Malaysian Independent Chinese Secondary Schools

Information Technology Curriculum Standards

Unified Curriculum Committee of

Malaysian Independent Chinese Secondary School

Working Committee

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Contents

1. Preface

In 2018, the motto "Enjoy teaching, love learning—empower children to attain achievement" was raised as the education reform vision in the *MICSS Education Blueprint*; it literally translates independent Chinese secondary schools are paradises where teachers enjoy teaching and students love learning. Each and every student who steps into any independent Chinese secondary school will grow healthily and learn actively. The MICSS education prepares students to find a foothold domestically and brave the world lying ahead as it helps them to achieve success in the future. Within this vision, the main objectives of the MICSS education reform are as follows: Every student is given the leeway to develop holistically and individually under the umbrella of moral education, intellectual education, physical education, social education and aesthetics education. They will eventually realise the importance of lifelong learning, constant self-improvement, risk-taking, innovation, ever-readiness, self-confidence and teamwork in life. In this way, they are able to attain personal happiness and are willing to strive for harmony, prosperity, development, freedom and equality for their family, ethnic group, community and country and contribute themselves successively. Aiming to implement and put the vision and objectives raised in the *MICSS Education Blueprint* in place, the Unified Curriculum Committee forwarded the *MICSS Main Curriculum Standards* (simply put as the *Main Standards*) to concretely push the reform and development of the MICSS Curriculum forward.

The ultimate goal of the MICSS curricular reform is the production of "lifelong learners" and thus it endeavours to improve subject curriculums to provide cross-subject and interdisciplinary learning opportunities. These are to nurture self-activated learning, collaborative learning and the ability to participate in society naturally. The curriculum standards of each subject are designed amenable to the principles and direction set forth in the *Main Standards* to pursue the command of basic notions, objectives, competencies, curricular planning and contents of the subjects, let alone pedagogical approaches and assessment recommendations. In terms of curricular practice, there will be allowances for flexibility and options targeting to encourage group learning, task-based learning, inquiry-based learning, etc.; while in the matter of the assessment for learning effectiveness, multiple assessments for the development of multiple intelligences are adapted. As such, the design and formulation of each and every subject must correspond to both the vision of the *MICSS Education Blueprint* and the recommendations of the *Main Standards* to break new ground for subject advancement.

2. Aims

MICSS education is a sustainable education industry; other than the dissemination of Chinese culture, it also ensures every student in Malaysian independent Chinese secondary schools develops holistically in terms of morality, intelligence, physical health, teamwork and aesthetics. Students are expected to sustain lifelong learning and to strive unremittingly for self-improvement as well as being inquiry-oriented, innovative, daring in response to unpredictable change, confident, and willing to work as a team. In this way, the students are capable of achieving their personal happiness and willing to strive relentlessly for the harmony, prosperity, development, freedom and equality of their family, ethnic group, community and country to contribute successively.[1]

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[1] Dong Zong. (2018). *Malaysian Independent Chinese Secondary Schools Education Blueprint* (p. 49). United Chinese School Committees' Association of Malaysia (Dong Zong).

2.1. Junior Middle Level Curriculum Objectives

a. To build up students' foundation on morality, intelligence, physical health, teamwork and aesthetics and to develop their capabilities complying with their own personality in the balance based on these basics;

b. To nurture and train students on the capabilities and habits of learning how to learn, read and think to prepare for self-directed learning/active learning;

c. To ensure students reach the basic level in knowledge, capability and attitude so as to further unleash their potential for distinctive achievements;

d. To build up students' proactiveness and positive values towards living and life; and

e. To create an environment for students to know about the languages, cultures and religions, etc. of the ethnic groups in the country so as to lead students to respect the pluralistic culture, recognise the reality of the country thus opening up a global perspective.

2.2. Senior Middle Level Curriculum Objectives

a. To suitably build up students' foundation on morality, intelligence, physical health, teamwork and aesthetics to get ready for their prospective, career, learning and living;

b. To establish students' foundation on self-directed learning to further build up their capabilities on learning eagerness, independent thinking, critical thinking and innovation;

c. To cultivate students with the will to seek excellence and be altruistic thus creating the prerequisites for greater happiness for oneself, community, country and humankind;

d. To lead students to recognise themselves comprehensively and be confident and assured in the face of their society and era change;

e. To nurture students' responsibility towards their own family, ethnic group, society and country and respect multiple cultures as well as broadening their global perspectives; and

f. To create opportunities for students to partake proactively in various ethnic group activities, and ensure them to be able to interact and learn in cross-cultural environments.

3. Core Competencies

The *Main Curriculum Standards* is based on the six core competencies[2] proposed in the *MICSS Education Blueprint*, as well as three additional core competencies added to cater to curriculum development needs, forming a total of nine core competencies. Further explanation is given in the design of Junior Middle Level and Senior Middle Level curriculum development. Core competencies emphasise the holistic qualities of individuals and encompass knowledge, skills and attitudes.

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[2] Dong Zong. (2018). *Malaysian Independent Chinese Secondary School Education Blueprint* (pp. 40-41). United Chinese School Committees' Association of Malaysia (Dong Zong).

Figure 1

Framework for MICSS Core Competencies

Figure 1 shows that MICSS curriculum development cultivates lifelong learners. The structure expanded into three aspirations that empower children to attain achievement, namely self-directed learning, communication and collaboration as well as societal participation. The outer ring of the core competency structure is presented in a colour spectrum, revealing the integration of nine competencies with the three aspirations. The misalignment of the inner and outer circle further clarifies that the implementation of each competency incorporates the three major aspirations. Based on the principle of integration and feasibility, the *Main Curriculum Standards* promote each competency through three aspirations. Table 1 presents the core competencies and their definitions.
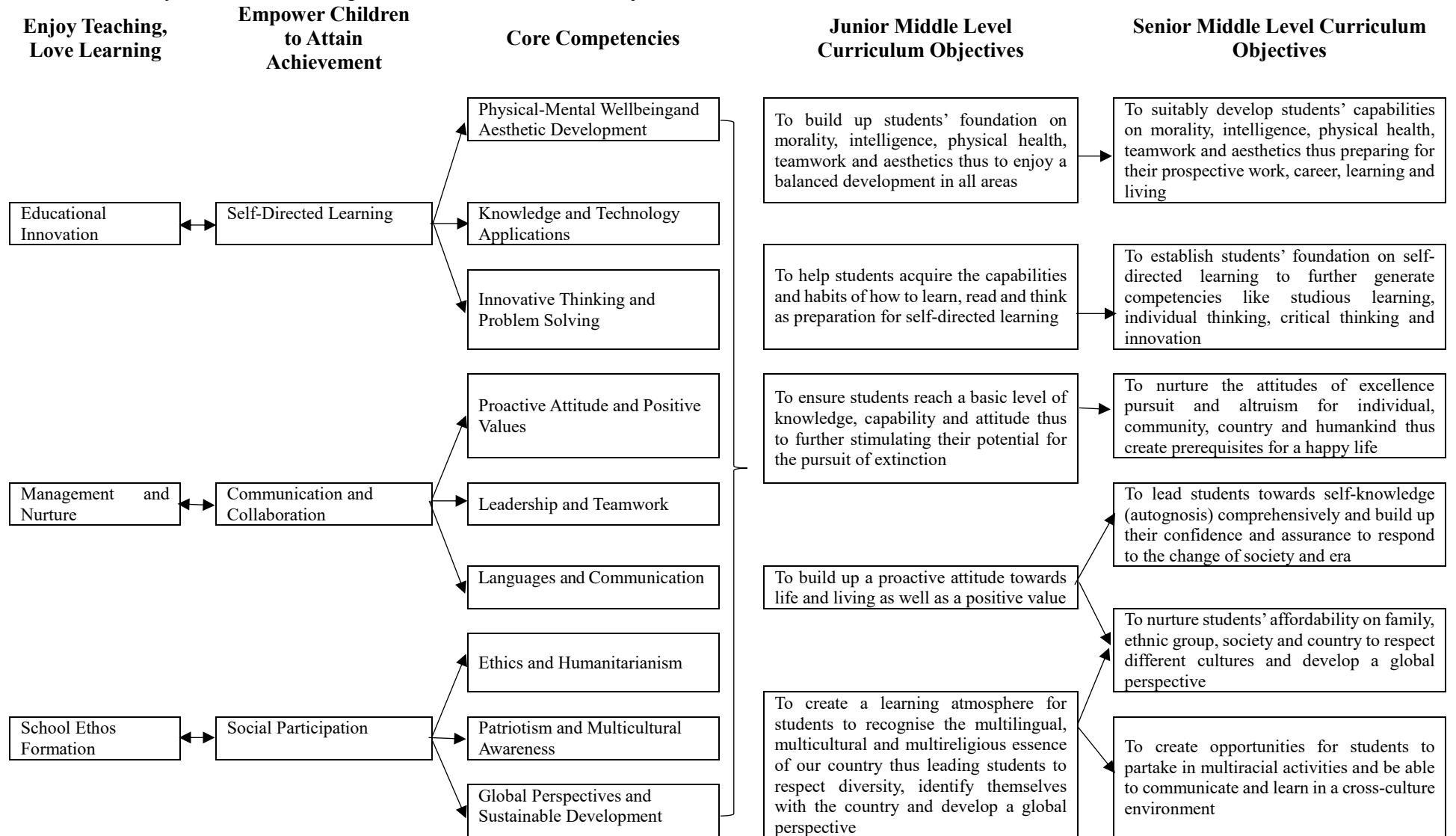
Table 1

