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Development Trend of General Technology Education in Senior High School in China

Xie Jun[1],Jirigala[1],Mamoru Matsuoka[2],Kiyoshi Sera[3]
[1]Inner Mongolia Normal University, China;
[2]Mie University;[3]Mie Prefectural Tsu Commercial High School;

Abstract:
In 2017, China launched curriculum reform. The Ministry of Education of the People's Republic of China has revised the general technology curriculum of ordinary senior high schools. New version of general technology curriculum of senior high school pays attention to the development of students' personality and constructs the system of optional compulsory courses and optional courses which reflects the students' different development orientations. The content of the general technology curriculum reflects students' life and production reality and the integration of science and technology and humanities. On the basis of integrating knowledge and skills, process and method, emotion, attitude and values, the academic quality evaluation condenses the key competencies of the general technology discipline and develops the performance level of key competencies of the general technology discipline. At the same time, the academic quality standard is established based on the performance level of subject key competencies. New version of the general technology curriculum pays more attention to the cultivation of practical ability, innovative thinking and craftsman's spirit. Through the learning of the course, so that students acquire the subject key characteristics for future development, lifelong learning and good life, and become the national builders and successors who have ideas, can design, can do things, and are good at creating.
Keywords: China; senior high school; general technology; development trend

Introduction

General technology, different from the professional technology, refers to the technology which is more basic in the contemporary technology system, more extensive in the daily life, and richer in educational value. It is the necessary technology for students to adapt to social life, higher education and professional development. General technology curriculum of ordinary senior high school, which connects with the labor skills courses of nine-year compulsory education in China, takes the improvement of students' key characteristics of subjects as the main purpose and the design and operation learning as the main features. It is a course based on practice, to emphasize creation and to embody the unity of science and technology and humanity.

On the basis of summarizing up the experience of curriculum reform in Chinese senior high school of 21st century and drawing lessons from the outstanding achievements of international curriculum reform. The Ministry of Education of the People's Republic of China has revised *the Curriculum Standard of General Senior High School (experiment) (2003)* and issued *the ordinary Senior Middle School Curriculum Program (2017)* and *General Senior High School Curriculum Standard (2017)*. In 2017, the general technical curriculum was incorporated into the selected subjects of Zhejiang Province College entrance examination and began to be fully implemented. The trend of general technology education in senior high schools in China is explained in detail by comparing structure, content and academic quality evaluation of the old and new versions of general technology courses.

Table 1:
Similarities and differences between the general technology courses of 2003 version and 2017 version

	Common parts	Variation part
Structure of general technology curriculum	The two versions of general technology course structure contain compulsory module and optional module.	The general technology course adjusts the elective module and adds the optional compulsory module.
Content of general technology curriculum	The two versions of general technology courses contain 4 topics, including electronic control technology, clothing and its design, housekeeping and production technology, and modern agricultural technology.	General technology curriculum adjusts the content, deletes two topics, including architecture and its design, vehicle driving and maintenance and adds ten topics such as technical and professional exploration, development and explanation of creativity, traditional technology and its practice and so on.
Academic quality evaluation of general technology curriculum	Two versions of academic quality evaluation of general technology curriculum are to measure students' understanding and application of technology and evaluate the students' technical learning level from the aspects of knowledge and skills, process and method, emotional attitude and values.	General technology curriculum, on the basis of integrating knowledge and skills, process and method, emotion, attitude and values, condenses the subject key characteristics of general technology, and develops the performance level of the subject key characteristics of general technology. At the same time, the academic quality standard is established based on the performance level of the subject key characteristics.

1 The Structure and Content of General Technology Curriculum

1.1 The structure of general technology curriculum

Table 2: The general technology curriculum of 2003 version and 2017 version

		Compulsory		Optional	
The general technology curriculum of 2003 version	**Curriculum module**	Technology and design 1	Technology and design 2	Electronic control technology	Architecture and its design
				Simple robot manufacture	Modern agricultural technology
				Housekeeping and production technology	Clothing and its Design

				Vehicle driving and maintenance	
	Major function	Meet the graduation requirements of senior high school students		Meet the interests of students and their future needs for further studies or employment	
The general technology curriculum of 2017 version		**Compulsory**		**Optional compulsory**	**Optional**
	Curriculum module	Technology and design 1	Technology and design 2	Technology and life series Technology and engineering series Technology and occupation series Technology and creation series	Traditional technology and its practice Experience and exploration of new technology Technology integration and application Modern agricultural technology
	Major function	Meet the graduation requirements of senior high school students		Meet the needs of students' higher education and employment as well as individualized development	Meet the special needs of students in technical learning

Table 1 shows the similarities and differences between the general technology courses of 2003 version and 2017 version and Table 2 shows the general technology curriculum of 2003 version and 2017 version. On the basis of maintaining the stability of the original compulsory modules, the new version of general technology curriculum structure has added the optional compulsory module and changed the function of optional compulsory module and optional module. Optional compulsory module contains technology and life series, technology and engineering series, technology and occupation series, technology and creation series.

