Curriculum Guidelines for the 12-Year Basic Education

Elementary School, Junior High School,

and Upper Secondary School

The Domain of Technology

Ministry of Education

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I. Fundamental Beliefs

The mission of the 12-year Basic Education Program is to "develop talent in every student—to nurture by nature, and promote lifelong learning." The mission of the curriculum guidelines for the technology domain of the 12-year Basic Education Program is to ensure that every student is equipped with basic technological literacy by shaping an adaptive and friendly learning environment, as well as to inspire and develop the talents of every student within an adaptive and supportive environment, regardless of gender. The traditional Basic Education of the past focused on cultivating the basic literacies of reading, writing, and arithmetic. However, the popularization of the Internet has led to the rapid development of technologies, such as Artificial Intelligence, mobile networking, big data analytics, the Internet of Things (IoT), digital fabrication technology, smart manufacturing, and so forth. For example, Germany proposed the concept of "Industry 4.0," which aims to use information and communications technology, big data analytics, IoT, and other technologies to carry out the smartification and virtualization of factories, promote the formulation of new industrial standards, and attempt to alter the traditional mode of production and manufacturing in Germany. The United States of America proposed a national strategic plan for advanced manufacturing which would involve the use of information software and systems, the Internet, and other information and communications technologies to develop advanced digital fabrication and smart manufacturing technologies. It would also involve establishing a national network of innovative manufacturing, including infrastructure such as advanced production technology platforms, advanced manufacturing processes, and design resource databases, as well as emphasizing innovation-side rapid prototyping technology (e.g., 3D printing) and network service technologies such as cloud computing and big data to accelerate industrial innovation. As citizens of a digital world, the basic literacies that all modern citizens should possess include knowing how to cope with the next-generation lifestyle that results from the development of technology, having the ability to master, analyze, and apply technology, and using resources wisely to co-exist with the sustainable development of the social environment.

The curriculum of the technology domain of the 12-year Basic Education Program aims to cultivate students' technological literacy, providing students with hands-on practice using technological tools, materials, and resources, and developing the knowledge and skills for technological tools and computing systems. These curriculum goals also aim to foster exploration, creative thinking, logical and computational thinking, critical thinking, problem solving, and other higher-order thinking skills.

On the international level, many developed countries have also established the technology domain in their curricular guidelines, which emphasizes the integrated application of science, technology, engineering, mathematics, and design knowledge, thus helping students understand the link between science and engineering by reinforcing the connectivity of interdisciplinary knowledge. It is indeed the highlight of this revision to the 12-year curricular guidelines to create a technology domain that incorporates technology and engineering into this curriculum planning, so as to strengthen hands-on experience and the integrated application of cross-disciplinary knowledge (e.g., science, technology, engineering, mathematics, etc.).

The philosophy of the technology domain curriculum is to guide students to observe and experience the needs or problems of everyday life, through which applicable items can be designed. In addition, students should be able to apply the tools of computer science to clarify, understand, perform inductive analysis on, or resolve the problems that they encounter in everyday life. The development and implementation of the curriculum are based on students' life experiences, needs, and learning interests, with the intent of cultivating students' knowledge and skills in "design thinking" and "computational thinking" through the process of problem solving and hands-on practice. "Design thinking" emphasizes the ability to "do, use, and think" by observing and solving problems encountered in everyday life, thereby cultivating students' abilities in hands-on application, the use of technological products, as well as design and critical thinking. "Computational thinking" involves cultivating logical and systematic thinking by developing computer science knowledge and skills. Through the process of technology project production and problem solving, students' knowledge and skills in computational and design thinking will be enhanced while also cultivating teamwork and appropriate attitudes and habits. In summary, the technology domain curriculum aims to cultivate students' computational and design thinking and increase their understanding and curiosity about technology topics by implementing two subjects: information technology and living technology.

II. Curriculum Goals

The curriculum goals of the technology domain are to help students:

1. Acquire basic technological knowledge and skills and develop appropriate concepts, attitudes, and work habits.
2. Become proficient in the use of technological knowledge and skills adopting creative, design, critical, logical, and computational thinking.
3. Integrate theory and practice to solve problems and meet needs.
4. Understand the technology industry and its future developmental trends.
5. Cultivate an interest in technological research and development, regardless of gender, and engage in relevant career exploration and preparation.
6. Understand the interactions between technology and individuals, society, the environment, and culture, and reflect on ethical issues related to its use.

III. Time Allocation and Subject Combinations

<table>
<tr><td colspan="2" rowspan="3">Educational stage / Learning stage / Grade
Domain/Subject</td><td colspan="3">Junior high school</td><td colspan="5">Upper secondary school</td></tr>
<tr><td colspan="3">Fourth learning stage</td><td colspan="5">Fifth learning stage</td></tr>
<tr><td>7th</td><td>8th</td><td>9th</td><td colspan="2"></td><td>10th</td><td>11th</td><td>12th</td></tr>
<tr><td rowspan="3">Technology</td><td rowspan="2">Information Technology</td><td rowspan="3">2</td><td rowspan="3">2</td><td rowspan="3">2</td><td rowspan="2">Required courses</td><td>Information Technology</td><td colspan="3">2</td></tr>
<tr><td>Living Technology</td><td colspan="3">2</td></tr>
<tr><td>Living Technology</td><td colspan="2">Enrichment and expanded elective courses</td><td colspan="3">8</td></tr>
<tr><td>Remarks</td><td colspan="9">The technology domain curriculum includes two subjects—information technology and living technology—with the following time allocated for it:
1. Junior high schools stage
The number of study sessions for the technology curriculum at the junior high schools stage is two classes per week. It is recommended that the sessions be arranged by semester, that is, information technology and living technology should be taught, respectively in the first and second semesters, with two consecutive class periods per week.
2. Upper secondary schools stage
(1) The Ministry-mandated required courses for information technology and living technology at the senior high schools stage are worth two credits each or two study sessions per week. It is recommended that these two sessions be arranged by semester, that is, information technology and living technology should be taught, respectively, in the first and second semesters, with two consecutive class periods per week.
(2) The enrichment and expanded courses are worth a total of eight credits, and are planned to include the following topics: advanced programming (two credits), engineering design project (two credits), the domain- specific robotics project (two credits), and applied technology project (two credits).</td></tr>
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IV. Core Competency

The following table shows the representation of the domain of Technology by following the specific content of the various educational stages core competency in the *General Guidelines* and combining them with the domain of Technology's Fundamental Beliefs and Curriculum Goals.

