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ABSTRACT

Both technology and education are strongly emphasized in Taiwan. Recent educational measures have focused on establishing a more comprehensive compulsory educational system and have included efforts to develop a more pluralistic and refined program of technical and vocational education. Taiwan's national curriculum for 1996-1998 included craft work for elementary school students and various amounts of living technology (LT) for students in junior and senior high school. According to the revised curriculum slated for implementation in 2001, natural science and living technology, social studies, and arts and humanities will be integrated into LT. In the foreseeable future, LT will coexist with natural science (NS) in the learning area of NS&LT. Technology education programs are not currently institutionalized in Taiwan's teachers' colleges; however, some colleges have faculty members majoring in industrial or technology education. The following efforts to promote technology education in Taiwan are also under way: (1) technology education research projects funded by the National Science Council; (2) development of unit plans with technology learning activities; (3) technology education periodicals sponsored by educational authorities; (4) a technology performance contest for junior high students; (5) teachers' professional development workshops at various levels; and (6) activities sponsored by the Industrial Technology Education Association. (MN)

Running head: TECHNOLOGY EDUCATION IN TAIWAN

Technology Education and Its Promotion in Taiwan

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Paper prepared for
The Group Training Course in Industrial Technology Education in Fiscal Year 2000,
Japan International Cooperation Agency (JICA);
Aichi University of Education (AUE), Japan,
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Technology Education and Its Promotion in Taiwan

Both technology and education are strongly emphasized in the Republic of China on Taiwan (see Figure 1; hereafter, called Taiwan). As such, Taiwan ranks number one in the world in the manufacture of nine categories of information technology products, including computer motherboards, mice, image scanners, keyboards, power supplies, monitors, network cards, modems, and graphic cards. Taiwan also intends to establish itself as the "Green Silicon Island". In addition, the constitution of Taiwan allocates the greatest share of national expenditure for educational purposes. For example, for the fiscal year of 1999, the government spent about 6.5% of the GNP, or 15.6% of total government expenditures, as education, science, and culture about 6.5% (ROCGIO, 2000). The purpose of this paper is to introduce technology education for all (i.e., technological literacy education) and its promotion in Taiwan.

The Taiwanese Schooling System

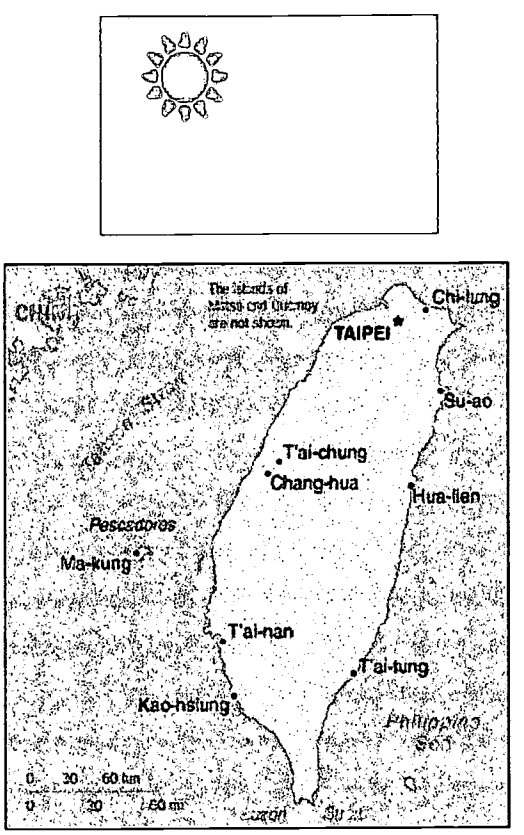
The schooling system in Taiwan is as shown in Figure 1. In the 1998-1999 academic year (from August 1, 1998 to July 31, 1999), the total academic enrolment rate of the population aged 6-21 was 80.0%, and more than one-fifth of the total population was attending an educational institution of some type. The national illiteracy rate was 5.3% (ROCGIO, 2000).