MICSS Core Competencies and Definitions

Curriculum Principle	Core Competencies	Definitions	Junior Middle Level	Senior Middle Level	Student Outcome
A. Self-Directed Learning	A1. Physical-Mental Wellbeing and Aesthetic Development	She/He possesses the capability to take care of personal mental and spiritual health and knows how to appreciate the best parts in life, and can reflect on her/his experience in learning and growing thus adjusting stages of pursuits in career development. This way, it not only benefits mental and spiritual growth but also exerts proactiveness in creating happiness for her/his own life.	She/He is well informed of personal mental and spiritual health, knows the uniqueness of aesthetics and can discover personal value in living to exert richness and aesthetics thus experiencing the meaning of life proactively.	She/He possesses the competency and is informed of the approaches to promote her/his physical and mental wellbeing; she/he knows how to appreciate the true goodness of people and entities, affirm the personal value and realise professional pursuits, including how to enrich life by applying aesthetics in daily life, and relentlessly seek self-improvement to transcend herself/himself thus to create a happy personal life.	One who cares about herself/himself
	A2. Knowledge and Technology Applications	She/He possesses literacy and numeracy and living skills as well as acquiring the three languages, core subjects like Mathematics and History, etc. She/He knows and learns knowledge of other domains, leverages Information Technology to communicate, interact and express for comprehensive development; meanwhile, she/he applies these in real life for better learning outcomes thus resolving difficulties in learning.	She/He possesses the fundamentals of knowledge and various symbols and commands the application of Information Technology to sense problems in daily life and is able to communicate, experience and practice in such circumstances.	She/He possesses the ability to make use of various symbols to express and is literate in Information Technology and can focus on and deepen the particular field of knowledge to exchange experience, and express thoughts and values in innovative problem-solving.	One who is knowledgeable
	A3. Innovative Thinking and Problem Solving	She/He possesses inquisitive, critical and inferential capabilities and can use her/his creativity to monitor her/his self-directed learning skills to tackle or solve problems in living and life thus deciding on a response to societal changes.	She/He possesses the capabilities of self-directed learning, inquiry-based learning, critical and inferential and innovative higher-order thinking thus using appropriate strategies to resolve and tackle daily life problems and issues.	She/He can consolidate inquiry-based learning, critical thinking and innovative higher-order thinking, and can practise active learning as well as expressing her/his creativity to further inquire into unknown realms and solve all sorts of issues and challenges in the face of daily life on this basis.	One who can solve problems

Curriculum Principle	Core Competencies	Definitions	Junior Middle Level	Senior Middle Level	Student Outcome
B. Communication and Collaboration	B1. Proactive Attitude and Positive Values	She/He possesses values like respect, voluntary accountability, studious and positive values to confront challenges generated in daily life and the learning process. She/ He also recognises the importance of fulfilling social responsibility and has the courage to make a clear and appropriate judgement when confronted with dilemmas and can learn to face discrepancies as well managing conflicts.	She/He inquires about the personal and environmental values and senses the discrepancies between them. She/He learns to live with discrepancies and build up respect, responsibility, studious attitudes and positive value in life.	She/He deepens her/his attitudes and values thus to respect, care and appreciate others' discrepancies, and can fumble on the differences of values between oneself and the existence and learn to tackle confrontation, affirm and practise positive value and competency; she/he braves to make a proper judgment in the face of difficulties and challenges.	One who cares about others
	B2. Leadership and Teamwork	She/He possesses the capability to lead and can effectively work and build up an interactive relationships with others thus developing teamwork competencies of communication, negotiation and service.	She/He possesses the basic self-directed capability and good habits and is happy to interact thus building up good collaborative relationships and can complete tasks through collaboration.	She/He possesses compassion, personal judgment, gregarious capability and attitude; meanwhile, she/he develops communicative co-operation and teamwork competency; she/he can get along well with others collaboratively, and is able to complete the assignment well with advanced planning.	One who knows the importance of teamwork
	B3. Languages and Communication	She/He possesses the background knowledge of culture, tradition and religion and can make use of Chinese learned, together with the command of Bahasa Melayu towards patriotism and love for community and is versed in English for international linkage. When it permits, she/he will master more languages and use these languages in different situations for optimal effect.	She/He possesses the background knowledge of culture, tradition, religion and can make use of Chinese learned, together with the command of both Bahasa Melayu and English to make friends from different ethnic groups thus enhancing the four skills in language learning and eventually realise the importance of language as a medium of cultural dissemination and communication.	She/He is well versed in Chinese and possesses appreciative competency to enrich her/his knowledge of local and exotic cultures, lifestyles and religions through the learning of Bahasa Melayu and English. If it permits, she/he will equip herself/himself with more additional languages in the face of academic pursuits and professional development.	One who is skillful in communication
C.	C1.	She/He practices good morality and can	She/he practices well on good morality	She/He possesses the correct attitude	One who is

Curriculum Principle	Core Competencies	Definitions	Junior Middle Level	Senior Middle Level	Student Outcome
Social Participation	Ethics and Humanitarianism	manage her/his own behaviours and understand that it is a social responsibility to promote personal competencies. She/He can appreciate, is compassionate and respect others for their freedom of speech.	and can suitably reflect her/his own behaviours; she/he can likewise sustain and modify her/his initiated voluntary proactiveness and is willing to listen to different views, ways of expression and respect others' decisions.	towards ethical and public issues and presents herself/himself as someone who treats others generously and is severe with herself/himself and expresses her/his care towards society through rational expression and care and learns to judge public issues from different aspects and angles.	open-minded
	C2. Patriotism and Multicultural Awareness	She/He possesses the cultural identity of her/his own culture, understands and respects others' culture thus merging herself/himself in a multicultural environment, recognise the history of her/his country and realise the multiplicity of the country and is proud of herself/himself as a Malaysian who has civic awareness and responsibility safeguarding the harmony of the country for national unity and integration.	She/He is well versed in her/his own culture, understands and accepts the culture of other ethnic groups; she/he respects discrepancies, cares about national issues, and is proactive in community construction and is ready to be of service to others.	She/He identifies her/his cultural identity, respects and appreciates the discrepancies between cultures; she/he has civil awareness and knows her/his responsibilities; she/he safeguards national harmony and promotes the spirit of national consolidation and is proactive in the development of her/his community and country to confer benefits on society.	A patriot and one who loves her/his community
	C3. Global Perspectives and Sustainable Development	She/he has the competency of caring for world issues and international relationships and also cares about the environment, economics and social problems. She/He walks her/his talk in the protection of the environment, her/his and others' living mode and sustains the concept of sustainable development and cherishes resources on earth.	She/He is informed of global issues and international relationships and can express herself/himself on environmental, economic and social problems. She/He cherishes the living of resources appreciation and cares about the environment and social justice-related issues.	She/He possesses the ability to express her/his own views on global issues and international relationships and can debate on the environment, economy and social problems; She/He can keep her/his word and not bring harm to the environment, people and lifestyle; she/he is willing to partake charity campaigns such as environmental protection and social justice.	One who knows the importance of sustainable development

Figure 2

The Relation of Vision, Core Competencies and Curriculum Objectives

Enjoy Teaching, Love Learning	Empower Children to Attain Achievement	Core Competencies	Junior Middle Level Curriculum Objectives	Senior Middle Level Curriculum Objectives

Physical-Mental Wellbeingand Aesthetic Development

Educational Innovation

Self-Directed Learning

Knowledge and Technology Applications

Innovative Thinking and Problem Solving

To build up students' foundation on morality, intelligence, physical health, teamwork and aesthetics thus to enjoy a balanced development in all areas

To suitably develop students' capabilities on morality, intelligence, physical health, teamwork and aesthetics thus preparing for their prospective work, career, learning and living

To help students acquire the capabilities and habits of how to learn, read and think as preparation for self-directed learning

To establish students' foundation on self-directed learning to further generate competencies like studious learning, individual thinking, critical thinking and innovation

Proactive Attitude and Positive Values

Management and Nurture

Communication and Collaboration

Leadership and Teamwork

Languages and Communication

To ensure students reach a basic level of knowledge, capability and attitude thus to further stimulating their potential for the pursuit of extinction

To nurture the attitudes of excellence pursuit and altruism for individual, community, country and humankind thus create prerequisites for a happy life

To lead students towards self-knowledge (autognosis) comprehensively and build up their confidence and assurance to respond to the change of society and era

To build up a proactive attitude towards life and living as well as a positive value

To nurture students' affordability on family, ethnic group, society and country to respect different cultures and develop a global perspective

Ethics and Humanitarianism

School Ethos Formation

Social Participation

Patriotism and Multicultural Awareness

Global Perspectives and Sustainable Development

To create a learning atmosphere for students to recognise the multilingual, multicultural and multireligious essence of our country thus leading students to respect diversity, identify themselves with the country and develop a global perspective

To create opportunities for students to partake in multiracial activities and be able to communicate and learn in a cross-culture environment

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4. Fundamental Principles

The basic concept of the *Main Standards* is to reflect the educational vision of "Enjoy teaching, love learning—empower children to attain achievement", and implement the overall goal of the Independent Chinese Secondary School Education Blueprint, so that each student can achieve comprehensive and individual development. The rapid development of information technology has accelerated the progress of the transition from industrial civilization to information civilization, affecting the structure and model of society, and bringing a new generation of living and learning styles. In such environment, citizens of the information society must have the ability to cope with the computerization and technology of future life, and consciously strengthen their own information literacy.