Core Competency Dimension	Core Competency Item	Item Description	Core Competencies of the domain of Technology	
			Junior High School (J)	Upper Secondary School (S-U)
A Autonomous Action	A1 Physical and Mental Wellness and Self-Advancement	Possess the ability to conduct sound physical and mental developments, and maintain an appropriate view of humans and self. Through decision making, analyses, and knowledge acquisition, students can effectively plan their career paths, search for meaning in life, and continually strive for personal growth.	科-J-A1 Have a good attitude towards technology and be able to apply technical competence to reach one's potential.	科 S-U-A1 Possess knowledge and ability to apply technology and effectively plan career for personal growth.
	A2 Logical Thinking and Problem Solving	Possess competency in systematic thinking to understand problems, engage in analyses, think critically, and endeavor in meta-thoughts, with the ability to reflect and conduct actions, to effectively tackle and solve problems in daily life.	科-J-A2 Use technology tools to understand and summarize problems, and come up with simple solutions.	科 S-U-A2 Use technology tools and strategies to systematically think, analyze, and explore, effectively solve problems.
	A3 Planning, Execution, Innovation, and Adaptation	Possess the ability to devise and execute plans, as well as the ability to explore and develop a variety of professional knowledge; enrich life experience and fully utilize creativity to improve one's adaptability to social change.	科-J-A3 Utilize technology resources to formulate and implement technology research projects.	科 S-U-A3 Make good use of technology resources to plan, execute, reflect on, and innovate to solve problems in the context and further refine the quality of of technology projects.
B Communication and Interaction	B1 Semiotics and Expression	Possess the ability to understand and use various types of symbols, including languages, characters, mathematics and science, bodily postures, and arts to communicate and interact with others, and understand and feel empathy for others.	科-J-B1 Express and communicate in everyday life using scientific notations and computational thinking.	科 S-U-B1 Express with reasonable use of scientific notations and computational thinking. Express one's ideas and experiences, and effectively communicate with others to solve problems.

Core Competency Dimension	Core Competency Item	Item Description	Core Competencies of the domain of Technology	
			Junior High School (J)	**Upper Secondary School (S-U)**
		Be able to make use of these abilities in daily life or at the workplace.		
	B2 **Information Technology Literacy and Media Literacy**	Possess the ability to effectively use technology, information, and media of all types, develop competencies related to ethics and media literacy, and develop the ability to analyze, speculate about, and criticize humans' relationships with technology, information, and media.	科-J-B2 Understand basic principles of information and technology. Possess media literacy, and understand interplay between people and technology, information and media.	科 S-U-B2 Understand principles and development trends of technology and information. Be able to integrate and use technology, information, and media. Analyze, think critically about, and criticize the relationship between people and technology, society, and the environment.
	B3 **Artistic Appreciation and Aesthetic Literacy**	Possess the abilities of art awareness, creation, and appreciation, experience artistic culture through reflection on arts in daily life, enrich artistic experiences, and develop the ability to appreciate, create, and share arts.	科-J-B3 Understand characteristics of aesthetics applied to technology, and conduct technological creation and sharing.	科 S-U-B3 Appreciate the beauty of technological products and be inspired to create and share technology.
C **Social Participation**	**C1** **Moral Praxis and Citizenship**	Possess competency in putting morality in practice from the personal sphere to the social sphere, and gradually develop a sense of social responsibility and civic consciousness; take the initiative in concern for public topics and actively participate in community events; pay attention to the sustainable development of humanity and the natural environment; and exhibit the qualities of moral character to recognize, appreciate, and practice good deeds.	科-J-C1 Understand technological and sociocultural issues. Cultivate the law-abiding mindset and civic awareness regarding technological development.	科 S-U-C1 Possess the skills of thinking critically and reflecting on technological and sociocultural issues. Be able to take active interests in social issues and ethical liability arising out of technological development.

Core Competency Dimension	Core Competency Item	Item Description	Core Competencies of the domain of Technology	
			Junior High School (J)	Upper Secondary School (S-U)
	C2 Interpersonal Relationships and Teamwork	Possess the competency in exhibiting friendly interpersonal feelings and the ability to establish strong interactive relationships; establish communication channels with others, tolerate outsiders, and participate and serve in social activities and other activities requiring teamwork.	科-J-C2 Use technology tools for communication, coordination, and teamwork to accomplish technology projects.	科 S-U-C2 Utilize technology tools to organize work teams, communicate and coordinate, and collaborate to complete technology projects.
	C3 Multi-cultural and Global Understanding	Stick to one's own cultural identity, respect and appreciate multiculturalism, show active concern for global issues and international situations, demonstrate the ability to adapt to the contemporary world and to social needs, develop international understanding and a multicultural value system, and strive for world peace.	科-J-C3 Use technology tools to understand the current state of domestic and global technological developments or other local and international affairs.	科 S-U-C3 Make good use of technology tools, proactively care about future technology development and trend, and reflect on the role of technology in multiculturalism and international understanding.

V. Learning Focus

The learning focus for the technology domain consists of two parts: "learning performances" and "learning contents." Learning performances include two dimensions: computational thinking and design thinking. The themes of the learning contents vary, depending on the subject matters of information technology and living technology. Information technology includes six themes: algorithms, programming, system platforms, data representation, processing, and analysis, application of information technology, and information technology, human, and society. Living technology includes four themes: the nature of technology, design and production, application of technology, and technology and society.

1. Learning Performance

The learning performances of the technology domain curriculum include two dimensions: computational thinking and design thinking. The learning performances of computational thinking include skills and capabilities in applying information technology tools in problem solving, collaborations, interactions, communication, and presentation. The performances also include proper attitudes in a digital world; understanding issues related to information technology, human, and society; correct usage habits of information technology, abiding by relevant ethics, moral values, and laws; and caring about various issues encountered in the digital world, such as intellectual property rights and information disclosure. The learning performances can be categorized into the following six categories: computational thinking and problem solving, collaborative and creative computing, presentation and communication about computing, attitudes toward computing, computational representation and procedures, and design and implementation of computational artifacts, all of which are explained below:

(1) Computational thinking and problem solving: Be equipped with the thinking skills needed to apply computational tools to analyze problems, develop solutions, and make effective decisions.

(2) Collaborative and creative computing: Be able to use computational tools to collaborate with others and carry out creative activities.

(3) Presentation and communication about computing: Be able to use computational tools to present ideas and communicate with others.

(4) Attitudes toward computing: Be able to establish healthy, sensible, and legal attitudes and habits toward computing, and be willing to explore information technology.