Nine years of education has been compulsory since the 1968-1969 academic year, and there is a wide range of other educational options for all ages. In the 1998-1999 academic year, the elementary school enrollment rate was 99.9%; about 99.2% of those that graduate continued on to junior high; and about 93.9% of all junior high graduates continued their studies in upper/senior-secondary schools.

After nine years of compulsory education, most junior high school graduates may choose to continue their upper-secondary studies either in the TVE track (technological and vocational education, including three-year vocational high school and five-year JCT), or in the academic education track (three-year senior high schools), or in the comprehensive education track (three-year CHS). All upper-secondary graduates have several opportunities to enter university/college.

Recent educational measures have focused on the establishment of a more comprehensive compulsory education system, universal preschool education, improvement of higher education, pluralistic and refined TVE, a system of life-long education and information technology education, more thorough promotion channels for further study, a new supportive student counseling system, and a program for fostering teachers' professional

development. Furthermore, family education, indigenous education, special education, and budget allocation as well as research and development are emphasized (ROCGIO, 2000).



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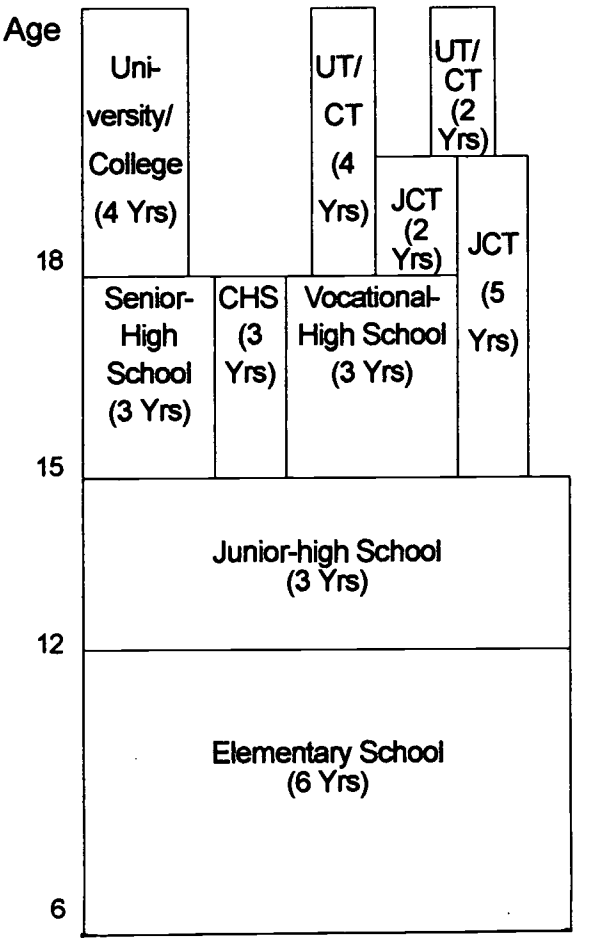


Figure 1. The flag and geographic location of Taiwan and its educational system.

Note

CHS: Comprehensive High School
UT/CT: University of Technology/College of Technology
JCT: Junior College of Technology
Yrs: Years

Technology Education in the National Curricula

Curricula for elementary and secondary schools are prescribed in national curriculum standards promulgated by the Ministry of Education (MOE). As shown in Figure 2, it has been anticipated that the curriculum standard, course of study and instructional plan all be aligned to each other. Table 1 depicts the teaching periods and program goals of technology education in the national curricula.