Students finish the study of the compulsory module and begin to study the optional compulsory and optional modules. Teachers can guide students to choose optional courses according to their learning conditions and occupation development plan. There are 2 optional modules in the general technology compulsory course of ordinary high schools, with a total of 3 credits. There are 54 lessons, per credit of 18 class hours. The optional compulsory module consists of 4 series, including 11 small modules. Each small module is 2 credits and each credit is 18 class hours. Students can choose either one of the small modules according to their personal interest and development orientation, up to 18 credits. The optional module is the course that students choose to study on their own. Its main function is to meet the special needs of students in technology learning, with a maximum of 4 credits. There are four small modules in

the optional module and each module can choose 2 credits. It is noteworthy that modern agricultural technology curriculum consists of 6 selective themes, each with 1 credit.

On the basis of compulsory courses of general technology, the general technology curriculum focuses on constructing the optional compulsory and optional curriculum system which reflects the students' different development orientations, and provides the multi-dimensional curriculum choice to the maximum extent. The general technology course meets the different development needs of students and promotes the all-round and individual development of students.

1.2 The content of general technology curriculum

The new version of curriculum system of general technology has adjusted the content, with the prominent characteristics of the times and being closely related to life. The new version of curriculum system of general technology adds 10 topics, including application and design of smart home, engineering design foundation, technical and professional exploration, vocational and technical foundation, development and explanation of creativity, product 3D design and manufacture, integration and innovation of science and technology and humanities, traditional technology and its practice, experience and exploration of new technology, integration and application of technology. It deletes two topics, including architecture and its design and vehicle driving and maintenance.

The content of general technology curriculum is closely related to students' life and production practice, and pays attention to the integration of science and technology and humanities. The content of general technology curriculum embodies the flavor of the times, adapts to the social development, reflects the future scientific and technological trend and has the transferable character. General technology curriculum content is beneficial to the curriculum implementation and the students' elective content, promotes the cultivation of the key competencies of the subject, and makes for the formation of the students' technical literacy and quality of the nation.

2 Evaluation of Academic Quality of General Technology Curriculum

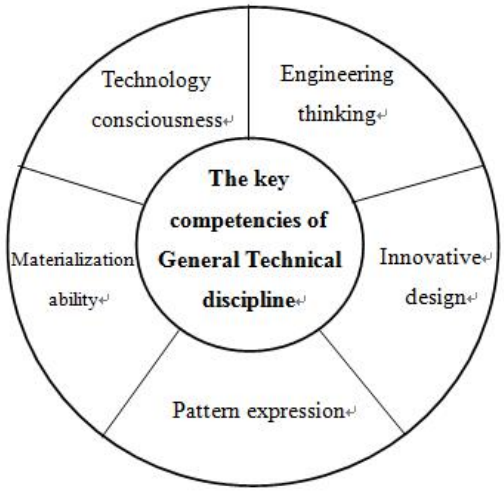
On the basis of integrating knowledge and skills, process and method, emotion, attitude and values, new version of the evaluation of academic quality condenses the key competencies of general technology discipline, and develops the performance level of the key competencies of the general technology discipline. At the same time, the academic quality standard is established based on the performance level of subject key competencies. New version of the evaluation of academic quality unifies the learning result with the learning process and realizes the organic unity of teaching, learning and evaluation, so that the students can obtain the subject key competencies of the future development, lifelong learning, good life and national rejuvenation.

2.1 The connotation and performance level of the key competencies of general technology discipline

2.1.1 The key competencies of general technology discipline

The subject key competencies are the correct value, the essential character and the key ability which the student gradually forms through the discipline study. It is the concentrated embodiment of the educational value of the subject, which has integrated the three dimensional goal—the knowledge and the skill, the process and the method and the emotion attitude values. The key competencies of general technology discipline mainly include five aspects: technology consciousness, engineering thinking, innovative design, pattern expression and materialization ability, as shown in Fig. 1.

Fig、1:　The key competencies of general technology discipline



2.1.2 The performance level of the key competencies of general technology discipline

China draws on the latest theoretical and practical achievements in the development of technology curriculum in many representative countries and regions of the world, reasonably draws on useful international experience, follows closely the future trend of technical education, proceeds from China's national conditions and educational realities and revises the old version of general technology curriculum. General technology curriculum emphasizes the cultivation of students' subject key competencies and establishes the performance level of key competencies of general technology discipline. As shown in Table 3, the performance level of key competencies of general technology discipline is divided into five dimensions: technical consciousness, engineering thinking, innovative design, pattern expression and materialization ability. Each dimension is divided into five levels. The table below introduces the performance level of key competencies of general technology discipline through key competencies 4: pattern expression. The classification of performance level of key competencies of general technology discipline provides the reference for academic quality standards, which is conducive to the implementation of the performance level of key competencies of general technology discipline in the practical level.

