

Articles

A Perspective of Technology Education in Taiwan, Republic of China

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A Brief Review of Taiwan's Educational System

The Republic of China was founded in 1911 and moved its seat of government from mainland China to Taiwan in 1949. Situated in the far western Pacific, Taiwan covers an area of 36,000 square kilometers (about .38 percent of the area of the USA) and has a population of 20 million. Its population density—556 persons per square kilometer—is one of the highest in the world and is over 20 times the population density of the USA. The absence of rich natural resources mandates that the Taiwanese workforce be highly productive in order that industry may be competitive; hence, a comprehensive educational system is needed to effectively develop productive abilities of the dense population.

The core of today's educational system in Taiwan (see Figure 1) is the nine-year compulsory national education program (“Kuo Ming Chiao Yu”). This includes a six-year elementary school and a three-year junior high school. Beyond these schools are two parallel three-year institutions—a senior high school and a senior vocational school. Junior college education assumes three patterns: two-year, three-year, and five-year programs. University programs last four to seven years, depending on variations within departments. Technical colleges offer two kinds of program: a two-year program for junior college graduates and a four-year

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Figure 1. Structure of the educational system.

Note: From Ministry of Education, 1989a, p. 9.

program for senior vocational school graduates. At the graduate level, the minimum length of study for a master's degree is two years, with an additional two years as the minimum required to earn a doctorate. Entrance examinations are required for admission to schools beyond the level of the nine-year compulsory education (Lin, 1985).

In the 1988-89 school year, the percentage of children of elementary-school age enrolled in school was 99.9 percent; the percentage of elementary-school graduates entering junior high school was 99.1 percent; the percentage of junior high graduates entering senior secondary school was 79.5 percent, and 45.5 percent of senior secondary graduates advanced to higher education (Ministry of Education, 1989b).

Curriculum in Transition

In Taiwan, curricula for elementary, junior high, and senior high schools are promulgated by the Ministry of Education. Curriculum standards for all levels of school are revised about every 10 years. Revision is made by sub-committees. The members, appointed by the Ministry of Education, are curriculum specialists, teacher educators, classroom teachers, and administrators.

According to current junior high and senior high curriculum standards¹ (Ministry of Education, 1983a & 1983b), which were promulgated in July 1983 and have been implemented since August 1984, students in grades 7 to 11 must select either industrial arts ("Kung I"), or home economics with a two-hour weekly study (a regular week is 32 to 39 hours). Schools usually assign boys to industrial arts programs and girls to home economics. Some elective courses pertaining to industrial arts, like drafting, metalworking, and electronics shop, are also provided at both junior and senior high levels, but they are more vocational-oriented (characterized by "learning for earning") than the required industrial arts (characterized by "learning for living").

As shown in Tables 1 (Ministry of Education, 1983a) and 2 (Ministry of Education, 1983b), the objectives and content of industrial arts education in Taiwan is undoubtedly industry-based and technology-oriented. Its curriculum focus is in transition from traditional industrial arts to contemporary technology education and its content categories seem to mix broad occupational areas (like woodworking) with industry clusters (like the manufacturing industry).

¹ At the elementary level, industrial arts is a component of the broad-study subject "craft work" which consists of drawing, sculpture, design, industrial arts, horticulture, and home-making.

Table 1

A Summary of the Objectives and Content of Junior-High Industrial Arts Curriculum in Taiwan

Objectives	Content (allocated weeks)
1. To help students to understand traditional and contemporary industrial civilization and recognize their local industrial status and trends.	1. Introduction to Industrial Arts (2)
2. To provide students with career exploration opportunities to discover their interests and abilities in the field of industrial technology.	2. Blueprint Reading and Planning (6)
3. To develop students' necessary knowledge, skills, and attitudes for living in the industrial society.	3. Ceramics Shop (5)
4. To foster students' cooperative, industrious, gregarious, and enthusiastic personalities.	4. Woodworking (15)
5. To develop students' consumer skills and knowledge.	5. Plastics Shop (5)
6. To foster students' habits to coordinate doing and thinking and ideas about dignity and equality in working.	6. Metalworking (15)
	7. Electricity Shop (7)
	8. Graphic Communication (4)
	9. Construction and Livelihood (9)
	10. Manufacturing Industry (12)
	11. Information Industry (6)
	12. Audio-visual Communication (7)
	13. Energy and Power (7)

The implementation of industrial arts curriculum standards has led to the following supportive efforts:

- Industrial Arts Equipment Standards are promulgated by the Ministry of Education after each curriculum standard revision to set up the minimum requirements of industrial arts facility and equipment.
- Junior-high industrial arts textbooks are compiled and printed by the National Institute of Compilation and Translation, an institution of the Ministry of Education. Commercial senior-high industrial arts textbooks also have to be approved by the institute.

