Curriculum (Senior Secondary)

The Elective Part (90 hours)

Multimedia Production and Web Programming

Data Communications and Networking

Software Development

e-Commerce

The Compulsory Part (135 hours)

BPC
DB
SI
I&A
IPP
CS&N

Compulsory part:

IPP	Information Processing and Presentation
CS&N	Computer Systems and Networking
I&A	Internet and its Applications
BPC	Basic Programming Concepts
DB	Databases and Database Management Systems
SI	Social Implications
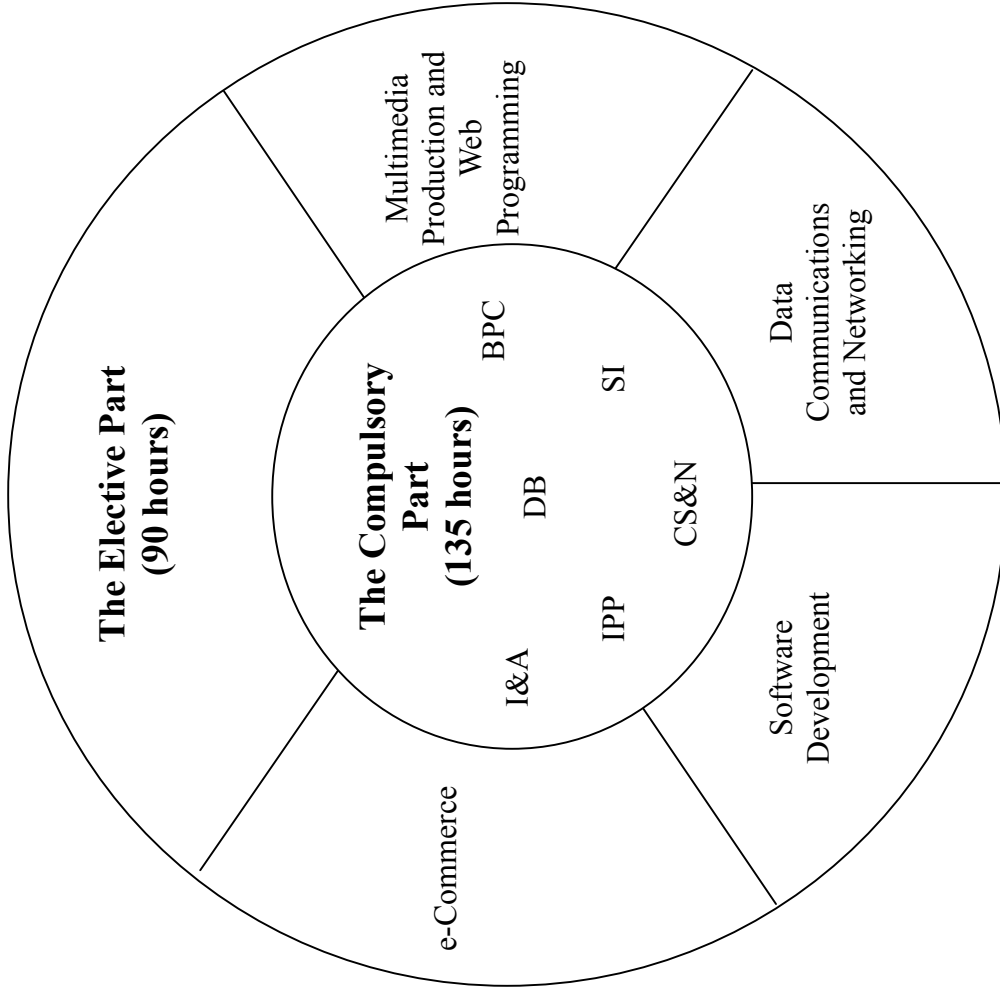
Learning Targets of the Compulsory Part