(5) Computational representation and procedures: Be able to represent problems and solutions in ways that computation could be performed, to represent data in a structure suitable for computation, to use programming languages to express computational procedures, or to develop algorithms to solve computational problems.

(6) Design and implementation of computational artifacts: Be able to design and implement computational artifacts using computational thinking, and use them to solve problems.

The learning performances of design thinking include guiding students to design and create useful and applicable items based on the needs of life, and learning by trial and error to think systematically in the process of design and creation. The outcomes also involve training students' capabilities in hands-on application, the use of technological products, and thinking critically about design of technology. In other words, through the process of implementing, using, and thinking, the living technology curriculum helps students consolidate their knowledge and skills to solve everyday life problems. More importantly, through practical experiences and the cultivation of habits, it fosters a positive attitude in students to proactively deal with a variety of technological problems, and to use their creativity in solving these problems. Thus, the categories of learning performances for design thinking include technological knowledge for everyday life, attitudes toward everyday technology usage, hands-on skills for everyday technology, and the integration of technological competencies, which are explained below:

(1) Technological knowledge for everyday life: It includes nature and evolution of technology, technological concepts and processes, impact evaluation, and others. It focuses on cultivating students' understanding about the nature and evolution of technology, the conceptual knowledge of technology (e.g., principles of technology, knowledge of tool use, and material handling, etc.), knowledge of technological processes (e.g., problem-solving process, engineering design process, etc.), and the impact evaluation of technology (e.g., interactions between technology and society, and between technology and the environment).

(2) Attitudes toward everyday technology usage: It includes interests, attitudes, habits, and others. It focuses on cultivating students' interests in learning about technology, developing the right attitudes toward technology usage, and cultivating the best habits through hands-on practice.

(3) Hands-on skills for everyday technology: It includes handling, usage, and maintenance of technological tools. It focuses on cultivating students' ability to handle and use technological tools and products, and ability to maintain these tools and products.

(4) Integration of technological competencies: Technological competencies include design, implementation, integration, creativity, communication, and others. It focuses on cultivating students' ability to integrate cross-disciplinary knowledge with practical design and implementation, as well as ability to communicate and collaborate effectively during the integration process, which can facilitate the development of creativity.

The encoding of learning performances of technology domain curriculum is explained below:

(1) The first code, consisting of two letters, describes the dimension and category of learning performances.

(2) The second code is the learning stage, where IV represents the fourth learning stage (Grades 7–9 of junior high school), and V represents the fifth learning stage (Grades 10–12 of senior high school).

(3) The third code is a serial number.

(4) "※" indicates the learning performances of enrichment and expanded elective courses.

First Code		**Second Code**	**Third Code**
Dimension	**Category**	**Learning Stage**	**Serial No.**
Computational thinking (C)	Computational thinking and problem solving (t) Collaborative and creative computing (c) Presentation and communication and about computing (p) Attitudes toward computing (a) Computational representation and procedures (r) Design and implementation of computational artifacts (m)	IV, V	1, 2, 3……
Design thinking (D)	Technological knowledge for everyday life (k) Attitudes toward everyday technology usage (a) Hands-on skills for everyday technology (s) Integration of technological competencies (c)	IV, V	1, 2, 3……

The learning performances of the technology domain curriculum are summarized below:

Dimension	Category	Learning Performance	
Computational thinking (C)	Computational thinking and problem solving (t)	C-t-IV-1	Be able to understand the components and operations of computing systems.
		C-t-IV-2	Be familiar with the use of computing systems and simple troubleshooting.
		C-t-IV-3	Be able to design computational artifacts to solve everyday life problems.
		C-t-IV-4	Be able to apply computational thinking to analyze problems.
		C-t-V-1	Be able to understand algorithms in computing.
		C-t-V-2	Be able to use programming languages to implement computational solutions.
		C-t-V-3	Be able to apply computational thinking to evaluate the pros and cons of solutions.
	Collaborative and creative computing (c)	C-c-IV-1	Be familiar with the methods of using computational tools for collaboration and artifacts creation.
		C-c-IV-2	Be able to select appropriate computational tools to collaborate with others in the completion of artifacts creation.
		C-c-IV-3	Be able to apply information technology to collaborate with others in the completion of artifacts creation.
		C-c-V-1	Be able to use computation to enhance the efficiency of teamwork.
		C-c-V-2	Be able to understand the concepts in project management.
		C-c-V-3	Be able to integrate appropriate information technology to conduct collaborative projects.
	Presentation and communication about computing (p)	C-p-IV-1	Be able to select appropriate information technology to organize thoughts and to achieve effective presentation.
		C-p-IV-2	Be able to use information technology to achieve effective interactions with others.
		C-p-IV-3	Be able to systematically organize digital resources.
		C-p-V-1	Be able to integrate computational tools and solutions to achieve effective communication and presentation.
	Attitudes toward computing (a)	C-a-IV-1	Be able to implement healthy digital usage habits and attitudes.
		C-a-IV-2	Be able to understand the legal, ethical, and social issues related to computation in order to protect oneself and respect others.

Dimension	Category	Learning Performance	
		C-a-IV-3	Cultivate the interest to explore information technology regardless of gender.
		C-a-V-1	Be able to practice healthy and appropriate digital citizenship.
		C-a-V-2	Be able to adopt multiple perspectives to speculate about issues related to information technology.
		C-a-V-3	Be able to explore emerging information technologies.
		C-a-V-4	Be able to analyze the myths, prejudices, and discrimination of social issues conveyed by various media and technological products.
		※C-a-V-5	Be able to proactively explore new concepts on information technology.
		※C-a-V-6	Be able to understand one's orientation toward computer science, regardless of gender.
	Computational representation and procedures (r)	※C-r-V-1	Be able to represent problems and solutions in a computational form.
		※C-r-V-2	Be able to represent data in a structure suitable for computation.
		※C-r-V-3	Be able to use programming languages to present computational procedures.
		※C-r-V-4	Be able to develop algorithms to solve computational problems.
	Design and implementation of computational artifacts (m)	※C-m-V-1	Be able to use computational thinking in artifacts creation.
		※C-m-V-2	Be able to use computational artifacts to solve problems.
Design thinking (D)	Technological knowledge for everyday life (k)	D-k-IV-1	Be able to understand the meaning of everyday technology and the basic concepts of design and production.
		D-k-IV-2	Be able to understand the basic principles, development process, and key to innovation of technological products.
		D-k-IV-3	Be able to understand the basic concepts concerning the selection of appropriate materials and correct tools.
		D-k-IV-4	Be able to understand the basic concepts concerning the selection, analysis, and application of technological products.
		※D-k-V-1	Be able to understand the basic concepts of engineering and engineering design.
		※D-k-V-2	Be able to understand the status of the technology industry and trends of technological development.