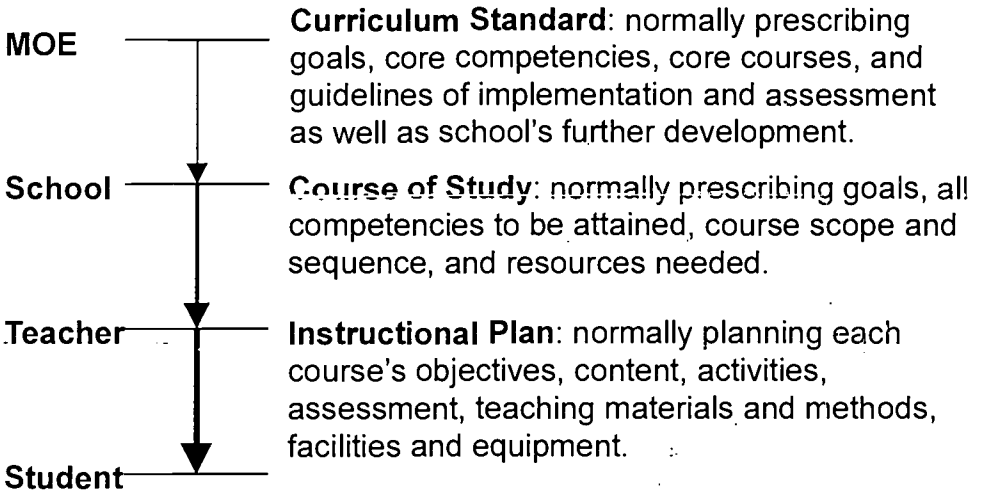


Figure 2. The alignment of three levels of curriculum documents.

Table 1. Technology Education in National Curricula.

	Elementary School (Grades 1-6)	Junior High School (Grades 7-9)	Senior High School (Grades 10-12)
Subject Title (Beginning Year/Month)	Craftwork (1996/8-)	Living Technology (1997/8-)	Living Technology (1999/8-)
Teaching Period*	Grades 1-2: two period/week Grades 3-6: three periods/week	Grades 7-9: one semester/ academic year; two periods/week	Grades 10-11: one semester/ academic year; two periods/week
Target Student	All students	All students	All students
Program Goal	To enhance the pupils' presentation, appreciation, and practical application abilities. At the level of grades 1-4, it emphasizes intelligent image and functional presentation, and further emphasizes on functional presentation at the level of grades 5-6. In the area of	To understand technology and its impact, to apply technological products and means, to apprehend careers related to technology as well as to the pupil's own interests and capabilities, and to enhance adaptability in the technological society.	To understand technology and evaluate its impact on individual, on society, and on human civilization, to pursue well-developed technological capabilities and problem-solving competence, and to establish proper technological attitudes and inform the students' interest in

	craftwork, the most important point of technology education is the practical application.		technology and study.
Subject Matter	Choosing toys/ clothes/ornaments, applying technological materials, using tools, etc., synthesis of perception, and creative problem-solving.	Technology and Life, Information and Communication, Construction and Manufacturing, and Energy and Transportation.	Technology and Life, Information and Communication, Construction and Manufacturing, and Energy and Transportation.
Instructional Focus	Unit teaching; Activity-oriented experiential discovery	Unit teaching; Activity-oriented problem-solving	Unit teaching; Activity-oriented problem-solving
Selective Courses Related to Technology		Occupational Disciplines: between one and three periods/week for grade 7, and between one and five periods/week for grade 8; subjects include agriculture, industry, commerce, home economics, marine products, etc.	Living Technology: two periods/week for grade 11, and between two and four periods/week for grade 12; subjects include graphics, energy and power, and industrial material.
Remark		"Computer Education" is required for all 8th and 9th graders, one period/week.	"Computer Education" is a selective course for 11th and 12th graders, two periods/week.

Note * : 40, 45, and 50 minutes per period respectively for elementary, junior-high and senior-high school.

The MOE began the amendment of the national curriculum syllabus for grades 1-9 from 1997, which reflects the call for educational reform, such as the articulation, integration and greater flexibility of curricula. The first stage of the syllabus for grades 1-3 was proclaimed in March 2000, and will be

implemented in 2001. According to this new curriculum syllabus, Natural Science & Living Technology, Social Studies and Arts & Humanities are integrated into the learning area named "Living" for 1st and 2nd grades students, Living Technology should be taught for no less than 11 teaching hours. The syllabus recommends that 3rd and 4th grades students have at least 11 periods of Living Technology lessons, no less than 40 periods for 5th-6th grades, and no less than 120 periods for 7th-9th grades. The class should be taught for two periods every week for one semester, or one period every week for two semesters.