The "Information Technology" curriculum is an important part of Independent Chinese Secondary Schools in Malaysia. The curriculum structure responds to the needs of the times, step with the future, and builds students' comprehensive understanding of the application and development of information technology and the information society. The "Information Technology" curriculum implements the vision of "empower children to attain achievement". Through various teaching activities in and outside the classroom, every child can have basic information literacy and learn self-directedly in an appropriate digital learning environment, communicate and collaborate, participate in society, and become lifelong learners. Through positive and appropriate education, the curriculum enhances students' adaptability and problem-solving skill in the information society, and can make good use of technology to coexist with the sustainable development of society. It is very important for the country to cultivate talents, social progress, and personal development. The specific curriculum concepts are as follows:

1. **Guiding students to learn the basic knowledge and skills of information technology, and cultivate students with information literacy**
   Through positive education, the curriculum guides students to learn the basic knowledge and skills of information technology. The curriculum is contemporary and basic, reflecting the curriculum values of Senior Level secondary school education. The curriculum cultivates students' information literacy from three aspects: knowledge and skills, process and methods, emotional attitude and values, laying the foundation for students' ability to cope with the computerization and technology of future life.

2. **Build a curriculum structure that takes students as the main body of learning, and train students to become lifelong independent learners**
   The curriculum structure is set according to the overall development of students and the needs of further studies, reflecting the "independent, inquiry and cooperative" learning style with students as the main body. The effective implementation of the curriculum can improve students' use of information technology to collect and process information, carry out learning and inquiry-based activities, actively participate in cooperative practice, acquire new knowledge, become lifelong independent learners, and develop comprehensively and individuality.

3. **Inspire students' interest in learning and enhance information literacy in the process of problem solving**

Guide students to observe and experience problems in life, inspire students' interest in learning, and make them actively participate in learning activities; guide students to use computational thinking to form solutions to problems in different problem situations; cultivate students' computational thinking, inquiry ability and the ability to solve problems, improve students' information literacy and overall quality, and prepare students for social life, higher education and career development.

4. **Establish a positive attitude and good habits to cultivate correct technological values**
Guide students to establish a positive learning attitude and good usage habits through teaching materials; understand the relationship between individuals and society in the process of technology application, think about the opportunities and challenges technology brings to human society, fulfill personal responsibilities in the information society and form the correct technological values.

5. Curriculum Objectives

The "Information Technology" curriculum aims to comprehensively enhance students' information literacy. The setting of the curriculum structure is guided by the nine Core Competencies of the *Main Standards*. It contains the three concepts of "empower children" of independent Chinese secondary school, namely self-directed learning, communication and collaboration, and societal participation. Below is the correspondence of the Curriculum Objective (CO) to core competency of the "Information Technology" subject:

Core Competencies			Curriculum Objectives After completing the Information Technology curriculum, students are able to:
A Self-Directed Learning	A1 Physical-Mental Wellbeing and Aesthetic Development	CO1	Equipped with skills of using information technology to improve physical and mental quality, appreciate the beauty of technology products, and inspire the creation and sharing of technology.
	A2 Knowledge and Technology Applications	CO2	Possess the basic knowledge and skills of information technology, and properly use information technology tools to acquire and process information.
	A3 Innovative Thinking and Problem Solving	CO3	Use information technology tools to think, analyse, explore, reason and innovate, and solve problems effectively.
B Communication and	B1 Proactive Attitude and Positive Values	CO4	Demonstrate active, positive and good attitude towards technology, and possess positive technology thinking and values.

Collaboration	B2 Leardership and Teamwork	CO5	Use information technology tools to organize work teams, have team leadership skills, be able to effectively cooperate with team members and establish a good interactive relationship, and complete the tasks in a planned and step-by-step manner.
	B3 Languages and Communication	CO6	Able to communicate information technology knowledge using appropriate language and technology symbols and have the ability to express using information technology language.
C Social Participation	C1 Ethics and Humanitarianism	CO7	Possess ethical practices, be able to respect and protect the privacy data of individuals and others, and abide by ethics and information laws and regulations related to information activities.
	C2 Patriotism and Multicultural	CO8	Have awareness of information security and civic responsibility, safeguard the legitimate rights and benefits of others and nation. Be able to reflect on the role of information technology in multiculturalism.
	C3 Global Perspectives and Sustainable Development	CO9	Have an understanding of information technology development trends, issues and international situations, understand the significance of intellectual property rights and the impact of information technology on society, and have the concept of sustainable development using information technology tools.

6. Curriculum Design

（1）**Design Ideas**

1. According to the "Information Technology" curriculum fundamental principles, promote the formation and development of students' information literacy, and improve students' ability to survive, develop and innovate in the information society.
2. Design and adjust the curriculum content according to the credits and hours allocations of the *Main Standards*, learn from international information technology education, and refer to the design ideas of advanced curriculum systems.
3. The selection of curriculum content is based on the learning patterns and life experiences that conform to the physical and mental development of Senior Level students, ensuring a clear knowledge system, reasonable difficulty, and providing moderate cognitive challenges. The curriculum content reflects the development trend of domestic and global information technology and improves the forward-looking of the curriculum standard.

4. According to the nature of the "Information Technology" curriculum, design curriculum content that has basic knowledge and meets the needs of further studies, and also focuses on theoretical study and practical application. In the curriculum design of basic knowledge, focuses to the common basic needs of all students. While in the curriculum design for further studies, students' options for further study are considered, laying the foundation for those interested in taking information technology-related courses in higher education.

（2）**Curriculum Structure**

The curriculum structure of "Information Technology" is shown below:

Senior One	Senior Two	Senior Three
1. Understanding data 2. Algorithm and programming 3. Artificial intelligence and applications 4. Information technology and society 5. Overview of information systems and networks 6. Information security and social responsibility	1. Information system 2. Network types and transmission quality 3. Network communication and operating systems 4. Network security and network resources sharing 5. Internet of Things and its applications	1. Introduction to data management and analysis 2. Data requirements analysis 3. Data management 4. Data analysis

The curriculum is structured around fifteen themes. There are six themes in the learning content of Senior One, namely "Understanding data", "Algorithm and programming", "Artificial intelligence and applications", "Information technology and society", "Overview of information systems and networks" and "Information security and social responsibility". The study content of Senior Two includes five themes: "Information system", "Network types and transmission quality", "Network communication and operating systems", "Network security and network resources sharing" and "Internet of Things and its applications". The learning content of Senior Three includes four themes, namely "Introduction to data management and analysis", "Data requirements analysis", "Data management" and "Data analysis".

The themes of Senior One merge the basic principles, knowledge and skills of the subject. The curriculum contents of this year focuses on enabling students to understand data, programming and artificial intelligence, followed by understanding knowledge in the fields of information technology applications, network overview, information society and social responsibility, helping students lay a solid foundation for studying information technology courses. The themes of Senior Two and Senior Three are designed according to the needs of students for further studies. The curriculum of this year is based on themes of Senior One, and the content of the curriculum extends the knowledge in the

fields of information systems, network and security, Internet of Things, data management and analysis, etc., aiming to provide conditions for students to continue to study in the direction of information technology in colleges in the future.

（3）**Credits and Periods**

1. The learning targets of the "Information Technology" curriculum in Senior Level are students of literature/business/science/technique.
2. The "Information Technology" curriculum has 40 weeks of classes in each academic year, and it is recommended to have 2 periods per week, each period lasts 40 minutes.
3. Students take 4 credits each academic year from Senior One to Senior Three, and the total credits shall be 12 credits.
4. The recommended credits and number of periods for the "Information Technology" curriculum are shown below:

Subject	Type	Senior One		Senior Two		Senior Three		Total Credits
Information Technology	Dong Zong Curriculum (Selective Compulsory)	Credits	Period per week	Credits	Period per week	Credits	Period per week	12
		4	2	4	2	4	2	

7. Curriculum Content

（1）**Content Standards**

The presentation of content standards is distinguished by theme, and extended to related items according to the theme, which then develop specific contents from the items.