Dimension	Category	Learning Performance	
		D-k-V-3	Be able to analyze, speculate and criticize the relationship of humans with technology, society, and the environment.
	Attitudes toward everyday technology usage (a)	D-a-IV-1	Be able to actively participate in hands-on technological activities and exploration of interests, regardless of gender.
		D-a-IV-2	Be able to have the right technological values and to appropriately select technological products.
		D-a-IV-3	Be able to proactively pay attention to the relationship of humans with technology, society, and the environment.
		D-a-IV-4	Be able to develop a sense of social responsibility and civic awareness for technological issues.
		※D-a-V-1	Be able to proactively explore new concepts related to technology.
		D-a-V-2	Be able to think about the choice of technology and issues of sustainable development from the perspective of caring for the natural ecosystem and the social sciences and humanities.
		※D-a-V-3	Be able to proactively pay attention to and participate in technological issues in daily life, regardless of gender.
	Hands-on skills for everyday technology (s)	D-s-IV-1	Be able to draw 2D or 3D design diagrams that can accurately convey design concepts.
		D-s-IV-2	Be able to use basic tools for material handling and assembly.
		D-s-IV-3	Be able to use technological tools to service and maintain technological products.
		※D-s-V-1	Be able to use drawing software or related technology to express design ideas.
		※D-s-V-2	Be able to use materials and tools effectively and flexibly according to practical needs, and perform precise processing and handling.
		※D-s-V-3	Be able to use technological tools to repair and modify technological products.
	Integration of technological competencies (c)	D-c-IV-1	Be able to use the design process to design and produce technological products to solve problems.
		D-c-IV-2	Be able to demonstrate innovative thinking abilities in hands-on activities.
		D-c-IV-3	Be able to communicate, coordinate, and cooperate with others.

Dimension	Category	Learning Performance	
		※D-c-V-1	Be able to use the engineering design process to plan, analyze, and execute project plans to solve practical problems.
		※D-c-V-2	Be able to use technological knowledge and skills and innovative thinking to design and produce technological products.
		※D-c-V-3	Be able to communicate, coordinate, and organize work teams.

2. Learning Content

The technology domain curriculum includes two subjects: information technology and living technology. The learning contents of the Ministry-mandated curriculum/required courses for information technology include six themes: algorithms, programming, system platforms, data representation, processing and analysis, application of information technology, and information technology, human, and society. The learning contents of the advanced programming enrichment and expanded elective course for information technology include four themes: programming languages, data structures, algorithms, and project implementation.

The learning contents of the Ministry-mandated curriculum/required courses for living technology include four themes: the nature of technology, design and production, application of technology, and technology and society. The learning contents of the engineering design project enrichment and expanded elective course, include themes such as design and production, and the application of technology.

In the domain-specific project of the enrichment and expanded elective courses, the learning contents of the robotics project include four themes: robot development, robot control, hands-on implementation, and design and production. The learning contents of the applied technology project include three themes: principles of applied information technology, information technology projects, and design and production.

The encoding of learning contents of technology domain curriculum is explained below:

(1) The first code, consisting of two symbols, describes the subject and theme, where “I” denotes information technology, “L” denotes living technology, and English letters

denote the themes. The domain-specific project of the enrichment and expanded elective courses contain both information technology and living technology; hence, “I” or “L” has been added before the theme code to indicate its subject-specific content.

(2) The second code is the learning stage, where IV represents the fourth learning stage (Grades 7–9 of junior high school), and V represents the fifth learning stage (Grades 10–12 of senior high school).

(3) The third code is a serial number.

(4) “*” indicates that each school or teacher can decide whether to teach the learning content according to the students’ learning needs.

<table>
<tr><th rowspan="2">Course Type</th><th colspan="3">First Code</th><th>Second Code</th><th>Third Code</th></tr>
<tr><th colspan="2">Subject / Course</th><th>Theme</th><th>Learning Stage</th><th>Serial No.</th></tr>
<tr><td rowspan="2">Ministry-mandated curriculum / required courses</td><td colspan="2">Information technology (I)</td><td>Algorithms (A), Programming (P), System platforms (S), Data representation, processing and analysis (D), Application of information technology (T), Information technology, human, and society (H)</td><td>IV, V</td><td>1, 2, 3……</td></tr>
<tr><td colspan="2">Living technology (L)</td><td>Nature of technology (N), Design and production (P), Application of technology (A), Technology and society (S)</td><td>IV, V</td><td>1, 2, 3……</td></tr>
<tr><td>Enrichment and expanded elective courses</td><td>Information technology (I)</td><td>Advanced programming</td><td>Programming languages (L), Data structures (Da), Algorithms (A), Project implementation (I)</td><td>V</td><td>1, 2, 3……</td></tr>
</table>

Course Type	First Code			Second Code	Third Code
	Subject / Course		Theme	Learning Stage	Serial No.
	Living technology (L)	Engineering design project	Design and production (P), Application of technology (A)	V	1, 2, 3……
	Domain-specific project	Robotics project	Robot development (IRd), Robot control (IRc), and Hands-on project-based robotics course (IRp), Design and production (LP)	V	1, 2, 3……
		Applied technology project	Principles of applied information technology (ITt), Hands-on applied information technology course (ITp), Design and production (LP)	V	1, 2, 3……

(1) Information Technology for Junior High School and Upper Secondary School Required Courses

The learning contents of information technology courses were formulated according to the basic subject matter of information technology, while also reflecting its current trends and future developments. The aim of this is to cultivate students' basic skills in information technology in order to move forward with the times, enabling them to become proactive and responsible digital citizens. The junior high schools stage focuses on problem solving, emphasizing the cultivation of students' ability to use information technology and computational thinking to solve problems. The senior high schools stage places more emphasis on integration of information technology and computational thinking, whereby the exploration of computer science enables students to further understand the relevant principles of computational thinking. This can foster their ability to integrate information technology and computational thinking to solve problems more effectively. Therefore, the learning contents of information technology encompass six themes: algorithms; programming; system platforms; data representation, processing, and analysis; application of information technology; and information technology, human, and society, as described below.