Compulsory part	S4-5 Computer and Information Technology Curriculum	Information and Communication Technology Curriculum	Learning Targets (*Students are expected to:*)
Curriculum Time	~ 80 hours	~ 135 hours	
Topics	*Information Processing and Presentation*	*Information Processing and Presentation*	➢ Understand and apply concepts related to information processing and information systems in our everyday life, including how information can be generated from raw data ➢ Appraise the impact and applications of ICT ➢ Have a basic understanding of how data are represented inside a computer ➢ Develop skills in using office applications and other ICT tools effectively ➢ Understand and apply concepts related to multimedia, including their use in presentation and the use of web authoring tools to construct web pages[1]
	Computer Systems and Networking	*Computer Systems and Networking*	➢ Understand the basic components of a computer and how they work together to perform computational tasks ➢ Understand concepts related to an operating system ➢ Understand why and how computers are connected to form networks ➢ Develop skills in operating a computer, including using the services commonly available in a networked environment, performing simple trouble-shooting and routine maintenance ➢ Develop skills in selecting the appropriate hardware and software to perform computational tasks ➢ Develop an awareness of the major trends in hardware and software development

[1] Strengthened area in the ICT Curriculum

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Compulsory part	S4-5 Computer and Information Technology Curriculum	Information and Communication Technology Curriculum	Learning Targets (*Students are expected to:*)
Curriculum Time	~ 80 hours	~ 135 hours	
Topics	Internet and its Applications	Internet and its Applications	➢ Understand concepts underlying the development of the Internet and World Wide Web ➢ Develop skills in using the services commonly available on the Internet effectively ➢ Have a basic understanding of the impact of Internet technology on our way of living ➢ Have a basic understanding of the risks and measures to safeguard ourselves in using the Internet, and develop skills to protect ourselves ➢ Understand concepts related to e-Commerce, including the importance of new emerging technologies to do business in a safe and reliable way[2]
	-	Databases and Database Management Systems[3]	➢ Understand and apply concepts related to databases ➢ Develop skills in managing data using an appropriate database management tool ➢ Have a basic understanding of the applications of database management systems in our everyday life ➢ Understand concepts related to data integrity and security

[2] Strengthened area in the ICT Curriculum
[3] New topic in the ICT Curriculum

Compulsory part	S4-5 Computer and Information Technology Curriculum	Information and Communication Technology Curriculum	Learning Targets (*Students are expected to:*)
Curriculum Time	~ 80 hours	~ 135 hours	
Topics	*Basic Programming Concepts*	*Basic Programming Concepts*	➢ Understand and apply concepts underlying problem solving in a systematic way ➢ Have a basic understanding of algorithm and its importance in computer programming ➢ Develop concepts related to structured programming and be able to create or interpret simple constructs of a programme[4] ➢ Appreciate the importance of good programming skills
	Social Implications of ICT	*Social Implications of ICT*	➢ Have a basic understanding of issues brought forth by the advancement in ICT ➢ Develop a care, concern and ethical attitudes towards using ICT ➢ Have a basic understanding of some ergonomics issues associated with the use of ICT

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4 Strengthened area in the ICT Curriculum

Learning and Teaching

17.   As expounded in previous sections, since the curriculum is intended for nurturing in students the knowledge, skills and attitudes necessary to use ICT effectively, creatively and confidently, no matter whether it is for further study or migration into the workforce, it is of utmost importance that the learning and teaching strategies adopted inside classrooms can help to bring these into realization.   In this connection, as stipulated in its curriculum and assessment guide, the learning and teaching of the existing S4-5 Computer and Information Technology Curriculum was designed to focus on:

⬦   Preparing students to cope with rapid technological changes

⬦   Learning according to students' interest, aptitude and ability so that student learning is sustainable

⬦   Learning through authentic situations

⬦   Learning and making progress through appropriate feedback and assessment

18.   The learning and teaching of the ICT Curriculum will follow the same way of thinking. Students will be encouraged to own and manage their own learning through structured tasks, projects, coursework, etc. where they can gain confidence and knowledge through their own efforts, and where teacher feedback is given on a regular basis.   Students will be encouraged to learn through regular reading, in particular up-to-date information about technological changes and trends, in journals, magazines and on the Web.   Teachers should focus on introducing basic concepts and leave ample space for students to develop themselves according to their own interests.