Theme/Content	Item	Details
Senior One		
1. Understanding Data	1.1. Data, information and knowledge	1.1.1. Data 1.1.2. Information 1.1.3.Knowledge
	1.2. Information digitization	1.2.1. Concept of digitization 1.2.2. Binary and number conversion 1.2.3. Data encoding 1.2.4. Data compression
	1.3.Data science and big data	1.3.1. Data science 1.3.2. Big data

2. Algorithm and Programming	2.1.Problem solving process	2.1.1. General process of problem solving 2.1.2. General process of problem solving using computer
	2.2.Algorithm and expression	2.2.1. Define algorithm 2.2.2. Algorithm expression
	2.3.Programming basics	2.3.1. Knowing Python language 2.3.2. Data types, variables and constants 2.3.3. User input 2.3.4. Selection structure 2.3.5. Repetition structure
	2.4.Algorithm and problem solving	2.4.1. Using algorithms to embody solutions 2.4.2. Diversified solution design
3. Artificial Intelligence and Applications	3.1. Development and technology of artificial intelligence	3.1.1. Development of artificial intelligence 3.1.2. Artificial intelligence related technologies
	3.2. Application and impact of artificial intelligence	3.2.1. Application of artificial intelligence 3.2.2. Impact of artificial intelligence
4. Information Technology and Society	4.1. Development and application of information technology	4.1.1. The development history of information technology 4.1.2. The development trend of information technology 4.1.3. Main technologies of information technology 4.1.4. Application of information technology
	4.2. Information society and its characteristics	4.2.1. Information society 4.2.2. Characteristics of the information society
5. Overview of Information Systems and Networks	5.1. Introduction to information system	5.1.1. System 5.1.2. Information system 5.1.3. Elements of an information system 5.1.4. Types and functions of information systems
	5.2. Development, application and influence of network	5.2.1. Computer network 5.2.2. Introduction to the development of mobile Internet 5.2.3. Network application 5.2.4. The impact of the Internet on life
6. Information Security and Social Responsibility	6.1. Information security risks and prevention	6.1.1. Information system security risks 6.1.2. Information system security precautions 6.1.3. Methods of safe use of information systems

	6.2. Information social responsibility	6.2.1. Social security threats and responses 6.2.2. Code of conduct for personal information security 6.2.3. Code of ethics for the information society 6.2.4. Information society laws and regulations

Senior Two		
1. Information System	1.1. Information system development process	1.1.1. System development life cycle 1.1.2. The concept and drawing method of data flow diagram 1.1.3. Problems faced by the traditional system development model
	1.2. The development direction, advantages and limitations of information systems	1.2.1 Development direction of information system 1.2.2 Advantages and limitations of information system
2.Network Types and Transmission Quality	2.1. Types of networks	2.1.1. Network coverage 2.1.2. Network transmission medium 2.1.3. Network topology 2.1.4. Network transmission method 2.1.5. Network sharing structure
	2.2. Main factors affecting network transmission quality	2.2.1.Noise 2.2.2 Attenuation
3. Network Communication and Operating Systems	3.1. Basics of network communication	3.1.1. Data exchange technology 3.1.2. TCP/IP protocol 3.1.3. IP address 3.1.4. Subnet and subnet mask 3.1.5. Domain name and URL
	3.2. Connecting device and operating system	3.2.1. Network connection equipment 3.2.2. Network operating system 3.2.3. Ways to connect to the Internet 3.2.4. LAN security strategy 3.2.5. Impact of bandwidth and access mode on information system
4.Network Security and Network Resources Sharing	4.1. Network communication threats and network security technology	4.1.1. Threats to network communications 4.1.2. Digital summary 4.1.3. Encryption technology 4.1.4. Digital signature 4.1.5. Authentication 4.1.6. Firewall
	4.2.Network resource sharing	4.2.1. Types of network resources 4.2.2. Ways of network resource sharing 4.2.3. Reasonable and safe use of network resources
5. Internet of Things and	5.1. Concept of Internet of Things	5.1.1. Concept and architecture of Internet of

its applications		Things 5.1.2. Development history of IoT 5.1.3. Sensing technology 5.1.4. Communicationg technology 5.1.5. IoT protocols and cloud computing
	5.2. Applications and security risks of Internet of Things	5.2.1. Applications of Internet of Things 5.2.2. Security risks of Internet of Things

Senior Three		
1.Introduction to Data Management and Analysis	1.1. Data, big data and data science	1.1.1. Realize the value of data 1.1.2. Application value of big data 1.1.3. Basic concepts of data science
	1.2. Introduction to data management and analysis	1.2.1. Development and methods of data management 1.2.2. Storage and management of big data 1.2.3. Data analysis and its basic process 1.2.4. The role and significance of data analysis in scientific decision-making
2.Demand Analysis and Data Collection	2.1. Business requirements and solutions	2.1.1. Analyse business requirements 2.1.2. Design solution 2.1.3. Analyse data requirements
	2.2. Introduction to data acquisition	2.2.1. Methods and approaches of data collection 2.2.2. Collect data in the network
	2.3. The concept of data structure	2.3.1. Data with different levels of structure 2.3.2. Phenomena and causes of noise data
3.Data Management	3.1. Database and data management	3.1.1. Database and database management system 3.1.2. Basic functions of the database 3.1.3. Conceptual data model
	3.2. Logical structure and database establishment	3.2.1. Convert conceptual model to relational model 3.2.2. Create and view database 3.2.3. MySQL data types 3.2.4. Create and view data table 3.2.5. Alter and drop data table 3.2.6. Insert data into the data table
	3.3. Structured query and extraction	3.3.1. Structured Query Language 3.3.2. Database query method 3.3.3. Extraction of query data
	3.4. Backup and restore database	3.4.1. Common causes of data loss 3.4.2. Common backup methods 3.4.3. Backup and restore database
4.Data Analysis	4.1. The concept of data analysis	4.1.1. Tools for data analysis 4.1.2. Data analysis method

	4.2. Data visualization and data reporting	4.1.3. Data mining
		4.2.1. Graphics in data visualization
		4.2.2. Steps of data visualization
		4.2.3. Programming to accomplish data visualization
		4.2.4. Construct data analysis report

（2）Learning Standards

　　In the planning of the new curriculum development for independent Chinese secondary schools, the "Learning Standards" are defined as the cognitive, psychomotor, and affective (including emotions, attitudes, and values) that students can learn from the content standards. Such learning standards cover the connotation of "competency". The three domains of cognitive, psychomotor and affective of the learning standards for "Information Technology" as outlined below.

Domain	Cognitive（C）	Psychomotor（P）	Affective（A）
Item	Ca Information Technology Knowledge	Pa Practical Innovation Ability	Aa Information Technology Attitude
	Cb Information Awareness	Pb Inquiry Ability	Ab Information Social Responsibility
	Cc Computational Thinking	Pc Communication and Collaboration Skills	Ac Information Technology Values

（3）Descriptions of the Items and the Learning Standards

Domain	Item	Descriptions
Cognitive （C）	Ca Information Technology Knowledge	I. Possess the basic knowledge, principles and phenomena of information technology. II. Be able to use the knowledge of information technology in life and learning.
	Cb Information Awareness	I. Possess information sensitivity, observation and judgment. II. Able to find appropriate ways to acquire and process information.
	Cc Computational Thinking	I. Able to define and analyse problems using methods of thought in the field of computer science. II. Able to organize and express ideas logically. III. Able to use computational thinking to solve problems reasonably.
Psychomotor （P）	Pa Practical Innovation Ability	I. Possess basic skills in the operation and practical.

		II. Able to choose digital resources and tools, create innovative works, and complete learning tasks.
	Pb Inquiry Ability	I. Be able to carry out independent and exploratory learning. II. Be able to actively explore new knowledge and issues of information technology. III. Can integrate subject knowledge with cross academic concept and engage in inquiry.
	Pc Communication and Collaboration Skills	I. Able to use computer vocabulary and terminology to express opinions and communicate with others. II. Able to use information technology terms and tools to express ideas. III. Able to use appropriate information technology tools to collaborate with team to discuss, plan, manage and complete tasks.
Affective（A）	Aa Information Technology Attitude	I. Possess a positive attitude towards IT learning and pay attention to relevant issues. II. Possess a correct attitude and habit of using information technology. III. Curiosity and interest in information technology. IV. In the process of using information technology, students can realize the differences between their own understanding and solutions to problems and those of others, and respect the choices of others.
	Ab Information Social Responsibility	I. Be aware of information security. II. Commit to the moral and ethical principles of the information society. III. Comply with information laws and regulations. IV. Publish, disseminate and use information responsibly.
	Ac Information Technology Values	I. Be able to cope with changes in the information world, be competitive and adapt to global challenges. II. Be able to make correct value judgments on IT issues.