In the foreseeable future, the subject Living Technology (LT) will coexist with Natural Science (NS) in the learning area of Nature Science & Living Technology (NS&LT). The two will be taught independently, but will have contact with each other (see Figures 3 & 4). The programs, teaching materials, and instructional strategies of LT need to be highly developed.

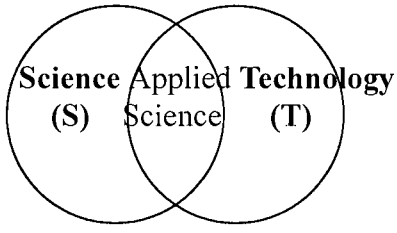


Figure 3. Technology is science's partner, not its subordinate

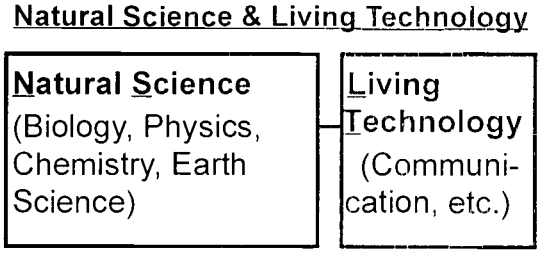
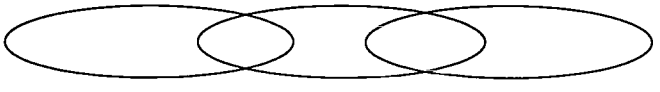


Figure 4. LT will coexist with NS in the area of NS&LT

Technology Teacher Education

As show in Figure 5, technological literacy needed by pupils, technology education in schools, and technology teacher education are in a value chain. They are interdependent. Teachers in elementary schools are almost all graduates of nine public teachers' colleges, while most teachers in junior and senior high schools are graduates of the following normal universities: National Taiwan Normal University, National Changhua University of Education, and National Kaoshiung Normal University. However, any university in Taiwan can offer a teacher education program if the university applies for it and passes the evaluation of the qualifications. At present, there are 38 qualified universities in Taiwan. There are also more than 10 qualified universities with programs for elementary teachers.



Technological Literacy Needed by Pupils | Technology Education in Schools | Technology Teacher Education

Figure 5. The value chain of technological literacy, technology education and technology teacher education.

As shown in Figure 6, those who graduate from university/college and complete a teacher education program are qualified to become interns. They might receive the teachers' license after passing the one-year internship assessment. Only licensed teachers can be formally employed by schools. Both initial and final certifications are based on the applicant's transcript review.

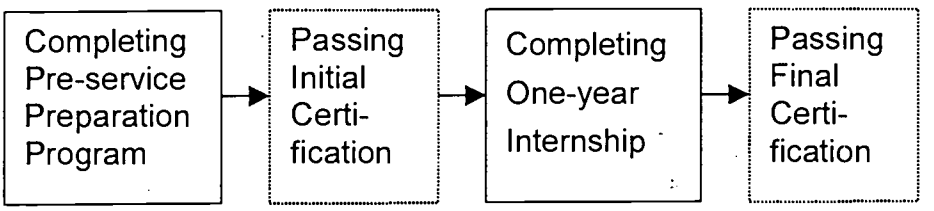


Figure 6. The procedure to be certified as a school teacher in Taiwan.

Liberal, speciality, and pedagogical courses are required for prospective teachers. There are 26 pedagogical semester credits in the teacher education program for secondary schools and 40 for elementary schools. The pedagogical courses in the programs are composed of between three and four educational areas: fundamental, methodology and practical teaching.

Teachers in elementary schools are mainly graduates from a variety of departments of teachers' colleges, who must take some required credits from departments which they do not belong to, so as to qualify to teach more than one subject. For instance, the instructional methods for craftwork, keyboard-instrument music and children's literature, are required in order to become a well-rounded teacher.