Assessment

(This part should be read in conjunction with the section "Assessment" of the Main Document.)

19.   Assessment is the practice of collecting evidence of student learning.   The aims are to improve learning and teaching as well as to recognize the achievement of students.   The assessment design will align with curriculum aims, design and learning processes of the subject.   The design of assessment practices in the ICT Curriculum will make full use of the assessment occasions available during the three years of study, to provide continuous support and feedback to students.   There will be a formative component unveiling needs and attainments *during and throughout* the process of learning, as well as a summative component marking the achievements of a student at the end of the course.   Surely, the assessment practices will be aligned with the curriculum aims, the learning targets of the individual parts and the learning and teaching strategies advocated.

Internal Assessment

20.   Internal assessment refers to the assessment practices that schools employ as part of the learning and teaching strategies during the three-year study in ICT.   During the three years of study, schools should be assessing the performance of students regularly, or helping students assess what they have attained themselves on a regular basis.   Both approaches are considered essential as the former provides more objective information, while the latter strengthens students' ownership of the learning process.   A variety of assessment modes including oral quizzes, practical or skill tests, written examinations, progress reports required of project-like work, etc. can be employed.   As certain skills in ICT (e.g. the use of word processing software to create and edit documents, the use of email to send mails as well as attachments, etc.) have now become everyday life-skills, schools can also consider adopting assessment practices that aim only at evaluating whether students can or cannot perform required tasks, sometimes irrespective of how long it might take them or how they achieve them, for certain areas of the ICT Curriculum.   In these cases, students are only required to demonstrate their competence.   The performance of each student is compared against one or more defined standards instead of against other individuals.

Public Assessment

21.   Public assessment of ICT leads to a qualification in the subject to be offered by the Hong Kong Examinations and Assessment Authority.   In the public assessment of the ICT Curriculum, a standards-referenced approach will be adopted for grading and reporting student performance.   The purpose of this approach is to recognize what each student can do in the subject at the end of three-year senior secondary education.   Each student's performance will be matched against a set of performance standards, rather than compared to the performance of other students.   It makes the implicit standards explicit by providing specific indication of student performance.   Descriptors will be provided for the set of standards at a later stage.

22.   Though a standards-referenced approach is adopted, the public assessment of the ICT Curriculum is not meant to include a summative component only.   There will be a written examination conducted at the end of the third year and a School-based Assessment (SBA) component conducted predominantly and preferably during the second and third years of study.

23.   The written examination will consist of two papers, one on the compulsory part and the other on the elective part chosen by the student.   The duration, weighting, kinds and number of assessment items in each paper will be provided at a later stage.

24.   In line with the change in the concepts of assessment advocated in the S4-5 Computer and Information Technology Curriculum and to facilitate better assessment for learning, School-based Assessment (SBA) is considered an essential component in the ICT Curriculum.   At present, 20% of the total mark in the public assessment is given to School-based Assessment in the S4-5 Computer and Information Technology Curriculum. Given that teachers are now gaining more experience in managing assessment tasks, it is therefore proposed that the percentage of SBA in ICT should be increased to 25% of the total weighting of public assessment.   The SBA in ICT will provide a more valid assessment of the performance of a student than an external written examination alone, since it will cover a more extensive range of learning outcomes through employing a wider range of assessment practices that are not necessarily possible in written examinations.   It also enables the sustained work of students to be assessed.   It provides a more comprehensive picture of student performance throughout the period of study rather than their performance in a one-off examination alone.

25.   A variety of assessment modes can be used to evaluate the different aspects of student performance, such as their ability to apply knowledge and ICT skills, the generic skills that they master, the values and attitudes they develop throughout the course, etc.   Teachers' workload and the prevailing culture regarding SBA will be considered when the details of the public assessment are worked out.   It should be noted that SBA is not an add-on element in the curriculum.   The assessment of student's performance during normal classroom activities such as class discussion and class observation can be part of SBA.   The assessment modes selected for SBA of ICT will be appropriate to the learning targets and processes that are to be assessed.   The design and implementation of SBA should avoid unduly increasing the workload of both teachers and students.