First Example of Alignment of Content Standards and Learning Standards

	Cognitive	Psychomotor	Affective
Learning Standard	CcI Able to define and analyse problems using methods of thought in the field of computer science.	PaI Possess basic skills in the operation and practical.	AaIV In the process of using information technology, students can realize the differences between their own understanding and solutions to problems and those of others, and respect the choices of others.
Content Standard			
Senior One 2.1.2 General process of problem solving using computer	Able to explain the steps problem solving using computer.	Able to use computer problem-solving methods and processes to solve problems according to the requirements of the problem.	Able to recognize differences between the way one uses computers and the way others use them to solve problems.

Second Example of Alignment of Content Standards and Learning Standards

	Cognitive	Psychomotor	Affective
Learning Standard	CbI Possess information sensitivity, observation and judgment.	PcI Able to use computer vocabulary and terminology to express opinions and communicate with others.	AaIII Curiosity and interest in information technology.
Content Standard			
Senior One 6.1.2 Information system security precautions	Have information system security awareness and be able to identify common information system security threats.	Able to clearly express and communicate information system security prevention methods.	Show curiosity and interest in information system security prevention methods.

8. Pedagogical Suggestions

Improving students' core competency is the goal of the "Information Technology" curriculum. In order to implement the core competency of the curriculum in teaching, teachers first need to understand

the connotation of the core competency of the curriculum, have a complete understanding of the curriculum knowledge taught and have a certain concept of the relationship between the knowledge taught with the overall knowledge. Teachers should adopt a series of effective teaching strategies to promote the all-round development of students.

The teacher's teaching implementation determines the effectiveness of education. In addition to the use of general books and equipment, teaching technology does include the ability of teachers to use technological aids. The network has broken the barriers of time and space. The place where students learn knowledge is no longer limited to the classroom and the way to receive knowledge is no longer only inherit from teachers. Students can learn through the network anytime, anywhere. Teachers need to have a certain grasp of different network platforms, software, programs, etc., in order to be able to achieve the tasks of the curriculum. Teachers use modern teaching technology to obtain the latest knowledge and skills to give lectures to students. This also encourages teachers to continuously improve themselves in teaching and effectively improve the overall quality of teachers.

（1）**Teaching Methodology**

The teaching of the "Information Technology" curriculum in Senior Level should adopt various teaching strategies, flexibly use of appropriate teaching methods and take the cultivation of the core literacy of the curriculum as an important goal of teaching to implement it in teaching activities. The teaching implementation can adopt the teaching strategy of "teacher-oriented, student-centered", and adopt a student-centered teaching design. Teachers should create a digital learning environment, provide students with rich curriculum resources, and select life-related cases to guide students' learning and thinking. From simple to complex, gradually stimulate students' interest in learning so that learning would be proactive.

The literacy learning emphasized in the *Main Standards* stress on students' ability to explore knowledge by themselves, so teachers need to plan the learning route to let students explore knowledge by themselves. The design of teaching activities should be based on the principle of problem-solving. Teachers need to design appropriate problems for students to solve, and practically use of knowledge to solve problems. Each activity can be designed for individual or group to cultivate students' ability of independent learning and teamwork learning. Students who are more capable should be encouraged to plan their own assignments to reach their potential and foster creativity. As for students with poorer learning ability, in addition to strengthening individual tutoring, their learning progress should be adjusted in the manner of breadth and depth.

The following teaching methods can be used in the daily teaching of "Information Technology" curriculum:

1. Lecture pedagogy – The teacher explains the knowledge systematically. This teaching method is mainly used in the teaching of general knowledge of information technology and the explanation of the principles and operation steps of computer operability knowledge.

2. Demonstration teaching method - This teaching method is operated by the teachers, and the students learn the steps and methods of operation from the teacher's demonstration. This teaching method is mainly used for teaching with strong operability, such as the demonstration of the use and operation steps of computer software.

3. Synchronous teaching method - Students and teachers operate synchronously. This teaching method is mainly used for teaching with strong operability. The teacher uses the computer to explain while operating, and shows the operation steps through the projector, and the students follow the teacher's operation and explanation to operate step by step until the entire operation process is completed. Students master the knowledge and operation content in the process of synchronous operation.

4. Exploratory teaching method - For a special teaching content, the teacher first gives some hints or does not explain at all, but just a task to be completed by the students. This allows students to explore knowledge and complete the task. This method is suitable for use when students have a certain foundation. During the exploration process, teachers should be good at guiding the students, encouraging them to explore and find solutions to problems. Teachers shall create more conditions for students to explore and solve, so that the exploration process can proceed smoothly. The exploratory teaching method is mostly used for teaching content that is interesting, has a certain degree of difficulty but is not being too tough. Teachers can also design interdisciplinary inquiry tasks, such as combining information technology with environmental science, physics or mathematics, so that students can master interdisciplinary knowledge and skills through independent inquiry. This approach not only help students apply multidisciplinary knowledge in an integrated manner, but also cultivate their innovation ability and ability to solve complex problems.

5. Task-teaching method – Teachers formulate practical tasks for a period according to the progress of teaching content and the actual situation of students' learning, so that students can complete the tasks prescribed by the teacher through learning and working.

6. Situational teaching method – According to certain purposes and teaching themes, teacher set up situations related to classroom teaching content, allowing teachers and students to integrate into the teaching situation to complete the teaching task. For example, teachers can design a simulation scenario, assuming that the enterprise network is attacked by hackers, and students play the role of as members IT department of the enterprise. They need to analyze current network threats, develop and implement security measures to protect enterprise data and prevent future attacks. Through this scenario, students not only understand the importance of network security, but also improve their ability to solve practical problems, while stimulating their interest in learning.

7. Discussion pedagogy – Under the guidance of the teacher, students debate the teaching content, express their opinions and draw conclusions through whole class or group discussions. Discussion teaching method is conducive to in-depth exploration of knowledge, and cultivates

students' ability of thinking, oral expression and comprehensive analysis of problems.

（2）**Suggested of Period Allocation for Each Theme**

Below shows the suggestions for the allocation of periods from Senior One to Senior Three：

Academic Year	Theme	Period
Senior One	1. Understanding Data	10 – 12
	2. Algorithm and Programming	16 – 20
	3. Artificial Intelligence and Applications	6 – 9
	4. Information Technology and Society	8 – 9
	5. Overview of Information Systems and Networks	7 – 8
	6. Information Security and Social Responsibility	8 – 10
	Flexible periods (classroom review, quizzes, teaching activities, etc.)	10 – 12
	Total periods	**65 - 80**
Senior Two	1. Information System	11 - 15
	2. Network Types and Transmission Quality	6 - 8
	3. Network Communication and Operating Systems	13 - 15
	4. Network Security and Network Resources Sharing	19 - 22
	5. Internet of Things, Innovative Network Services and Privacy Protection	6 - 8
	Flexible periods (classroom review, quizzes, teaching activities, etc.)	10 - 12
	Total periods	**65 - 80**
Senior Three	1. Introduction to Data Management and Analysis	9 – 12
	2. Data Requirements Analysis	13 – 16
	3. Data Management	17 – 21
	4. Data Analysis	11 – 14
	Flexible periods (classroom review, quizzes, teaching activities, etc.)	15 – 17
	Total periods	**65 - 80**

9. Assessment Suggestions

The main purpose of curriculum assessment is to check the extent to which students have achieved their learning outcomes, to promote the development and formation of students' literacy, and to improve teachers' teaching. The assessment of the "Information Technology" curriculum should meet the requirements of the *Main Standards*, content standards and learning standards, and the assessment method should be conducive to students' learning and teaching development. Students' intellectual fields are diverse, so the assessment methods should be diversified, as to evaluate the different levels of students' cognition, psychomotor and affective fields, and trigger students'

introspection and thinking. Through the reasonable implementation of assessment, students' interest in learning and applying information technology is stimulated, and students are helped to gradually improve their information literacy and become spontaneous and active learners.

（1）Assessment Principles

The evaluation of the "Information Technology" curriculum should follow the following principles:

1. Based on achieving the goals of the "Information Technology" curriculum

The assessment of the "Information Technology" curriculum should focus on the key points of the curriculum objectives, and on the base of respecting the differences in students' levels and individual differences. Through flexible and diverse evaluation methods, the basic goals of the subject could be achieved.

2. To facilitate student learning and improve teacher teaching

The assessment of the "Information Technology" curriculum in Senior Level should focus on students' learning and development, play a variety of guiding functions such as diagnosis, feedback, motivation and promotion, and cultivate students' information literacy. By observing students' operation process, analysing students' works, checking students' ability to use technology to solve problems, stimulating students' inner learning motivation, and helping students to clarify their own deficiencies and direction of efforts. Assessment also helps teachers to reflect on teaching behavior on the basis of understanding students' learning strengths, weaknesses and the reasons for their formation, so to make adjustments and improvements.