Table 3: The performance level of key competencies of general technology discipline

Level	key competencies 4: pattern expression
Level 1	Students can realize the importance of the technical language, analyze the kinds of the technical language and its application; students can read the common technical drawings through the concrete physical display, such as sketches, three views, simple machining drawings; students are able to express and communicate design ideas with simple sketches.
Level 2	In the simple technical design practice, students can draw the standard design drawing, form the good design habit, can read the common technical drawing, such as the flow chart, the block diagram of control system and can express the simple design plan; students can simply design with two-dimensional, three-dimensional design software.

Level 3	Students are able to read common design drawings in mechanical, electronic and other technical fields, such as common machining drawings and simple electronic circuit diagrams, etc.; students are able to express design ideas with more detailed sketches and use design documents and log to record design ideas, process and outcome.
Level 4	Students are able to read more complex technical drawings, such as sketches, three views, machined drawings, etc.; students are able to accurately express and communicate design ideas with more complex sketches in familiar and complex problem situations; students are able to skillfully use common technical drawings and design the scheme; the simple design scheme can be displayed with 2D and 3D design software, and it can be optimized and improved continuously.
Level 5	Students are able to express and communicate design ideas accurately with more complicated sketches in the face of more difficult problem situations; when faced with complex situations, students can actively choose and synthetically use drawings or other technical languages to express design ideas to form the ability to use technical language to change thinking.

2.2 Academic quality standard

Academic quality is the performance of students' academic achievement after completing the course. The subject key competencies and its performance level is the main dimension. According to the key characteristics of academic achievement performance at different levels, the academic quality standard clearly divides the academic level into five levels, and describes the concrete performance of learning results at different levels, as shown in Table 4. The academic quality standard is the important proposition basis of the academic qualification examination and the academic grade examination. The academic quality standards of general technology in high school connects academic achievement performance with key characteristics, provides the standard for evaluating students' academic achievement, puts the key characteristics into practice, so that students can obtain subject key characteristics of future development, lifelong learning, good life and play a great rejuvenation of the nation.

Table 4: Academic quality standard

Level	Quality description
4	4-1 The students can synthesize all kinds of data and information, judge the influence of a certain technical field on people, society and environment and form a correct view of technology and ecological civilization; the students participate in the discussion and decision of technology development and application appropriately; the students can use the trend analysis method to make the decision to the future development of a certain technology.
	4-2 In face of more complex problem situation in a certain technical field, the students can use the method of system analysis to substantiate tasks, form the possible solutions and constantly optimize the solutions; the students can initially use simple simulation test or mathematical model to make performance and risk assessment on a technical scheme, and form a

	certain system and engineering thinking.
	4-3 The students can use the user model analysis method to extract the unique needs of the user and identify the specific technical problems to be solved; the students, based on design requirements, use creative thinking and creative technology to design a number of plans to make a comprehensive comparison and balance to form a certain design innovation ability.
	4-4The students are skillful in the design of the scheme by using the common technical drawings in different technical fields; the students can show the simple design scheme in two-dimensional and three-dimensional design software and continue to optimize and improve.
	4-5The students can analyze the design plan and select the right materials according to the design requirements; the students should have the initial tool thinking and the craftsman spirit to complete the model and assembly of the model or product; the students can perform high precision technical tests and simple program tests on models or products; the students can write simple technical tests and program test reports.

2.3 Academic proficiency examination

Academic proficiency examination of high school is divided into the qualification examination and the grade examination. The academic proficiency examination is a standard referenced test for students' basic knowledge and basic skills. The academic grade examination is mainly used for students to enter a higher school and the score is one of the basis of enrollment in ordinary universities.

Academic proficiency examination of high school is working hard to scientifically evaluate on the basis of the classification of academic quality, explores the interpenetration of subject key characteristics, subject content and life situation and establishes the paper-pen test and non-paper-pen test combined with the academic proficiency examination system finally.

Conclusion

In the new round of curriculum reform, the general technology curriculum condenses key characteristics of general technology curriculum. Curriculum content selection embodies the characteristics of the times and is closely related with life. At the same time, general technology curriculum explores the construction of reasonable structure to meet the different needs of students and realizes the organic integration of science and technology and humanity. The general technology curriculum shows practice ability, innovative thinking and craftsman spirit and establishes the evaluation mechanism that is equal to the learning results and the learning process, so that students acquire the subject key characteristics for future development, lifelong learning and good life, and become the national builders and successors who have ideas, can design, can do things, and are good at creating.

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