Supporting Measures

26.   To support schools to implement the curriculum, a Curriculum and Assessment Guide will be published.   This will provide information on the curriculum aims, learning targets, course requirements and examination.   The Guide will also serve as a framework to guide teachers on the suggested pedagogies, learning strategies and School-based Assessment. Other support materials may include sample examination questions and guidelines on the implementation of School-based Assessment.

27.   To equip teachers with the necessary skills and knowledge to teach the curriculum, a series of professional development programmes for teachers will be developed.   Tertiary institutions and professional bodies will be invited to contribute their expertise to developing teachers' professionalism.   The professional development programmes, in the form of workshops, seminars and various sharing sessions, will be launched to:

⬧   update teachers' technological skills;

⬧   familiarise teachers with the latest concepts of pedagogy and assessment;

⬧   inspire teachers on good implementation strategies and practices; and

⬧   widen teachers' technological horizons.

Teachers' networks will also be developed for teachers to continue sharing their experiences and concerns.   These act as a means to sustain professional dialogue and promote continuous professional development.

28.   Beside the quality textbooks that will be available in the market, lists of references on books, journals, magazines and websites will be compiled to acquaint teachers with ways to access useful resources for the curriculum.   These references can act as guides for both the teachers and the students to enrich themselves in learning and understanding the concepts covered.

29.   An e-Learning platform for the curriculum will also be developed as far as possible, in partnership with tertiary institutions or relevant service providers, to provide teachers with up-to-date information for student learning.   This kind of support is considered particularly important, in view of the fact the learning elements in areas like ICT are always rapidly changing.   It is also undeniable that the learning of ICT is better realized and substantiated through a platform developed and supported by ICT.

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New Senior Secondary Curriculum
Elective Subjects under the Technology Education Key Learning Area

Position of Technology and Technology Education

1.   Technology is ever-changing and ever-improving in nature.   In the context of school education in Hong Kong, technology is defined as the purposeful application of knowledge, skills and experiences in using resources to create products or systems to meet human needs.

2.   The curriculum of Technology Education (TE) focuses on how human beings solve their daily problems and how the processes involved can be replicated and transferred to solve new problems.   In the current Hong Kong context, the following six knowledge contexts are considered essential in TE: *Information and Communication Technology, Materials and Structures, Operations and Manufacturing, Strategies and Management, Systems and Control, and Technology and Living* [see Technology Education Key Learning Area Curriculum Guide (Primary 1 – Secondary 3) published in 2002].

Present Situation in the Technology Education Key Learning Area at S4-7

3.   The existing subjects at S4-7 under the Technology Education Key Learning Area (TE KLA) are introduced at different points of time with varying emphases to meet the learning needs of students.   They are constantly reviewed and revised to reflect contemporary social, economic and technological changes and developments in both the local and global contexts.

4.   These subjects can be broadly categorised into the following four areas of study:

Subjects related to:	Existing subjects at S4-7
Business	• Commerce • Principles of Accounts • Word Processing and Business Communication (English) • AL Business Studies • AL Principles of Accounts
Information and computing technology	• Computer and Information Technology • ASL Computer Applications • AL Computer Studies
Design and technology	• Design and Technology / Design and Technology (Alternative Syllabus) • Electronics and Electricity • Graphical Communication / Technical Drawing • Technological Studies • ASL Design and Technology • ASL Electronics

Subjects related to:	Existing subjects at S4-7
Well being of the individual, family and society	• Accommodation and Catering Services • Fashion and Clothing • Home Economics (Food, Home and Family) • Home Economics (Dress and Design) • Textiles

Role of Technology Education in Senior Secondary Education

5.   At the level of Basic Education (P1−S3), as suggested in the TE KLA Curriculum Guide (P1−S3), the focus of Technology Education is on "Exploration, Experiencing and Familiarisation", in which students are given opportunities to experience technology education.   After completing Basic Education, students are expected to have a basic understanding of technology, its development and its impact on the individual, family and society.   They are also expected to have gained a broad and balanced knowledge of various technologies, to have discovered where their interests lie, and to have acquired a basis for making informed decisions on their choice of subjects in their senior secondary studies.