3. Assessment methods should be diversified, fair and just

Depending on the content of the assessment and the different aspects of the students' learning and development, a variety of different assessment methods can be adopted. The "Information Technology" curriculum is highly operational and practical, and the learning process experienced by students is also an important basis for assessment. The academic assessment of students should adopt the combination of formative evaluation and summative evaluation as much as possible. Teachers should choose appropriate assessment methods according to teaching needs, and explore assessment methods suitable for different purposes in order to improve the assessment effect. The design and implementation of the assessment plan should take into account the actual situation of all students, and the assessment plan should be formulated in advance and announced in a timely manner. Learning assessment should strive to evaluate students' academic status in a comprehensive, fair and just manner.

4. Integration of assessment content

The "Information Technology" curriculum integrates cognition, psychomotor, affective and other aspects. The students' ability is also a comprehensive ability composed of different components at multiple levels. The evaluation of the "Information Technology" curriculum is a comprehensive assessment of the above aspects of ability.

（2）Learning Assessment

Literacy is a student's inner quality, which can only be observed through performance. It is formed through repeated ability performance, reflection and adjustment, which is gradually deepens and accumulates. Literacy-oriented curriculum and teaching focus on students' learning process and outcomes. Teachers use learning assessment as a tool to evaluate students' learning status or results from their learning performance, always pay attention to the facts of students' learning, give them appropriate feedback and encouragement, and at the same time reflect on and adjust their own teaching. The content of the assessment should take into account students' physical and mental development, individual differences, and the connotation of core literacy, and the learning performance in different fields such as cognition, psychomotor and affective. The cultivation of students in any field must be arranged according to a certain level, deepened and improved according to a certain direction. Learning assessment covers the following components:

1. Learning assessment covers categories such as scientific and technological cognition, psychomotor, affective and comprehensive ability, focusing on the combination of formative assessment and summative assessment.

2. The assessment of the cognitive domain should cover different cognitive levels. This can be done through questions, task answers, etc.

3. The assessment of psychomotor areas should cover different skill levels. It should be done through practice, works, research, file evaluation, etc.

4. The assessment of the affective domain should cover different aspects such as technology attitudes, responsibilities and values, and can be done through peer assessments, teacher assessments, etc.

5. The assessment of comprehensive ability should cover critical thinking, problem solving, teamwork, innovation, etc., and be done through practice, project learning, peer evaluation, teacher evaluation, etc.

The assessment of the "Information Technology" curriculum is based on the performance standards, and the performance standards are based on the requirements of the curriculum standards. Performance standards are guidelines for performance levels so that the levels mastered by the student can be shown. Educational objectives in the domain of cognition are divided into six levels from low to high: remember, understand, apply, analyse, evaluate and create. Educational objectives in the domain of

psychomotor are divided into five levels: imitation, manipulation, precision, articulation and naturalisation. The educational objectives of the field of affective are divided into five levels: receiving, responding, valuing, organising & conceptualising and characterising by values. For different types and levels of educational objectives, teachers need to adopt different teaching methods. For example, if you want to help students to achieve high-level cognitive goals, you cannot just use the one-way teaching method of lectures, but must use the teaching method of two-way communication between teachers and students. Performance standards serve as a guide for teachers in conducting internal assessments.

Performance Standards for Cognitive, Psychomotor, and Affective Domains for Information Technology：

Domain	Item	Level	Performance Standards
Cognitive （C）	Ca Information Technology Knowledge	1 Remember	Memorize basic concepts, knowledge and principles of information technology.
		2 Understand	Explain the basic concepts, knowledge and principles of information technology.
		3 Apply	Apply basic concepts, knowledge and principles of information technology to life or learning tasks.
		4 Analyse	Analyze basic concepts, knowledge, principles and phenomena of information technology.
		5 Evaluate	Evaluate information technology solutions or phenomena according to certain standards and make suggestions for improvement.
		6 Create	Create or discover new IT concepts, knowledge and principles.
	Cb Information Awareness	1 Remember	Memorize the basic concepts of information processing.
		2 Understand	Understand the value, process and tools of information processing and be able to select appropriate tools based on needs.
		3 Apply	Properly select information technology tools according to the actual needs of solving problems; have the awareness of using

			information technology tools for information security prevention.
		4 Analyse	Analyze the information required for the task, use the Internet to obtain resources, and be able to comprehensively analyze the obtained information.
		5 Evaluate	Evaluate the source of information and judge the reliability, authenticity and purpose of the information.
		6 Create	Use IT tools and collaborate on creation according to the characteristics of the task requirements.
	Cc Computational Thinking	1 Remember	Able to identify basic features with the simple task given.
		2 Understand	Understand the task requirements, be able to extract the main features of the problem and define the problem in a way that the computer can process.
		3 Apply	Use basic algorithms to design solutions to problems and be able to use programming languages or other technological tools to implement solutions.
		4 Analyse	Able to analyse and reason common computing problems, draw conclusions and transfer them to other related problems.
		5 Evaluate	Able to evaluate facts and conclusions related to computer science, propose explorable solutions, and use appropriate methods to optimize the solutions.
		6 Create	Aiming at specific learning tasks, students can use strategies and methods related to computer science to complete tasks and create works.
Psychomotor （P）	Pa Practical Innovation Ability	1 Imitation	Able to imitate actions demonstrated by others.
		2 Manipulation	Can follow the technological operation method to complete the operation process.

		3 Precision	Accurate and proficient in scientific and technological operation methods and processes.
		4 Articulation	Able to coordinate the rationality of practical application schemes in the process of scientific and technological operation.
		5 Naturalisation	Can combine the knowledge and skills learned in the practical application of science and technology, form naturalized evaluations and propose reasonable improvement plans, and reflect on the process and results of practical application.
	Pb Inquiry Ability	1 Imitation	Able to simulate a variety of feasible methods through computer science inquiry.
		2 Manipulation	Can follow the scientific and technological inquiry method to complete the inquiry process.
		3 Precision	Able to discover problems in daily life, conduct autonomous and exploratory learning, and complete inquiry tasks independently and accurately.
		4 Articulation	With the change of technology and environment, coordinate the process of inquiry, innovate and create.
		5 Naturalisation	Be able to evaluate the inquiry process, form an evaluation in a natural way, propose reasonable improvement plans and reflect on the inquiry process and results.
	Pc Communication and Collaboration Skills	1 Imitation	Willingness to collaborate with others, mimicking the basic skills of communication and collaboration.
		2 Manipulation	Able to collaborate with others to conduct research and organize data for communication and collaboration.
		3 Precision	Respect others in cooperation, communicate and collaborate

			accurately, and propose exploration plans.
		4 Articulation	Coordinate with others in cooperation to correct mistakes, collaborate and propose appropriate solutions.
		5 Naturalisation	Actively participate in cooperation. Naturally play the role of team work and can formulate optimized plans.
Affective （A）	Aa Information Technology Attitude	1 Receiving	Follow information technology issues, have curiosity and interest in information technology.
		2 Responding	Actively participate in information technology activities, have interest in learning technology and curiosity to explore technology.
		3 Valuing	Share new information technology knowledge with others, explore new information technology knowledge and issues, and implement healthy technology usage habits and attitudes.
		4 Organising & Conceptualising	Establishing a correct attitude towards information technology to form a system of various values, integrate various values, and form information technology use behaviors.
		5 Characterising by Values	Develop a good attitude and habit of technology, and be able to use multiple perspectives to speculate on IT-related issues.
	Ab Information Social Responsibility	1 Receiving	Focus on the strategies and methods of protecting personal information and be able to use information equipment safely.
		2 Responding	Actively participate in information activities, have information security awareness, and be able to respect and protect the privacy of individuals and others.
		3 Valuing	Ability to share information and social responsibility with others.

		4 Organising & Conceptualising	Establishing a correct sense of social responsibility for information to form a system of values, integrate them, and form responsible behaviors.
		5 Characterising by Values	Be able to consciously abide by information laws and regulations, information ethics and moral standards, and promote the harmonious and sustainable development of the information society.
	Ac Information Technology Values	1 Receiving	Focus on the development of information technology and understand the changes and challenges in the information world.
		2 Responding	Actively participate in scientific and technological research, respond positively, and understand the changes and challenges of information technology.
		3 Valuing	Able to share the value of information technology with others.
		4 Organising & Conceptualising	Be able to form a system of information technology values and integrate them, be able to make good use of technology-related knowledge and values to adapt to technological changes.
		5 Characterising by Values	Form the correct values of information technology.

Teachers can use the "Performance Standards for Cognitive, Psychomotor and Affective for Information Technology" to select performance standards for each corresponding learning standard and develop classroom teaching objectives with measurement levels. When teaching the same course, teachers can set different performance standards according to the different levels of students.

