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Junior-high-school Technology Education in Taiwan

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The technology education in Taiwan has been mainly implemented by means of the subject "Living Technology" (LT; "生活科技" in Chinese). Taken into effect in 2002 academic year (August 1, 2002-July 31, 2003), the newly implemented nation-wide junior-high-school course of study integrated LT with natural sciences (NS's) and formulated the learning area Natural Science and Living Technology (NS< "自然與生活科技" in Chinese). This paper presents the status quo, opportunities and threats of the newly implemented LT.

Like Japan, Taiwan's schooling system begins with one to several years of preschool education and nine years of compulsory education, comprised of six years of elementary-school education and three years of junior-high-school education. After finishing compulsory education, students take nation-wide exams in order to receive senior secondary education, which includes three years of senior high school (SHS), three years of vocational high school (VHS), three years of comprehensive high school (CHS) or five years of junior college of technology (JCT). Influenced by Confucius (i.e., "孔子" in Chinese, 551-479 BC), people in Taiwan have placed a high priority on education; thus, competition for entering famous schools is extremely severe.

In his teaching, Confucius emphasized the following "Six Arts" (i.e., "六藝" in Chinese): ritual, music, archery, chariot-riding, calligraphy, and computation (i.e., "禮、樂、射、御、書、數" in Chinese). Although the "chariot-riding" has been widely interpreted as the "technical competence" (i.e., "技術能力" in Chinese), the public's technical success and technical training never won well-respect.

In recent centuries, industrialization has entailed a remarkable expansion of education, because of a need for literacy and technical competence as well as a decline in child labor. Along with this expansion, technology education, aiming to prepare students for success in an ever-changing technological world, was added to school subjects in many countries. However, technology education in schools has no high regard and little upward mobility. This paper presents the status quo, as well as opportunities and threats to the state of technology education at the junior-high-school level in Taiwan.

This Is a Time for the Better, or for the Worse

In 1997, in response to a call for better alignment of the elementary-school (grades 1-6) course of study and the junior-high-school (grades 7-9) course of study, which were revised by different committees and promulgated by the Ministry of Education (MOE) in varied years, the minister of education decided to create the Aligned Course of Study for Grades 1-9. Finally, a wide range of changes occurred in the new course of study, which took effect for elementary schools in 2001, and junior high schools in 2002. Subject integration was one of the main changes. In the former course of study which took effect in 1997, there were 21 subjects for grades 7-9. The 21 subjects were integrated into seven learning areas. Table 1 presents the changes in subjects and weekly teaching hours related to science and technology in junior high schools. As

shown in Table 1, LT becomes a part of the learning area entitled NS&LT.

Table 1. Changes in Subjects and Weekly Teaching Hours Related to Science and Technology in Junior High Schools

	Teaching Hours in Each Grade		
Former Subjects/ Present Learning Area	7	8	9
Former Subjects			
1. Biology	3	--	--
2. Physics & Chemistry	--	3	2-4
3. Earth Science	--	--	1
4. Living Technology	1	1	1
Total	4	4	4-6
Present Learning Area			
Natural Science and Living Technology (NS&LT)	2.8-4.2	2.8-4.2	3.0-4.5

In the new NS&LT course of study, the approach of standard-based curriculum development (SBCD), arguing that all students must meet agreed upon learning standards that are developmentally appropriate, is employed. Normally, the learning standard concerns what all students “need to know” and “need to be able to do” at each developmental level. Aiming to enhance students’ scientific and technological literacy, the NS&LT course of study prescribes 100 skill benchmarks as the “standards”, which are categorized into the eight domains shown in Table 2. The total 21 benchmarks included in Domains 4 and 8 are highly related to LT. For example, “to read assembling drawings and product instructions” is one benchmark in Domain 8.

Table 2. Eight Domains of NS&LT Skill Benchmarks

Domains (Number of Skill Benchmarks for Junior-high-school Students)	
1. Process Skills (18)	5. Scientific Attitude (5)
2. Scientific and Technical Understanding (34)	6. Thinking Intelligence (8)
3. Nature of Science (8)	7. Applications of Science (6)
4. Technological Development (11)	8. Design and Making (10)

According to the new NS&LT course of study, every junior high school is mandated to develop its own NS&LT program of study, including thematic units corresponding to appropriate skill benchmarks.