- Algorithms: including the concepts, principles, representation methods, design applications and performance analysis of algorithms.
- Programming: including concepts, hands-on practice, and programming applications, in which visual programming tools can be used, and teaching can be conducted in conjunction with algorithms.
- System platforms: including the usage methods, basic compositional architecture, working principles, and future developments of various computing systems (e.g., personal computers, mobile devices, the Internet, cloud computing platforms).
- Data representation, processing, and analysis: including the attributes, representations, transformation, analysis, and application of digital data.
- Application of information technology: including the usage methods of various common Internet technology applications and network services.
- Information technology, human, and society: including the fair use principles for information technology, and the relevant ethical, legal, and social issues of information technology.

A. Junior high school

Theme	Learning Content
Algorithms (A)	Grade 7 I-A-IV-1 Basic concepts of algorithms Grade 8 I-A-IV-2 Concepts and application of the array data structure I-A-IV-3 Introduction to basic algorithms
Programming (P)	Grade 7 I-P-IV-1 Basic concepts, functions, and application of programming I-P-IV-2 Structured programming Grade 8 I-P-IV-3 Hands-on programming with arrays I-P-IV-4 Concepts of modular programming I-P-IV-5 Hands-on problem solving with modular programming
System platforms	Grade 9 I-S-IV-1 Important developments and evolution of system platforms

Theme	Learning Content
(S)	I-S-IV-2 Basic concepts of architecture and operation of system platforms I-S-IV-3 Concepts and introduction to computer network I-S-IV-4 Concepts and introduction to network services
Data representation, processing, and analysis (D)	Grade 9 I-D-IV-1 Principles and methods of data digitization I-D-IV-2 Representation of digital data I-D-IV-3 Concepts and methods of data processing
Application of information technology (T)	Grade 7 I-T-IV-1 Data processing project Grade 9 I-T-IV-2 Information technology project
Information technology, human, and society (H)	Grade 7 I-H-IV-1 Personal data protection I-H-IV-2 Fair use principles for information technology I-H-IV-3 Information security Grade 8 I-H-IV-4 Social issues related to media and information technology I-H-IV-5 Information ethics and law Grade 9 I-H-IV-6 Impact of information technology on human life I-H-IV-7 Characteristics and types of common computer industries

B. Upper secondary school required courses

Theme	Learning Content
Algorithms (A)	I-A-V-1 Concepts and application of important data structures I-A-V-2 Concepts and application of important algorithms I-A-V-3 Performance analysis of algorithms
Programming (P)	I-P-V-1 Concepts and hands-on practice of textual programming I-P-V-2 Hands-on programming of the array data structure I-P-V-3 Hands-on programming of important algorithms
System platforms (S)	I-S-V-1 Fundamental algorithms and operation of system platforms I-S-V-2 Future development trends of system platforms
Data representation, processing, and analysis (D)	I-D-V-1 Concepts of big data I-D-V-2 Basic concepts of data mining and machine learning
Application of information technology (T)	I-T-V-1 Concepts and tools of digital collaboration and co-creation

Theme	Learning Content
Information technology, human, and society (H)	I-H-V-1 Fair use principles for information technology I-H-V-2 Personal data protection I-H-V-3 Influence and impacts of information technology on humans and society

(2) Living Technology for Junior High School and Upper Secondary School Required Courses

The learning contents of living technology at the junior high schools stage focus on the use of the production procedures for simple tools and material handling to foster students' creativity and design abilities, thus helping students understand the formation of technology and its relationship with living. The upper secondary schools stage places greater emphasis on the use of project production activities in engineering design, which allows students to learn about the integration of cross-disciplinary knowledge (e.g., science, technology, engineering, and mathematics), through which higher-order thinking skills such as design thinking, and innovative and creative thinking, are cultivated. More specifically, the learning contents are mainly divided into four themes: nature of technology, design and production, application of technology, and technology and society, as described below.

- Nature of technology: Introducing subject matters such as the nature and evolution of technology, the operation of technological systems, various types of technological industries and their development trends, and the relationship of technology with science and engineering. Students should be able to understand the important and practical concepts of technology (e.g., the use of common technological products, operating principles of technology, the relationship between technology and science, subject matter of the engineering domain, etc.).
- Design and production: Introducing subject matters such as product design/engineering design/problem-solving processes, drafting and blueprint reading,

material selection, and operation of common tools. Students should be equipped with the skills to operate tools and handle materials, and to understand the product design/engineering design processes, facilitating their solving of everyday technological problems and personal life needs, and fostering interests and habits of hands-on application.

- Application of technology: Introducing subject matters such as the servicing and maintenance of technological products, mechanical and structural design, and the principles and application of mechatronics. Through technological project-based hands-on activities, students should be able to use the design process to express their creativity, as well as to design and produce creations that are distinctive and applicable in terms of material, mechanism, or function. Based on these experiences, students should learn about the integration and application of concepts from science, technology, engineering, mathematics, and other disciplines, thus enabling them to put creative ideas into practice, and solve technological problems encountered in everyday life.
- Technology and society: Introducing subject matters such as the mutual interaction and influence of technology with society and the environment, and issues of emerging technologies. Students should be able to explore the interactions of technology with people, society, the environment, and culture, thus enabling them to understand the social problems derived from the abuse of technology and the misuse of technological products. This exploration can foster the right attitudes and values toward the usage of technological products. In addition, the characteristics of different technological industries are introduced to assist students in their career exploration and planning.

A. Junior high school

The living technology curriculum for junior high school emphasizes hands-on practical activities. Teachers should regard hands-on activities as the main learning content, and integrate the learning contents in the table below as needed, in order to ensure that students are able to truly grasp the nature of technology, and become proficient in the use of design and production to solve technological problems encountered in everyday life. As a result, they should be able to evaluate and reflect on the interactions between technology and society.