First Example of Alignment of Content Standards and Learning Standards with Performance Standards

	Cognitive	Psychomotor	Affective
Learning Standard	CcI Able to define and analyse problems	PaI Possess basic skills in the operation and	AaIV In the process of using information

	Cognitive	Psychomotor	Affective
Content Standard	using methods of thought in the field of computer science.	practical.	technology, students can realize the differences between their own understanding and solutions to problems and those of others, and respect the choices of others.
Senior One 2.1.2. General process of problem solving using computer	Able to explain the steps problem solving using computer.	Able to use computer problem-solving methods and processes to solve problems according to the requirements of the problem.	Able to recognize differences between the way one uses computers and the way others use them to solve problems.
Performance Standard	Able to distinguish the steps that computers take to solve problems. (C4 Analyse)	Able to correctly use computer problem-solving methods and processes to solve problems according to the requirements of the problem. (P3 Precision)	Actively participate in discussions on methods and processes of using computers to solve problems, and be interested in different approaches. (A2 Responding)

Second Example of Alignment of Content Standards and Learning Standards with Performance Standards

		Cognitive	Psychomotor	Affective
	Learning Standard	CcI Able to define and analyse problems using methods of thought in the field of computer science.	PaI Possess basic skills in the operation and practical.	AaIV In the process of using information technology, students can realize the differences between their own understanding and solutions to problems and those of others, and respect the choices of others.
Content Standard				
Senior One 2.1.2. General process		Able to explain the steps problem solving	Able to use computer problem-solving	Able to recognize differences between

of problem solving using computer	using computer.	methods and processes to solve problems according to the requirements of the problem.	the way one uses computers and the way others use them to solve problems.
Performance Standard	Able to describe the general process of problem solving using computer. (C2 Understand)	Able to solve problems according to computer problem-solving methods and processes. (P1 Imitation)	Actively participate in discussions on methods and processes of using computers to solve problems, and be interested in different approaches. (A2 Responding)

The teaching assessment modes of the "Information Technology" curriculum can be divided into:

1. Formative assessment

Formative assessment mainly refers to the measurement of students' learning process and results in order to improve and perfect teaching activities during the teaching process. Teachers should use the results of measurement to improve teaching, so that teaching tends to be perfect in the process of continuous assessment, feedback, correction or improvement. The frequency of this type of test is relatively frequent, generally after the initial teaching of new concepts or new skills is completed, and the scope of the test is relatively small. Formative assessment includes students' performance in participating in operations and practical activities, work creation, learning situation, etc.

2. Summative assessment

Summative assessment generally refers to the evaluation of students' learning outcomes after a curriculum or a teaching period is over. The main purpose of this type of assessment is to evaluate students' academic performance, determine the degree to which students have achieved their learning goals, and provide a basis for determining the starting point of students' learning in subsequent curriculums and formulating new learning goals. The generalization level of summative assessment is generally relatively high, the content of the examination is relatively wide, and the number of assessment is not many. Mid-term exams, final exams, and graduation exams in schools are all such assessments. When organizing summative assessment, it is necessary to select appropriate question types and methods according to the requirements of the curriculum standards and specific examination content, and adopt various forms of assessment methods to comprehensively examine the coordinated development of students' information literacy.

Internal and external assessments can be used to test students' knowledge of:

（3）Internal Assessment

In daily teaching, school teachers assess students' learning process and learning outcomes in the areas of cognition, psychomotor and affective. Evaluation methods include paper-and-pencil test, computer-based test, work assessment, peer evaluation, etc. The paper-pencil test is suitable for assessing students' understanding and mastery of IT knowledge. Adding open-ended questions to the paper-and-pencil test can help assess students' higher-order thinking skills. The computer-based test is suitable for assessing students' proficiency in practical operation and examining students' ability to solve problems. Work assessment is suitable for the examination of students' practical works. Peer evaluation is when students evaluate each other's behavior or work.

Teachers should follow various teaching objectives, according to teaching materials and teaching activities, choose appropriate assessment methods for different assessment purposes, comprehensively examine students' learning outcomes in terms of cognition, psychomotor, and affective so to truly examine whether students have learned the basic ability of each stage, which can be further used as a reference for teachers to evaluate teaching performance and improve teaching methods. Since the teaching in the field of science and technology focuses on the performances of practice and application, teachers should focus on students' performance in planning, design, production and problem-solving abilities when implementing assessments. In the process of assessment, individual differences and performance of students should also be taken into consideration, remedial or enrichment teaching should be implemented in a timely manner and students' learning effects should be checked to implement teaching results.

In daily teaching, teachers can design one or more project activities, according to the requirements of the curriculum content. The teacher's assessment of each project activity should be timely and the assessment should highlight the role of motivation and guidance. Multi-assessment methods should be used in the evaluation, combining mutual evaluation, self-evaluation and other methods. The assessment criteria of project activities need to be designed one by one according to the requirements of specific activities. The assessment standard can be set according to the actual situation based on assessment indicator, weight and assessment standard description. Appendix 2 provides an example of the project activity assessment form of "Algorithms and Programming" in the compulsory part for reference. Teachers can design corresponding forms according to the actual needs of teaching.

School-based assessment of project-based learning focuses on the assessment of process and learning outcomes (research results). The main idea of project-based learning is to extend assessment to an integrated application covering all learning areas in the programme. Students are required to complete a project in the school-based assessment according to the teacher's guidance. The assessment requirements for project-based learning are related to the course content. Before the start of project-based learning, teachers should let students understand the requirements of the assessment and continue to provide students appropriate feedback to improve their learning effects. Appendix 3 provides example of grading elements and weights for project-based learning.

（4）**External Assessment**

External assessment may refer to public examinations, and the "Information Technology" unified examination is used to assess the learning achievements of independent Chinese secondary school students after completing information technology curriculum. The assessment results can be used as a reference for students' career planning.

10. Implementation Highlights

（1）**Teachers**

In terms of teacher requirements, it is recommended that teachers should hold a diploma qualification or above in an information technology-related course. All schools should take effective measures to strengthen the construction of IT teachers and provide full-time IT teachers according to the curriculum requirements to provide basic guarantees for the curriculum. In line with the implementation of this curriculum, schools should arrange a variety of teacher trainings and teaching and research activities for teachers.

The main purpose of teacher training is to enable teachers to clarify the curriculum concept, curriculum objectives, curriculum content, teaching requirements, teaching methods and assessment, etc., in order to improve teachers' knowledge, skills and teaching ability.

Schools should arrange IT teachers to participate in teaching and research activities to promote collaboration and experience exchange among teachers. Collaboration among teachers can be carried out in various modes, including joint lesson preparation, group teaching, and mutual lesson observation. Teaching and research activities are an effective way for teachers to exchange teaching experiences and ideas, explore the discipline of education and teaching work, improve teachers' teaching professional ability, improve teaching methods and enhance teaching effects.

（2）**School Facilities**

School facility is the material basis for the implementation of the "Information Technology" curriculum. Schools need to set up classrooms and computer rooms that can meet the teaching needs according to the number of students and the demand for teaching hours.

Classrooms should be equipped with computers and related network facilities according to teaching requirements, while appropriate software should be installed for teaching. The computer room should be set up according to the teaching needs, equipped with a reasonable number and appropriate configuration of computers and corresponding equipment, and equipped with software and network facilities that meet the teaching needs, so to meet the needs of students for practical operation.

The school needs to improve the maintenance of related equipment according to the teaching requirements. In addition, equipment updates should be carried out in combination with the actual needs of teaching.

（**3**）**Teaching Resources**

The teaching resources of the "Information Technology" curriculum mainly include resources related to teaching and learning. In order to support students' learning, schools should select and develop relevant resources and effectively integrate internal and external resources to enhance students' learning effectiveness.

1. Teaching materials and self-compiled teaching materials

   Teaching materials include textbooks, teacher's handbook, reference books, auxiliary teaching materials and extracurricular reading materials, etc. In addition to the approved textbooks, according to the characteristics and needs of students, schools may collect, organize and select or edit suitable textbooks to enhance students' interest in learning.

2. Digital teaching materials and online resources

   Make good use of or build digital teaching materials and network resources related to information technology curriculum for students to study independently, observe and learn from each other, so to expand their learning scope. Digital teaching materials include Dong Zong E-Learning platform, teaching courseware, teaching videos, teaching short films, images, etc. Network resources include websites, blogs and cloud repositories related to teaching information technology.

3. Library and library facilities

   The library and library facilities are used to assist teaching. Each school can consider the needs of teaching and learning to purchase related books, journal and magazines, multimedia audio-visual materials and other equipment related to the curriculum, so to cultivate students' interest in reading and expanding students' information vision and knowledge.

4. Current Issues and Activities

   Teachers should make good use of current issues and activities related to information technology to encourage and guide students in discussing the relationship between individuals and communities through exploration and experience. Schools can invite parents, alumni, and professionals with professional knowledge to provide information-related lectures to students to expand their learning content.