Table 2

A Summary of the Objectives and Content of Senior-High Industrial Arts Curriculum in Taiwan

Objectives	Content (implemented grade)
1. To introduce students to industrial technology knowledge and foster industrial skills for their industrialized living and advanced studies.	1. Project Planning and Drafting (grade 10)
2. To ignite students' interests of design and creation, provide them with career exploration opportunities in the field of industrial technology, and encourage them to do research and invention.	2. Industrial Materials (grade 10)
3. To develop students' appropriate working habits and attitudes.	3. Energy Industry (grade 10)
	4. Information Industry (grade 11)
	5. Automation (grade 11)

- Sponsored by the Ministry of Education or the departments/bureaus of education in provincial/special municipal governments, a variety of in-service teacher training programs are provided for industrial arts; almost all the enrollments of these training programs are free of charge.
- Through the recognition of outstanding industrial arts teachers, the annual convention, publications, etc., the Chinese Industrial Arts Education Association devotes its energies to the improvement of industrial arts education at all levels.
- The *Journal of Industrial Arts Education*, edited by the Department of Industrial Arts Education at National Taiwan Normal University, is disseminated monthly, free of charge, to secondary schools and other institutions pertaining to industrial arts education.
- Funded by the Ministry of Education or the departments/ bureaus of education in provincial/special municipal governments, serial publications and teaching aids are often provided for industrial arts teachers.
- An industrial arts consultative team, composed of industrial arts teachers, supervisors, and principals, is organized at every county and city to serve junior high industrial arts teachers.
- The yearly industrial arts project exhibition and/or student contest is/are respectively held at county/city and province/special municipality levels.

There are two university departments of industrial arts education in Taiwan, one at the National Taiwan Normal University and the other at the National Kaohsiung Normal University. Each provides both pre-service and in-service secondary school teacher training programs. In terms of the pre-service program, students are admitted following successful performance on the yearly College Joint Entrance Examination (CJEE) administered to graduating senior-high students. During their five-year period of study in the program, students enjoy a four-year tuition waiver and living expenses in their universities. One additional year is spent in secondary schools in a teaching internship. In recent years, there have been around 100 graduates annually from these two departments of industrial arts education. Faculty members in these two departments have plenty of chances to devote themselves to a variety of efforts to improve industrial arts education.

Problems Facing Technology Education

A problem refers to “a significant discrepancy between an existing degree or amount of a characteristic [‘to be’ or the actual] and a preferred degree or amount of that characteristic [‘ought to be’ or the ideal]” (Friedman, Brinlee, & Hayes, 1980, p. 16). Today's industrial arts education in Taiwan has the following problems which are listed in a descending order of priority.

Industrial Arts Is Seen as a Subordinate Subject

Since both the entrance examinations for senior high school and college/university admissions are very competitive² and industrial arts is not included in the required subjects for these examinations, most parents, principals, teachers, and even students in secondary schools see industrial arts as a subordinate, unworthy subject.

The Public's Perceptions are not Aligned with the Field

The current name of industrial arts “Kung I” was translated from American “industrial arts” in the 1950s, but the term “Kung I” has been used in Chinese society for thousands of years. “Kung I”, in early Chinese language, referred to polytechnic or technology, but, has been widely seen as the equivalent of handicraft after the introduction of western ways into China at the turn of this century. Hence, it is difficult for professionals in the field of industrial arts education to communicate the ideas of this field to the public.

Coupled with the public's perceptions, the educational administrators admitted numerous personnel who majored in fine arts or related disciplines to be *qualified* industrial arts teachers in the late 1960s. Many of these so-called

² In 1988, for example, 112,327 applicants took the College Joint Entrance Examination (CJEE) and only 37,929 (33.76 percent of the total applicants) were admitted to one of the day-session programs in colleges or universities.

“industrial arts teachers,” especially those who have been unwilling to attend in-service teacher training programs, have opposed the development of technology-oriented industrial arts education.