Theme	Learning Content
Nature of technology (N)	Grade 7 L-N-IV-1 Origin and evolution of technology Grade 8 L-N-IV-2 Systems of technology Grade 9 L-N-IV-3 Relationship between technology and science
Design and production (P)	Grade 7 L-P-IV-1 Methods of creative thinking L-P-IV-2 Creation of design drawings L-P-IV-3 Operation and usage of hand tools Grade 8 L-P-IV-4 Process of design L-P-IV-5 Material selection, processing, and handling L-P-IV-6 Operation and usage of common tools Grade 9 L-P-IV-7 Design and development of products
Application of technology (A)	Grade 7 L-A-IV-1 Selection of everyday technological products L-A-IV-2 Mechanistic and structural applications of everyday technological products Grade 8 L-A-IV-3 Maintenance of everyday technological products L-A-IV-4 Energy and power applications of everyday technological products Grade 9 L-A-IV-5 Electrical and control applications of everyday technological products L-A-IV-6 Application of emerging technologies
Technology and society (S)	Grade 7 L-S-IV-1 Interactions between technology and society Grade 8 L-S-IV-2 Influence of technology on society and the environment Grade 9 L-S-IV-3 Investigation of issues related to technology L-S-IV-4 Development of technological industries

B. Upper secondary school required courses

The living technology curriculum for upper secondary school emphasizes hands-on practical activities centered on project production. Teachers should apply the engineering design process and integrate the learning contents in the table below as needed, in order to ensure that students are able to truly grasp the nature of engineering, and to become proficient at using the engineering design process to solve mechanistic and structural problems, mechatronics and control problems, and other engineering problems. As a result, they should be able to evaluate and reflect on the interactions between engineering and society.

Theme	Learning Content
Nature of technology (N)	L-N-V-1 Relationship between technology and engineering L-N-V-2 Integration and application of engineering, technology, science, and mathematics
Design and production (P)	L-P-V-1 Engineering design and hands-on activity
Application of technology (A)	L-A-V-1 Design and application of mechanisms and structures L-A-V-2 Design and application of mechatronics and control
Technology and society (S)	L-S-V-1 Investigation of issues related to engineering technology

(3) Enrichment and Expanded Elective Courses in Upper Secondary School

The enrichment and expanded elective courses planned for the technology domain curriculum include advanced programming in information technology (two credits); an engineering design project for living technology (two credits); and a robotics project (two credits) and applied technology project (two credits).

1. Learning content of the Advanced Programming course

The information technology enrichment and expanded elective courses were designed according to the basic concepts of the technology domain courses. The aim is to cultivate students' ability to further explore technological knowledge, integrate and apply technological knowledge and skills, and enhance their interest in technology, which should enable them to explore and develop the technological expertise required for their future careers. Therefore, the information technology enrichment and expanded elective courses give students the opportunity to integrate their knowledge and skills of information technology. By taking the enrichment and expanded elective courses, students can apply computational thinking and computational tools to problem solving, and engage in artifacts creation. The curriculum goals of advanced programming are as follows:

- Develop the ability to integrate and apply computational thinking and information technology.
- Cultivate the ability to explore new concepts on information technology.
- Develop proficiency in using knowledge and skills of computation, creative thinking, and problem solving.
- Foster information integration, project management, effective communication, and teamwork.
- Cultivate the correct concepts and attitudes toward computation, and inspire an interest in information technology research and careers.
- Provide opportunities to explore and develop expertise in information technology.

<table>
<tr><th>Theme</th><th colspan="2">Learning Content</th></tr>
<tr><td rowspan="2">Programming languages
(L)</td><td>I-L-V-1</td><td>Concepts and application of programming languages</td></tr>
<tr><td>I-L-V-2</td><td>Development of programming languages</td></tr>
<tr><td rowspan="2">Data structure
(Da)</td><td>I-Da-V-1</td><td>Principles and application of common data structures
- Stacks
- Queues
- Lists</td></tr>
<tr><td>I-Da-V-2</td><td>Hands-on programming of common data structures
- Stacks
- Queues</td></tr>
<tr><td>Algorithms</td><td>I-A-V-4</td><td>Principles and application of important algorithms</td></tr>
</table>

Theme	Learning Content	
(A)		- Searching algorithms - Sorting algorithms - Divide-and-conquer algorithms - Greedy algorithms
	I-A-V-5	Hands-on programming of important algorithms - Search algorithms - Sorting algorithms - Divide-and-conquer algorithms - Greedy algorithms
	I-A-V-6	Performance analysis and comparison of algorithms - Sequential search and binary search - Iteration and recursion
Project implementation (I)	I-I-V-1	Hands-on programming project
	I-I-V-2	Program debugging

2. Learning content of the Living Technology Engineering Design Project course

The living technology enrichment and expanded elective courses were developed according to the concepts of the technology domain. The engineering design project course was designed based on the students' career and social development needs, in order to provide them with the learning opportunities for adaptive development and self-actualization. The engineering design project should focus on building integrated interdisciplinary concepts and inquiry-based thinking skills, while also emphasizing practical project-based hands-on learning, thereby allowing students to further grasp engineering-oriented design and production. Teachers can select suitable themes for project production in accordance with school equipment, student interest, and other factors. The course goals of the engineering design project are as follows:

- Understand the interactions among technology, engineering, science, and mathematics.
- Be proficient in technological knowledge and skill, creative thinking, and problem-solving abilities.
- Have the right technological concepts and attitudes, and an interest in technological

research and development.

- Be able to perform resource integration, project management, effective communication, and teamwork.
- Be able to perform engineering design, conduct inquiry-based experiments, and analyze and interpret data.

Theme	Learning Content	
Design and production (P)	L-P-V-2	Advanced engineering design and hands-on practice - User requirements and market analysis - Design and development procedures - Functional analysis and innovation - Mechanical simulation and analysis - Computer-aided design and manufacturing (CAD and CAM)
Application of technology (A)	＊L-A-V-3	Spatial and structural design
	＊L-A-V-4	Engineering materials and application
	＊L-A-V-5	Product design and production.
	＊L-A-V-6	Production of transport vehicles.
	＊L-A-V-7	Application of emerging technologies.

＊ indicates optional content. Teachers should choose at least one learning content unit for course planning according to school characteristics and student needs.

3. Learning content of domain-specific project courses

The domain-specific project courses assign two credits each to the Robotics Project course and the Applied Technology Project course. The cross-disciplinary enrichment and expanded elective courses were developed according to the concepts of the technology domain, with an emphasis on the technological integration abilities of computational thinking and design thinking. The goal of these advanced project-based courses is to cultivate students' ability and skills for integrated application of their knowledge in information technology and living technology. The learning contents of the courses are described below.

(1) Learning content of the Robotics Project course

The Robotics Project course focuses on applying knowledge and skills of computational thinking and design thinking to perform project production. The learning contents of the course include subject matters such as robot development, robot program control and hands-on practice, and advanced mechatronics design and hands-on practice. The course goals are as follows:

- Cultivate the ability to automate data access and computation using programs.
- Cultivate programming and mechatronics abilities.
- Develop the ability to integrate computational thinking and design thinking.