11. Appendices

（1）Cognitive, Psychomotor and Affective Domains
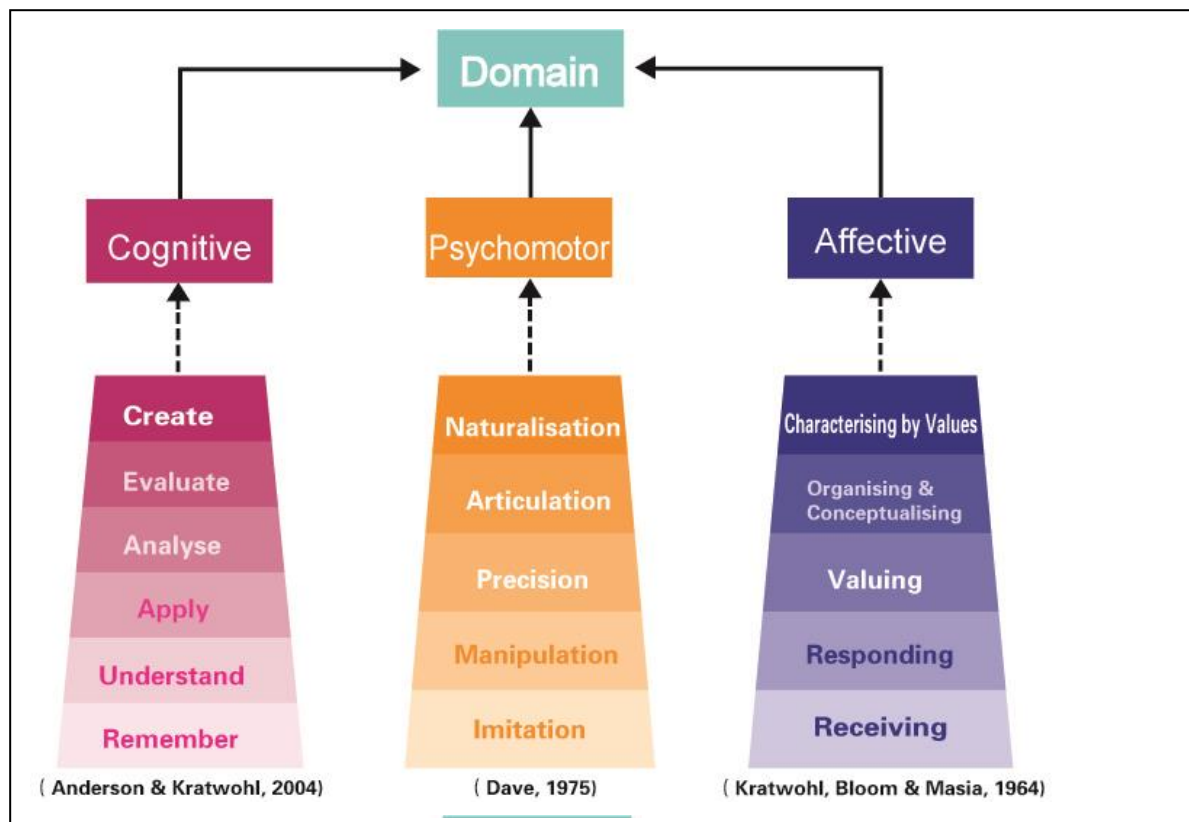
（2）*Example of Project Activity Evaluation Form*

Example of project activity evaluation form for "Algorithms and Programming" in the curriculum:

Evaluation Content	Evaluation Indicators	Weight	Self-Evaluation	Peer Evaluation	Teacher Evaluation
Project Design	Flow Chart	15%			
Project Program	Technique	10%			
	Program Code Readability	5%			
	Function	5%			
	Program Running	5%			
Team Work	Report Content	5%			
	Cooperative Learning	5%			
	Score	（50%）			
	Project Evaluation Score	Average Score = Self-Evaluation×20% + Peer Evaluation×20% + Teacher Evaluation×60%			

Evaluation Content	Evaluation Indicators (Weight)	Assessment Criteria Description		
		Excellent （4-5 Marks）	Basic Mastery （2-3 Marks）	Room for Improvement （0-1 Marks）
Project Design	Flow Chart （15%）	The process flow, graphic symbols and descriptions of the flow chart are correct.	Most of the process flow, graphic symbols and descriptions of the flow chart are correct.	Most of the process flow, graphic symbols and descriptions of the flow chart are incorrect.
		The flow chart is logical and the process is clear.	The flow chart is moderately logical and most processes are clear.	The flow chart is illogical and some processes are not clear.
		The flow chart is complete and can meet the functional requirements of the project.	The flow chart is slightly complete and can still meet the basic functional requirements of the project.	The flow chart is incomplete and cannot meet the basic functional requirements of the project.
Project Program	Technique （10%）	Algorithms and syntax are properly applied without errors.	Algorithms and syntax are generally applied with some errors.	Algorithms and syntax are improper with obvious errors.
		Ingeniously design algorithms to solve problems, the algorithm is efficient and the programs written are optimized.	The designed algorithm can still solve the problem but the efficiency of the algorithm is not high and the written program is not optimized enough.	The designed algorithm cannot solve the problem very well and still needs further modification and improvement.

	Program Code Readability（5%）	The logical organization and program structure of the program code are clear and readable.	The logical organization and program structure of the program code are general readability.	The logical organization and program structure of the program code are not clear and the readability is poor.
	Function （5%）	Realized all the expected functions of the project and has application value.	Realized the basic expected functions of the project and has low application value.	Realized only part of the expected function of the project and has no application value.
	Program Running （5%）	The program runs successfully and the output is correct.	The program runs basically successfully with minor errors in the output.	The program cannot run successfully.
Team Work	Report Content （5%）	The content of the report is clear, the written and language expression are fluent.	The content of the report is relatively clear, the written and language expressions are acceptable.	The content of the report is not clear, the written and language expression are not fluent.
	Cooperative Learning （5%）	The team can work well in division of work cooperation and discussion.	The team can still work together, cooperate and discuss.	The team cannot work well, cooperate or discuss.

（3）Eample of Grading Elements and Weights for Project-based Learning

Grading Elements and Weights for Project-based Learning

Grading Elements	Weights
1.Process	**（2%）**
1.1 Time Management	1%
1.2 Team Work	1%
2.Written Report	**（14%）**
2.1 Purpose	2%
2.2 Analysis	2%
2.3 Conception	2%
2.4 Application	2%
2.5 Testing and Evaluation	2%
2.6 Conclusion	2%
2.7 Content Organization	2%
3. Oral Presentation	**（4%）**
3.1 Presentation	2%
3.2 Question and Answer	2%
TOTAL	**（20%）**

Grade Description of Performance Standards for Grading Elements:

1. Process（2%）

1.1 Time Management（1%）

Score	Description (Grade Description/Learning Performance Level)
1	Able to submit reports on time according to the work schedule
0	Not according to work schedule and late in submission of reports

1.2 Team Work（1%）

Score	Description (Grade Description/Learning Performance Level)
1	The team assists each other, communicates and cooperates
0	The team did not assist each other, lack of communication and cooperation

2. Written Report（14%）

2.1 Purpose（2%）

Score	Description (Grade Description/Learning Performance Level)
2	Able to clearly state the purpose of the assignment
1	Still possible to write out the purpose of the assignment
0	The purpose of the assignment is unclear

2.2 Analysis（2%）

Score	Description (Grade Description/Learning Performance Level)
2	Able to analyse problems and determine needs in detail
1	Can briefly analyse problems and needs
0	Problems and needs are not clear

2.3 Conception（2%）

Score	Description (Grade Description/Learning Performance Level)
2	The method conceived is sound and creative
1	The method conceived is moderate
0	The method conceived is poor

2.4 Application（2%）

Score	Description (Grade Description/Learning Performance Level)
2	Fully demonstrate the results obtained during the conception process and provide detailed evidence: diagrams, pictures, interfaces, etc.
1	Can still show the results obtained during the conception process and provide some supporting evidence: diagrams, pictures, interfaces, etc.
0	Cannot show the results obtained during the conception process and the evidence provided is insufficient

2.5 Testing and Evaluation（2%）

Score	Description (Grade Description/Learning Performance Level)
2	Can record the test results in a general way according to the measurement indicators in the test plan, and use a comprehensive method to test and evaluate
1	Able to record basic test results according to the test plan, and use basic methods for testing and evaluation
0	Some test results are recorded, testing and evaluation are poor

2.6 Conclusion（2%）

Score	Description (Grade Description/Learning Performance Level)

Score	Description (Grade Description/Learning Performance Level)
2	Have sufficient conclusions and can write concrete results, findings, ideas, suggestions or constructive arguments
1	The conclusion is acceptable, results, findings, ideas or suggestions written in brief.
0	No appropriate conclusion

2.7 Content Organization（2%）

Score	Description (Grade Description/Learning Performance Level)
2	The organization and layout are logical and clear, and the sentences are smooth and fluent
1	The organization and layout are reasonable and orderly and the sentences are relatively smooth
0	The organization is chaotic, disorganized and the sentences are not smooth

3. Oral Presentation（4%）

3.1 Presentation（2%）

Score	Description (Grade Description/Learning Performance Level)
2	Systematically and emphatically explain the content and characteristics of the report
1	Still possible to explain the content of the report
0	Can only read the contents of the report sequentially

3.2 Question and Answer（2%）

Score	Description (Grade Description/Learning Performance Level)
2	Able to answer questions, provide supplement information other than reports and develop insights
1	Can still answer questions
0	Unable to answer questions