Some Drawbacks Exist in the Promulgation of Curriculum Standards

Based on Lee's studies (1986, 1987, & 1988), some drawbacks of the centralized industrial arts curriculum standards have been identified:

- The revision interval is too long, so the standards are unable to promptly reflect social changes.
- The standards lack flexibility, so they are unable to meet differences in school districts and students.
- Its decision-making process is too teacher educator-oriented.
- Its process leans toward an arbitrary judgment because few related professional inquiries such as situation analysis, experiments, and follow-ups have been done.

Many Teachers Deviate from the Curriculum Standards

Admittedly, the implementation of curriculum standards mainly depends upon the teacher's instruction. It is evident that industrial arts teachers' instruction in Taiwan has widely deviated from the ideal curriculum prescribed by the curriculum standards. The deviation could be a desirable modification based upon critiques of the curriculum standards, but unfortunately almost all deviation has led in a worse direction (Lee, 1987). The two predominate factors to cause the deviation are:

Teachers' indifference. As mentioned above, industrial arts has not been a subject required by the entrance examinations of senior high schools and colleges/universities. Lacking serious supervision and desirable expectations, many industrial arts teachers are dull or unable to reflect curriculum change in their teaching. Especially, the thirteen sub-categories of junior high industrial arts curriculum, mixing broad occupational areas with industry clusters, are really too great to be managed well.

Teachers' overload. At present, each industrial arts teacher is confronted by large class sizes, averaging 46 students, and about 23 teaching hours per week (more than the hours of most teachers teaching other subjects). The overload leads them to often “cut the feet to fit the shoes,” i.e. trim instructional activities to what they can handle.

When industrial arts had its name changed from “Arbeit” (German word meaning “work”) in the early 1960s, Wang (1960), who was the director of the Department of Secondary Education, Ministry of Education and in charge of curricular revision for secondary schools at that time, cited the following Chinese fable to claim the appropriate position of industrial arts in general education.

In the past, an expert in general education, who thought the 3R's—*reading*, *writing*, and *arithmetic* were the whole of general education, hired a boat to pass

a river. While the boat was crossing the river, he chatted away to the boatman. First, he asked, "Can you read?" The boatman answered, "No." He told the boatman, "You lost one third of your life." He then asked if the boatman could write; the boatman's answer was also negative. "You lost two thirds of your life," said the expert. After a moment, the boat was in the middle of the river and the wind made the boat pretty unstable. The boatman asked the expert, "Can you swim?" The expert answered, "No" with fear. The boatman complacently said, "If the boat turns over, you will lose the whole of your life." (p. 9)

The fable indicates that descriptive, prescriptive, and formal knowledge (which can be linked to the 3R's) is not sufficient learning for general education; praxiological knowledge (which can be linked to *swimming*) has to also be offered in schools (Towers, Lux, & Ray, 1966). Admittedly, since industrial arts education in Taiwan was greatly influenced by the USA in the 1950s,³ it has appropriately been seen as an action-based study of functional literacy (like swimming in the above fable) in general education. Owing to the preceding problems, however, industrial arts education is still "swimming up stream."

Future Efforts: Focus on Curriculum Change

In accordance with the plan to extend the nine-year compulsory national education to 12 years in the 1990s, the industrial arts curriculum standards are expected to be revised in the coming two years and the student's formative performance on all subjects in junior high school could be considered as the criteria to admit him/her to his/her preferred senior high or senior vocational school. This appears to be a good opportunity for professionals in this field to rename industrial arts, develop a progressive philosophy, reconstruct industrial arts curriculum, and win the public's support for industrial arts education.

Summary

Under a centralized strategy, industrial arts education in Taiwan is required for students (mainly, boys) in grades 7 to 11. In the process of transition and characterized by the industrial-base and technology-orientation, current industrial arts curriculum mixes traditional "industrial arts" with contemporary "technology education."

Although a variety of support from governmental institutions for industrial arts education is evident, today's industrial arts education in Taiwan is still

³ In 1953, under some American specialists' assistance, the Department of Industrial Education at Provincial Taiwan Normal College (now National Taiwan Normal University) was founded in Taipei, Taiwan. Since that time, American industrial arts theory and practice has been widely introduced into Taiwan through frequent exchanges of Sino-America professional personnel and literature.

struggling with many problems which are mainly caused by the public's weak support. It is anticipated that the coming curriculum standards revision may effect a profound improvement upon industrial arts education.

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