Theme	Learning Content	
Robot development (Rd)	I-Rd-V-1	Types and application of robots
Robot control (Rc)	I-Rc-V-1 I-Rc-V-2 I-Rc-V-3	Usage of robot program development tools Control methods of various motorized devices in robots Data access methods for various sensors in robots
Hands-on implementation (Rp)	I-Rp-V-1	Hands-on robotics programming
Design and production (P)	L-P-V-3	Advanced mechatronics design and hands-on practice - Functional analysis and innovation - Mechanism control devices - Transmission and power systems - Sensing circuit and program control

(2) Learning content of the Applied Technology Project course

The Applied Technology Project course emphasizes the technological integration abilities of computational thinking and design thinking, involving the integrated application of big data analytics, data mining, image processing and recognition, graphics, artificial intelligence, networks, engineering design principles, mechatronics principles, and technological product design to perform product production. It allows students to proactively learn and apply the principles and practice of informational technology in relation to the theme, and allows completion of the project product through advanced engineering design and hands-on practice. The course goals are as follows:

- Cultivate the ability to explore new concepts in the technology domain.
- Cultivate the ability to manage project, effective communication, and teamwork.

- Cultivate the ability to use information technology for data access, analysis, and computation.
- Cultivate the ability to integrate hardware and software.
- Cultivate the ability to integrate computational thinking and design thinking.

Theme	Learning Content	
Principles of applied information technology (Tt)	I-Tt-V-1	Computational principles of applied information technology
Hands-on implementation of applied information technology (Tp)	I-Tp-V-1	Methods of applied information technology
	I-Tp-V-2	Performance evaluation of applied information technology
Design and production (P)	L-P-V-2	Advanced programming and hands-on practice - User requirements and market analysis - Design and development procedures - Functional analysis and innovation - Mechanical simulation and analysis - Computer-aided design and manufacturing (CAD and CAM)

VI. Implementation Directions

1. Curriculum Development

(1) The domain of technology should emphasize both living technology and information technology. It should focus on the horizontal integration of technology with science, mathematics, and social studies, as well as the vertical articulation with national high schools.

(2) The domain of technology should emphasize values, respect, and tolerance of differences with regard to gender equality

(3) The curriculum of information technology focuses on computational thinking. Through learning of computer science-related skills, students should develop computational thinking such as logical thinking and systematic thinking. Furthermore, students should also develop the ability to apply computational thinking, problem-solving skills, teamwork, and innovative thinking through the design and implementation of information technology. In national high schools, the emphasis should be placed on developing students' ability to use computational thinking and information technology to solve problems, while in senior high schools, students should gradually explore computer science to understand the principles of computational thinking and be able to further integrate its application. While teaching in national high schools, teachers are recommended to consider students' prior knowledge and entry behavior, and flexibly adjust the depth and breadth of curriculum content. In the case of "information application", the national high school curriculum should emphasize the integration of software application, complemented by practical concepts and principles to solve problems or express ideas. Students do not need to be proficient in the operation of various software applications. In curriculum development, teachers should integrate the content of algorithms and programming and plan appropriate programming languages or tools according to students' needs and characteristics. Visual programming tools can be used for beginners.

(4) The curriculum design of national high schools living technology should focus on creative design, emphasizing the development of students' creativity and design skills through the use of simple machines and material handling procedures. The goal is for students to understand the relationship between technology development and technology and life. On the other hand, the curriculum at senior high schools should focus on engineering design, emphasizing the provision of interdisciplinary knowledge integration learning (i.e. science, technology, engineering, art, and mathematics) for students through project production activities in

engineering design. It aims to develop higher-level thinking such as design, innovation, and critical thinking in technology and engineering.

(5) To enrich learning in the domain of technology and increase regional concern and international perspectives, curriculum development should focus on student experience and select life-oriented teaching materials. In addition, it should also contain basic concepts of issues such as gender equality, human rights, the environment, and marine education and their substantive contents at different learning stages. By linking the content of domains or subjects, the curriculum should be developed in a sequence of problem awareness, knowledge understanding, skill acquisition, and practical action.

2. Teaching Material Selection and Composition

(1) The selection and composition of teaching material should be in line with the concepts, curriculum objectives, and learning focus of technology domain. Moreover, it should be appropriate to cognitive abilities and physical and mental development of students.

(2) The selection and composition of teaching material should be coherent. If there is a sequential relationship, it should be introduced gradually. The content of teaching material should also be contemporary and forward-looking.

(3) The content of teaching materials and teaching activities should make use of teaching resources such as digital technology platforms or software.

(4) The examples, explanations, and teaching activities in teaching materials should be designed to match students' daily lives and learning experiences. It should be both interesting and challenging.

(5) The text, images, and materials used in teaching material should emphasize gender quality, cultural differences, and respect for human rights. The presentation of teaching material should pay attention to power structures relationship between gender, ethnic group, and class in society, and protect gender rights.

(6) The selection and composition of teaching material should avoid unnecessary duplication with other domains or subjects. However, teachers should consider appropriate integration with other courses.

(7) The description of the text in teaching materials should be vivid and easy to understand. For necessary technical terms in technology, additional information should be provided for

detailed explanations. However, the use of excessive technical terms should be provided.

(8) Adhering to the curriculum guidelines, teachers of all schools may appropriately select and compose teaching material and plan practical learning activities independently to suit the particularities of each region, school, or individual student. However, the learning performance fostered by teaching material should conform to the curriculum guidelines.

(9) The selection and composition of teaching material may include the issues listed in General Guidelines as curriculum development materials. In addition, teaching material should guide students to analyze, speculate, and criticize relationship between people, technology, society, and the environment to enhance the breadth and depth of technology learning.

(10) Information technology teachers should compose or select teaching materials integrating algorithms and programming. Moreover, teachers should use visual programming tools to teach programming according to teaching needs and students' characteristics.

(11) The selection and composition of teaching material in schools with special indigenous focuses is encouraged to appropriately combine with local indigenous cultures and tribal life experiences for culturally responsive teaching.

3. Teaching Implementation

(1) To implement the concept of interdisciplinary teaching in technology, each school may arrange collaborative teaching of elective courses integrating information and living technology to strengthen students' knowledge and hands-on skills.

(2) Teachers should formulate lesson planning for the entire school year, for short-term or teaching activities for each unit, so that they can be instructed in a gradual and orderly manner with objectives and planning.

(3) Teachers should have gender-equal awareness while using teaching materials and engaging in educational activities. They should eliminate gender stereotypes, avoid gender bias and discrimination, and encourage students to pursue non-traditionally gender-specific subjects.