Coping with the creation of new course of study, the future NS&LT teachers at the secondary-school level will be structured into the three tiers shown in Figure 1. In addition, all prospective teachers in the field of NS are required to take three semester credits of Introduction to LT while all LT prospective teachers are required to take three semester credits of Introduction to NS plus 30 semester credits of LT specialized courses. In addition, in-service teacher training courses have been offered to promote the structure shown in Figure 1.

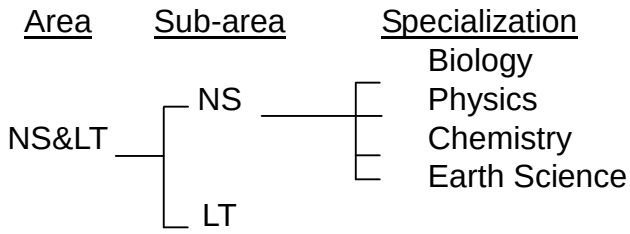

Figure 1. Three tiers of future NS&LT teachers.

On the surface, there are at least the following two opportunities for promoting LT:

1. LT moves toward the middle of the stage

In the former course of study, LT was one of 21 subjects whereas it has become half of seven key learning areas. That is to say, along with an increase in its visibility, LT has moved toward the middle of the stage in which many disciplines perform to serve students and please the public.

2. NS teachers will better know LT

According to the new course of study, all NS&LT teachers in every junior high school have to group up to form an NS&LT curriculum team to deal with curriculum, instruction and assessment. As a result, both NS and LT obtain mutual benefit from the interaction in the team.

At present, a junior high school normally allocates four hours per week for teaching NS&LT. Some schools assign a teacher to teach the whole four hours while some assign an NS teacher to teach three hours of NS as well as an LT teacher to teach one hour of LT. When an NS teacher teaches the whole four hours, LT is often narrowed down to an applied science（see Figure 2）or even totally ignored.

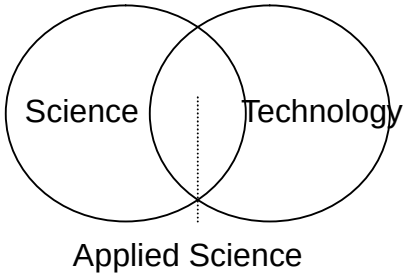

Figure 2. The relationships between science, technology and applied science.

Confucius liked to combine learning and thinking. He proposed "learning without thinking leads to bewilderment; thinking without learning results in idleness" (i.e., “學而不思則罔，思而不學則殆” in Chinese). When taught by a professional LT teacher, LT combines technical learning and higher-order thinking. For example, an LT teacher in Taipei designed a teaching unit called “Rocking Chair.” In this unit, his students are grouped to define the problem, develop alternatives, select the solution, implement the solution, and conduct evaluations. The final product is a variety of models for a wooden rocking chair. The professional LT teacher also values durable materials such as metal, wood and plastic when he guides students to work on projects.

However, there are at least two threats confronting the new LT:

1. **NS&LT is like a "camel"**

There is a phrase, "a camel is a horse designed by committee" (Issigonis, nd). Many educators criticize that the new NS&LT course of study is a product of compromising in hurry. The compromise turned a desired "horse" to an unexpected "camel." As a result, many LT educators see the present subject integration of NS&LT unsatisfactory.

2. **LT is sitting in a "rocking chair"**

Sitting in a rocking chair is comfortable but shaky. At present, the skill benchmarks highly related to LT are not included in the nation-wide exams for the 9th graders. This leads to a situation in which the new LT is often buried in or expelled by the majority in the NS&LT--NS. As a result, many LT educators see the position of LT as not only shaky but also risky.

Because both opportunity and threat simultaneously exist, for LT this could be a time for the better and could be a time for the worse. It all depends on technology educators' efforts.

We Have to Work Together to "Place the Bell on the Cat's Neck"

In Aesop's fable, a group of mice gathered to decide what to do with a cat who was raiding and killing them one by one. Finally, It was agreed to tie a bell on the cat's neck to warn them of its approach. All were celebrating this great idea but stopped suddenly when one asked who would tie the bell around the cat's neck (Roberts-Hodge, 2000).

Many technology educators have probably made suggestions to promote LT and understand that there is a need to do many hard tasks to facilitate the development opportunities for and relieve the development threats to LT, but very few are willing to do it. The job of "placing the bell on the cat's neck" therefore becomes part of the technology educator's responsibility. However, this mandate can only be fulfilled with the support of all the "mice".

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