6.   The emphasis of TE at senior secondary level is on "Exploring Orientations for Life-long Learning and Specialisation".   To this end, the senior secondary TE curriculum provides a variety of subjects to cater for the different learning needs and interests of students.

Direction for the Development of Technology Education in Senior Secondary Education

7.   Throughout schooling, the Technology Education Curriculum is designed to match students' learning needs at different key stages. Students at the senior secondary level are progressing from teenagers to adulthood.   They are developing their value system, acquiring and enhancing their generic skills, exploring their orientation for life-long learning, and accumulating knowledge and skills to prepare for their adult life.

8.   To cater for the learning needs of such students, the emphasis of TE at this level needs to shift:

✧   *From* acquisition of easily outdated discipline-based knowledge and skills *to* the understanding of broader technological contexts to keep abreast of changes in the world

✧   *From* a choice between academic or vocational studies *to* a judicious balance of academic and practical studies for solving daily problems, for life-long learning and for work

✧   *From* acquisition of trade-specific skills *to* the application of generic skills in new situations to develop creativity, critical thinking and problem-solving skills.

Learning and Teaching in Technology Education

9.   Technology influences and is influenced by culture and is part of our daily life.   To motivate effective student learning, learning and teaching should be closely related to the everyday social, economic and technological contexts.

10.   In the Hong Kong context, the main pillars of our economy are financial services, producer services, logistics and tourism.   Creative industries and health care industries have also been identified by the Government as growing and likely to grow further.

11.   Building on the strengths of the existing subjects at S4-7 and catering for social, economic and technological development, we propose five elective subjects for the New Senior Secondary Curriculum:

Business, Accounting and Financial Studies (BAFS) [formerly known as Business and Financial Studies in the report *Review of the Academic Structure of Senior Secondary Education* (Education Commission, 2003)]. - The importance of business and financial services in Hong Kong makes the study of business, accounting and finance important in the development of students to become valuable human resources with an entrepreneurial spirit in the future.   This elective subject will enable students to acquire business knowledge, skills, values and attitudes and nurture them to become responsible and effective citizens in the business world and in society at large.

***Information and Communication Technology (ICT)* -** Information and communication technologies are essential to all industries, and in particular to those concerned with logistics. This elective subject will prepare students for technological challenges both at work and in their future studies.

Design and Applied Technology (DAT) - Design is the soul of the production, manufacturing and creative industries.   This elective subject will equip students with appropriate design skills and will nurture their creativity.

***Home Economics (HEc)* -** Food and clothing are basic human necessities. Advances in the technology used for producing food, clothing and textiles will continue to bring new challenges.   Through the study of contemporary technologies used for food and clothing, students will learn how to critically assess these and their impact on the well-being of individuals, families and society.

Health Management and Social Care (HMSC) - Hong Kong's most valuable asset has always been its human capital.   For this to thrive, the health of the community and its capacity to develop a caring society will be of utmost importance.   This elective will enable students to study health and social care issues, and to know how to live a healthy life and contribute to a caring society.

12.   An overview of the five elective subjects under the TE KLA is given in Figure 1. The relationship between the proposed elective subjects in the New Senior Secondary Curriculum and the existing TE subjects at S4-7 is depicted in Figure 2.

13.   In proposing elective subjects, it is of utmost importance to have an effective number of elective subjects to meet the learning needs of students.   Other than the elective subjects proposed, there are other channels to provide diversified learning opportunities in the senior secondary curriculum framework for students.