(4) Teachers should adopt a wide range of teaching strategies to teach technology and flexibly use appropriate teaching methods, refer to various teaching materials, and adopt student-centered instructional designs.

(5) Technology should be instructed with an approach to problem-solving or project production. Students are encouraged to carry out autonomous and exploratory learning to implement the

curriculum concepts of "design thinking" and "computational thinking". The practical hours should account for half to two-thirds of the total course hours.

(6) For algorithms and programming in information technology, teachers should teach students to use algorithms to analyze and design problem-solving methods and use programming to implement problem-solving programs. The two are interrelated and should be not taught separately. The curriculum should include examples related to students' daily life and learning to stimulate students' interest in learning algorithms and programming to solve problems. When teaching programming, teachers may select appropriate programming languages or tools according to their curriculum planning and student characteristics. Visual programming tools can be used for beginners.

(7) The "Design and Production" and "Applied Technology" practical activities of national junior high school living technology should comply with the following principles:

A. The emphasis should be placed on hands-on activities. Teachers should guide students to apply the design procedures in design and production to develop the ability to progressively solve practical problems.

B. Teachers should guide students to analyze the feasibility of design solutions and solve possible problems in the design and production process through meaningful trial-and-error learning.

C. Teachers should guide students to properly use tools and equipment for materials processing and handling.

D. Teachers must guide students to reflect on and improve the engineering design process. Moreover, they should also explore their interest in the engineering domain from this practice.

(8) The "Design and Production" and "Applied Technology" practical activities of senior high school living technology should comply with the following principles:

A. The emphasis should be placed on hands-on activities. Teachers should guide students to apply the engineering design process in project planning and execution to enhance their ability in solving practical problems.

B. Teachers should guide students to apply their engineering design and technological innovation skills and propose innovative and feasible design ideas for the structure or function of technological products.

C. Project practices should focus on engineering design and horizontally link with knowledge related to science, art, and mathematics.

D. Complemented by a series of practical or experimental units, teachers should guide students to apply their knowledge of science, technology, engineering, art, and mathematics to analyze the feasibility of design solutions, to predict, inquire, or solve possible problems in the engineering design and production process.

E. Teachers should guide students to properly use tools and equipment for material handling, and further solve problems during hands-on process.

F. Teachers must guide students to reflect on and improve engineering design process. Furthermore, they should also explore their interest in the engineering domain from this practice.

(9) For technology-interdisciplinary enriched elective courses (including robotics projects and applied technology projects), information technology and living technology teachers may conduct collaborative teaching. In addition, teachings may be divided by referring to the planning of learning content to guide students to complete their projects.

(10) The setting of unit learning objectives and the arrangement of learning activities should emphasize students' differences. Teachers should guide students to use both hands and brains and consider the balanced development of cognition, affection, skills, and integration ability.

(11) Technology teaching should be conducted in special classrooms, complemented by off-campus visits and other teaching activities as appropriate.

(12) Teachers should confirm that the school can provide software and hardware equipment required for teaching before the start of each semester, and confirm their safety and legality.

(13) The teaching content of technology should be linked horizontally with other learning domains such as engineering, mathematics, science, social studies, arts, etc., to facilitate the implementation of collaborative teaching.

(14) Teachers should continue to follow up on the current development in technology-related departments in colleges and universities and relevant careers in the technology industry to obtain new technological knowledge and teaching ideas.

(15) To enhance learning outcomes, schools may implement a comprehensive issue-based education by incorporating issues such as gender equality, human rights, environment, and marine education in alternative learning courses/hours and school-developed curriculum, as

well as shaping campus culture and implementing relevant activities. Teachers may integrate issues through extension, transformation, and integration of the domain or subject content while teaching. Furthermore, teachers may also incorporate figures, models, customs, festivals, cultures, or activities into teaching materials randomly, as embellishments, or supplement. They may be incorporated in assignments, works, performances, visits, and community and group activities in various methods. Through discussion, dialogue, criticism, and reflection, the classroom will become a learning community for knowledge construction and development, enhancing the quality of issue-based learning.

4. Teaching Resources

(1) Information technology teaching should be conducted in information technology special classrooms. Schools should procure appropriate hardware and software equipment (computers, application software, emerging technology tools, platforms, etc.) or use free software for teaching based on the teaching needs of teachers.

(2) Living technology teaching should be conducted in living technology special classrooms. Schools should procure appropriate hand tools, electric machines, desktop machines, or other emerging machines and equipment following the basic standards of facilities. In addition, schools should plan appropriate spaces for students to design and create.

(3) Schools should appropriately plan the placement and set up of equipment, tools, machines, and the other facilities in the information technology and living technology special classrooms. Furthermore, there should be safety protection and emergency measures. Teachers should specially instruct students on the use of equipment, operational safety, and proper management when tools, machines, and equipment need to be used.

(4) The technology domain provides abundant practical and applied teaching materials. It is recommended that relevant domains may make full use of these materials in developing their school-based curriculum.

(5) Schools should regularly replenish learning resources related to student learning activities (i.e. relevant books, journals, magazines, multimedia audio-visual materials, etc.).

(6) Teachers should consider gender myths, prejudices, and discrimination when using teaching resources and appropriately select materials with gender equality values.

5. Learning Assessment

(1) The learning focus of technology covers the categories of technological knowledge, technological attitudes, operational skills, and integration ability. Therefore, the learning assessment should cover these four categories and integrate the curriculum concept and learning focus of “do, use, and think”. In addition, there should be both formative and summative assessments and the individual differences of students should be taken into account.

(2) The assessment of technological knowledge should cover different aspects of cognition. The assessment designs aim to be flexible, creative, contextualized, and diverse. In addition, teachers should use open-ended questions to train students' thinking skills to the greatest extent.

(3) The assessment of technology attitudes should cover different aspects of interest and attitude. It should be done through teacher interviews, student self-assessment, and peer assessment.

(4) The assessment of operational skills should cover different skill levels. It should be done through practical or portfolio assessment. Moreover, teachers should also examine the improvement of students' daily performances and behavioral habits.

(5) The assessment of integration ability should cover design, innovation, problem-solving, teamwork, critical thinking, etc. It should be done through practical assignments, interviews, self-assessment, peer assessment, and portfolio assessment.

(6) In addition to covering the aforementioned categories, technology assessments should also guide students to self-reflect and improve their learning to develop metacognitive skills.

(7) Technology teachers should refer to students’ assessment results and make adjustments in the selection and composition of teaching material, teaching implementation, and classroom management.