Technology is not taught as an independent course in elementary schools at present. Similarly, technology education programs are not institutionalized in teachers' colleges. Nevertheless, in these colleges, there are some faculty members majoring in Industrial Education or Technology Education, so the prospective teachers still have the opportunity to study technological learning. There are few technological courses in the teachers' programs of other universities.

For elementary school teachers, the most common type of in-service training should be the "study time" which regularly takes place on Wednesday afternoons. Advanced studies for technology education (usually conducted by arranged lecture or seminar, with professors, or experienced teachers) are encouraged. Formal degrees of master/doctorate are also provided at normal universities, conferred upon these teachers as well as on teachers in secondary schools.

The developments tend to reflect the emergence of the new national curriculum syllabus of Living Technology for grades 1-9. With a view to implement new technological literacy education, the need emerges for programs/departments of technology teacher education, preparing elementary

school technology teachers. Furthermore, these institutions can also function as centers of in-service training.

In the past, the majority of secondary-school Living Technology teachers were graduates of the departments of Industrial Technology (formerly Industrial Arts) of National Taiwan Normal University and National Kaohsiung Normal University. These two departments accept more than 100 students who pass the joint entrance examination for colleges and universities every year. The students earn a B. Ed. and become certificated teachers in Industrial Arts/Living Technology after four years of on-campus training and a one-year field internship in secondary schools. Most of them work as junior-high or senior-high school teachers in living technology after graduation. They are the majority of the teachers in Living Technology in-service. Prospective teachers in the Living Technology/Industrial Arts teacher program previously took specialty courses such as metal working, wood working, electricity, electronics, plastics, information and computer, graphics, design, and modeling. Prospective teachers nowadays take systematic courses in the following four domains: construction, manufacturing, communication and transportation. Generally speaking, teachers who graduate from the two normal universities receive thorough training in teaching and thus have more technological knowledge and better learning abilities.

Both National Taiwan Normal University and National Kaohsiung Normal University supply graduate-level degree and non-degree programs to in-service teachers to satisfy their need for advanced studies. In 1991, both normal universities started their master's program in Industrial Technology Education. Many in-service teachers and university graduates compete for the opportunity to enroll in the programs every year. Some other authorized universities and teacher professional development centers have been organizing various courses or workshops for in-service teachers. To promote academic research and professional development, National Taiwan Normal University established a doctoral program in Industrial Technology Education in 1998 (Lee, Wang, Wang, Shih & Yeh, 2000).

Issues in Technology Education and Technology Teacher Education

On reflection, there are some issues in the technology education and technology teacher education that need to be resolved:

1.Technology education at elementary school level is still not universal

Mainly caused by teachers' training background, technology education at the elementary school level is still not universal. Hopefully, the Living Technology in the coming new national curricula for grades 1-9 will make a difference to this state of affairs.

2. Further-study generated teaching abnormal phenomenon at the secondary level

In general, the junior high school or senior high school takes a preparative role in our educational system. The major goal in these lower- or upper-secondary schools is to attain further study opportunities, at upper-secondary or at university level. However, Living Technology and other artistic as well as physical education courses are not included in the subjects on the entrance examination. These courses always play less important roles in school. In traditional Taiwan, people mocked these courses as merely auxiliary. This deep-rooted problem adversely influences our educational development. The alleged "abnormality" of those auxiliary courses is a problem in secondary school.

3. Lack of harmony between the curriculum standard and realistic learning environment

In comparison with other general courses, Living Technology needs more complicated and expensive teaching facilities. It also requires a more intricate learning support system in the realistic teaching environment. However, due to the impact of traditional culture, negative factors such as policy, budget and thinking prevent the curriculum standard and a realistic teaching environment from developing harmoniously.