Figure 1 An overview of the five elective subjects under the TE KLA
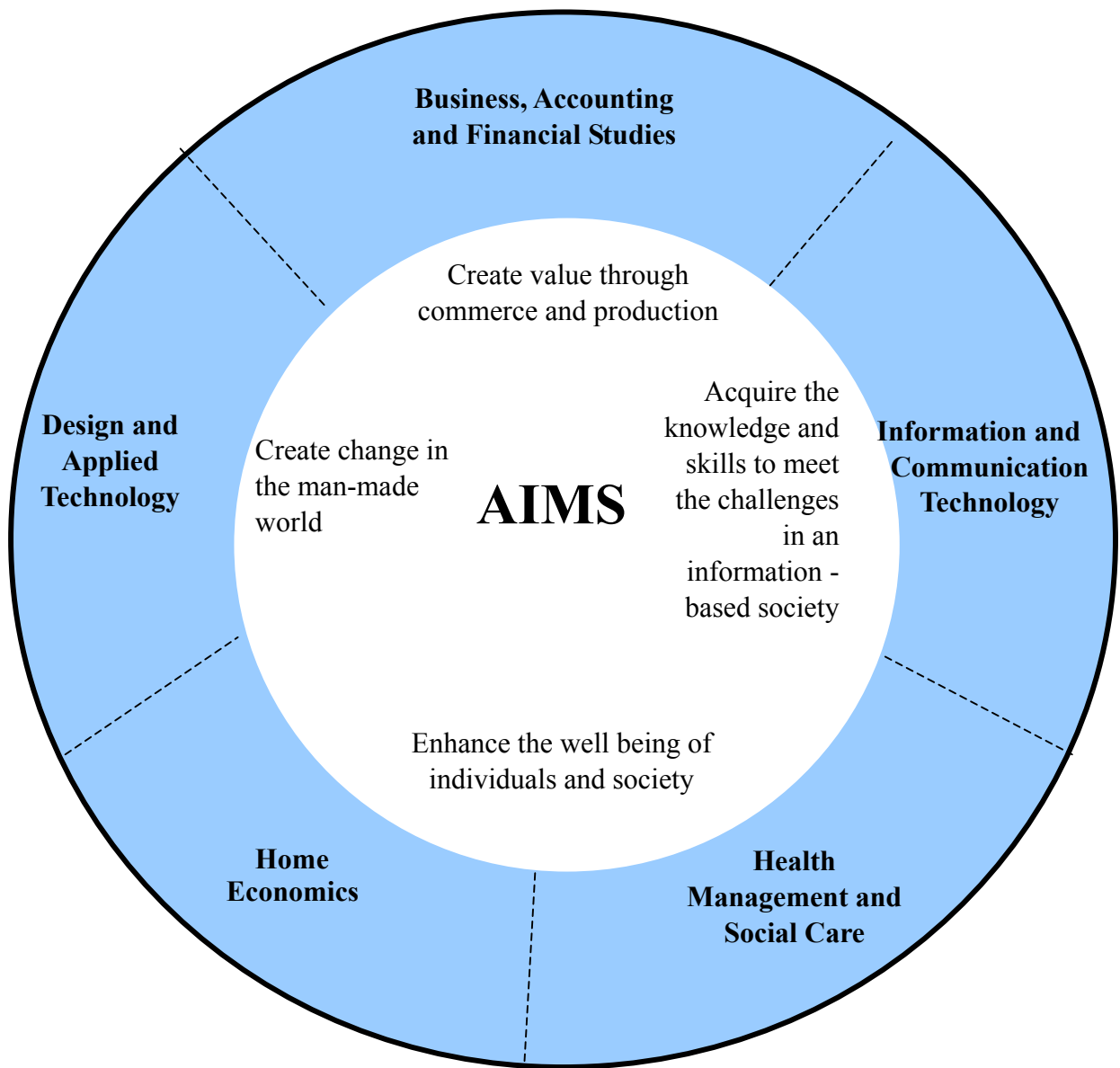

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Figure 2   Relationship between Proposed Elective Subjects in the New Senior Secondary Curriculum and Existing Subjects at S4-7 under TE KLA