4. New curriculum leads new problems and challenges

Compared with the previous Industrial Arts curriculum, the new Living Technology curriculum has a much broader content scope. Educational reform has lead innovative thinking into the new curriculum standard, requiring the implementation of many practical strategies. Many issues demand immediate attention and resolution, such as the improvement of teacher competence, in-service training problems, the updating of the learning environment, and textbook upgrading problems.

5. Traditional teacher training system is currently being transformed

In the open environment, traditional normal universities and colleges have to transfer their responsibility from a single to a multiple goal. The departments of Industrial Technology Education also provide multiple purpose curricula. For instance, they also provided specialized technology and human resource development (HRD) programs to fit industry and corporation requirements. That is, traditional technology teacher preparation institutions have gradually diversified their programs. This might result in the dilution of the quality of their technology teacher training and related research and development.

Efforts for Promoting Technology Education

In Taiwan, there are no subject-specific supervisors and curriculum development institutes in educational authorities. Thus, teacher educators are often entrusted to work on national curriculum development, and to assist educational authorities as well as schools with educational practices. For example, this author has been entrusted by the MOE to lead a team developing the national Living Technology curriculum for grades 1-9.

This author and his colleagues have been working on the following efforts

to promote technology education:

1. Technology education research projects

Mainly funded by the National Science Council (NSC), a series of research projects have been conducted in recent years, whose themes have included the cross-country comparative study of teaching strategies, learning assessment, and the identification and assessment of technological literacy, etc.

2. Unit plans with technology learning activities (TLAs)

In order to communicate the national curriculum to school teachers, many packages of technology unit plans with TLAs have been developed. They may be accessed online or in print. Those TLAs emphasize the idea, "For the Teacher and By the Teacher" (see Figure 7).

Figure 7. A package of TLAs. developed by a team of school teachers led by this author.

Figure 8. An elementary teacher presents her students' solar racecars.

3. Technology education periodicals

Sponsored by educational authorities, Living Technology Monthly (formerly called "Industrial Arts Monthly") has been published for over 30 years. School technology teachers receive it free of charge.

4. Students technology performance contest

Sponsored by the Taipei Bureau of Education, the Junior-High-School Students' Technology Performance Contest has been held yearly. Various workshops regarding technology education for students are also held.

5. Teacher's professional development workshop

Professional development workshops for technology teachers have been run at various levels in various places. In the workshops, technology teachers are strongly encouraged to share their successful experiences (see Figure 8).

6. Technology professional association

The Industrial Technology Education Association (ITEA), Taiwan, R.O.C. plays a vital role in organizing technology educators to work together in this field. For example, this association is a founding member of the International Conference on Technology in the Asia-Pacific Region (ICTE), which is a

professional group which normally holds a biennial conference to promote communication and academic exchange. The next ICTE will be held by the Korean Technology Education Association in the Autumn of 2001.

Called Industrial Arts or Living Technology, technology education has been developing in Taiwan for a long time. Predecessors of technology education have already established many outstanding achievements. In confronting future challenges, an aggressive attitude is the best solution to resolving the issues presented above.

References

Central Intelligence Agency (CIA). (1999). Taiwan, In The world factbook 1999. Available on http://www.cia.gov/cia/publications/factbook/tw.html.

Lee, L. S., Wang C. P., Wang, Y. C., Shih, N. M., & Yeh, C. C. (2000, June). Technology education and technology teacher education in Taiwan, R. O. C. National Taiwan Normal University, Department of Industrial Technology Education.

The Republic of China Government Information Office (ROCGIO). (2000) The Republic of China yearbook 2000. Available on http://udserv.gio.gov.tw/info/book2000/.

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Delegate of Taiwan, International Conference on Technology Education in the Asian and Pacific Region (ICTE)

Member, International Technology Education Association (ITEA)

Member, Association for Career and Technical Education (ACTE)

Main Publications

Issues in Technology Education and Vocational Education (1996, Book in Chinese)

Trends in Technology Education and Vocational Education (1997, Book in Chinese)

Prospects of Technology Education and Vocational Education (1998, Book in Chinese)

Outlook of Technology Education and Vocational Education (1999, Book in Chinese)

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